(No Model.) 3 Sheets—Sheet 1.

S. M. TERRY.

REGISTER AND RECORDER FOR REVOLVING SHAFTS.

No. 384,479. Patented June 12, 1888.

Fig. 1.

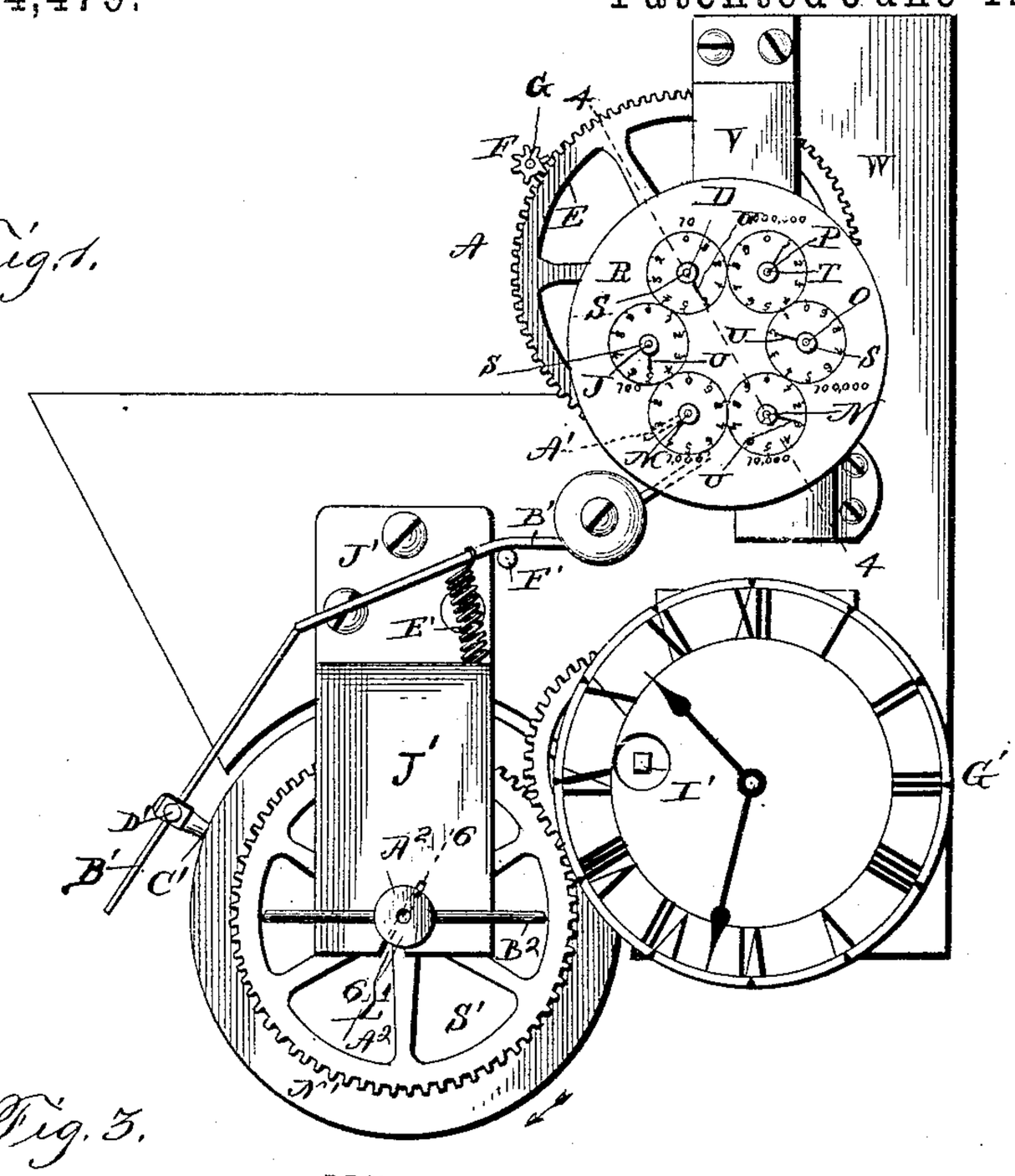
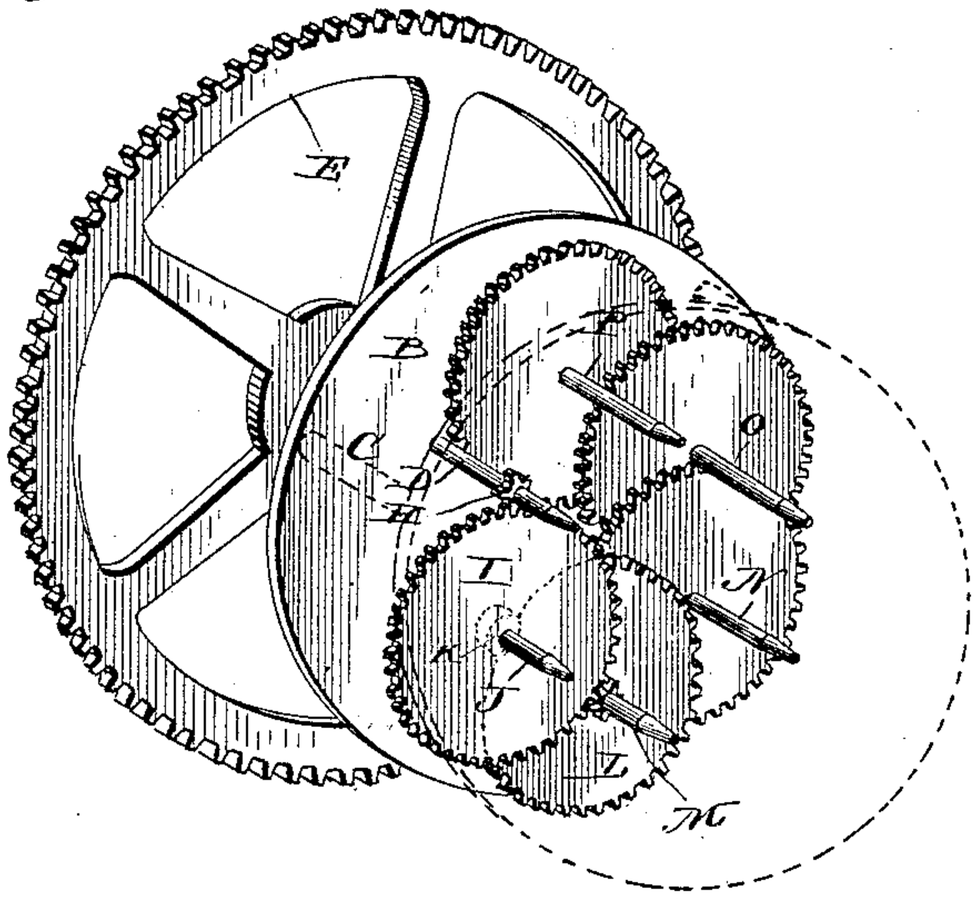


Fig. 3.



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By his Attorneys
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(No Model.) 3 Sheets—Sheet 2.

S. M. TERRY.

REGISTER AND RECORDER FOR REVOLVING SHAFTS.

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Fig. 2.

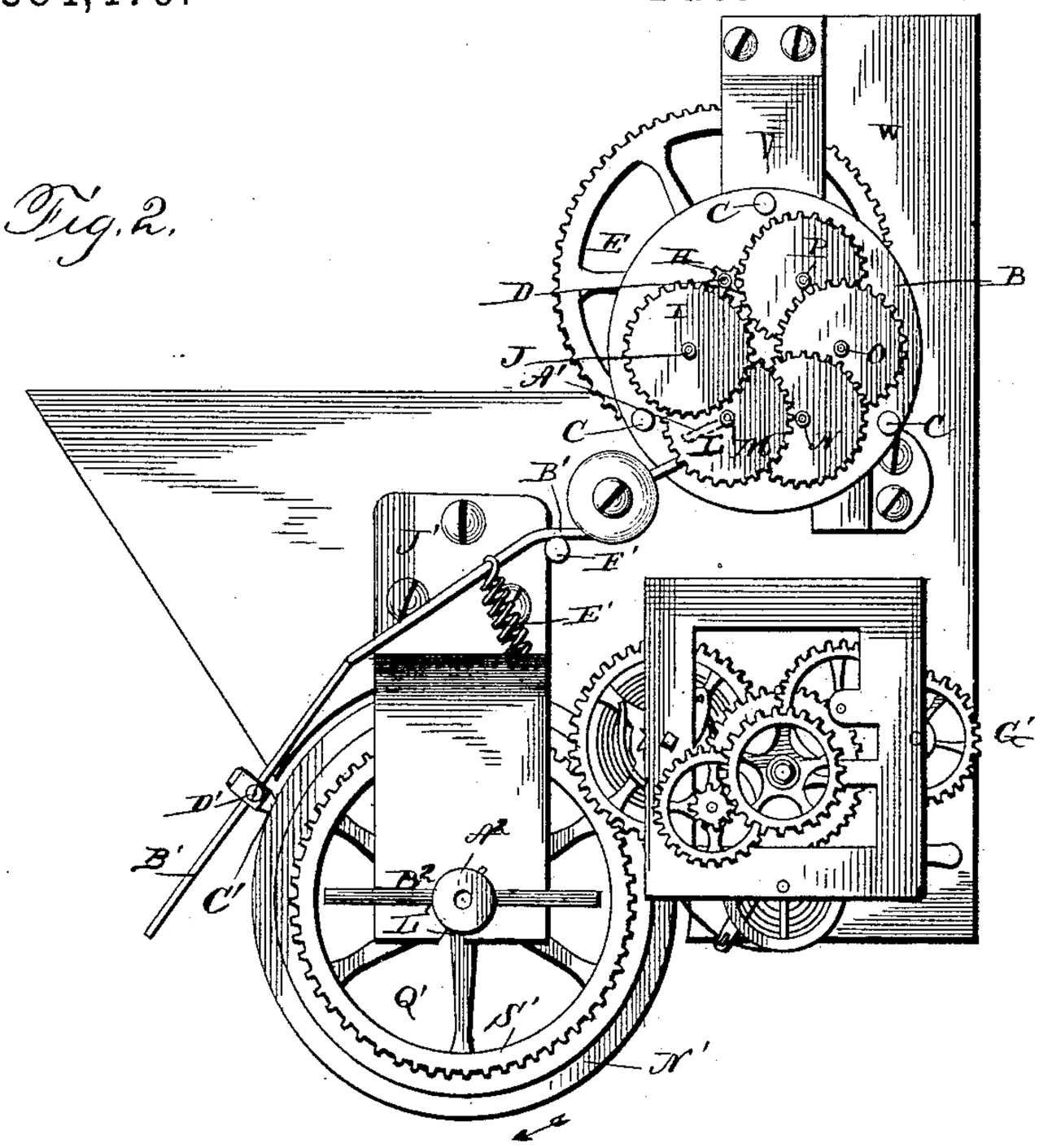
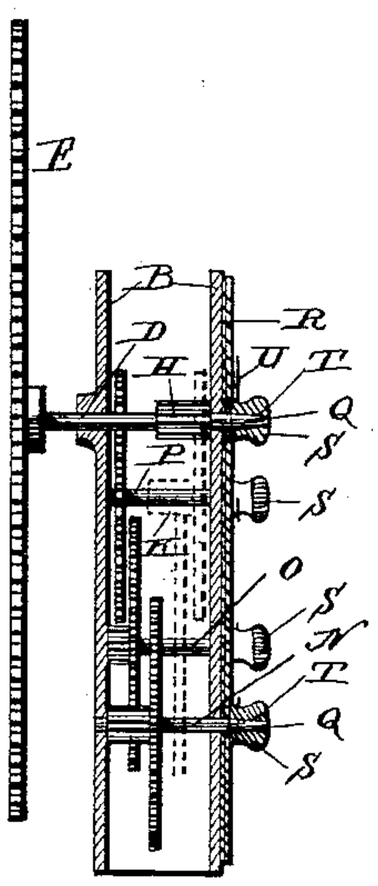


Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

S. M. TERRY.

REGISTER AND RECORDER FOR REVOLVING SHAFTS.

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Fig. 5.

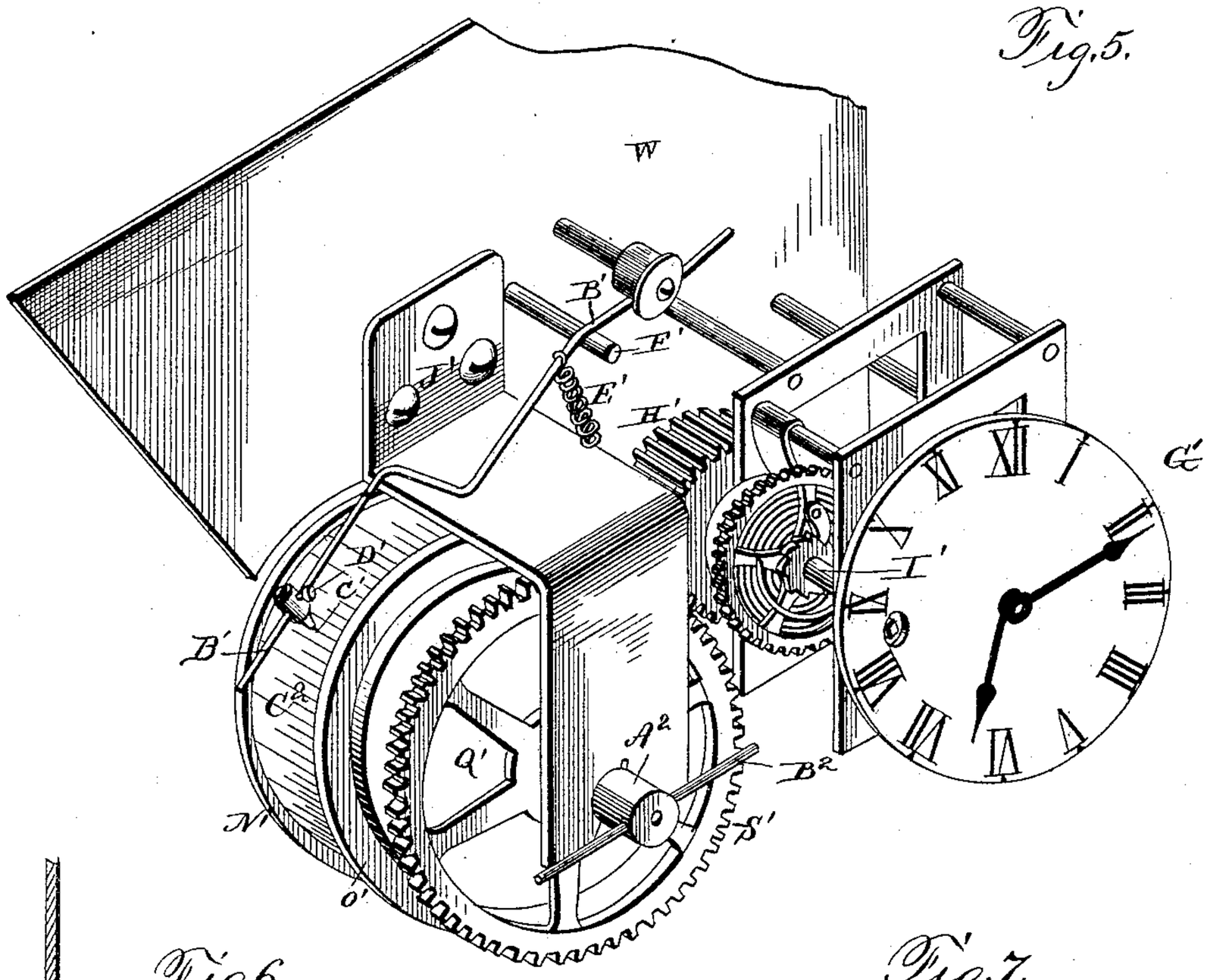


Fig. 6.

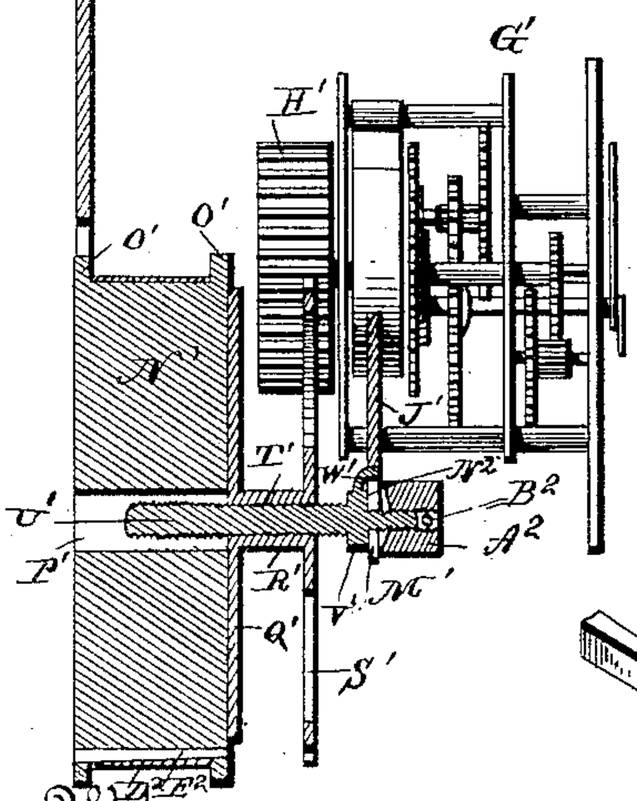
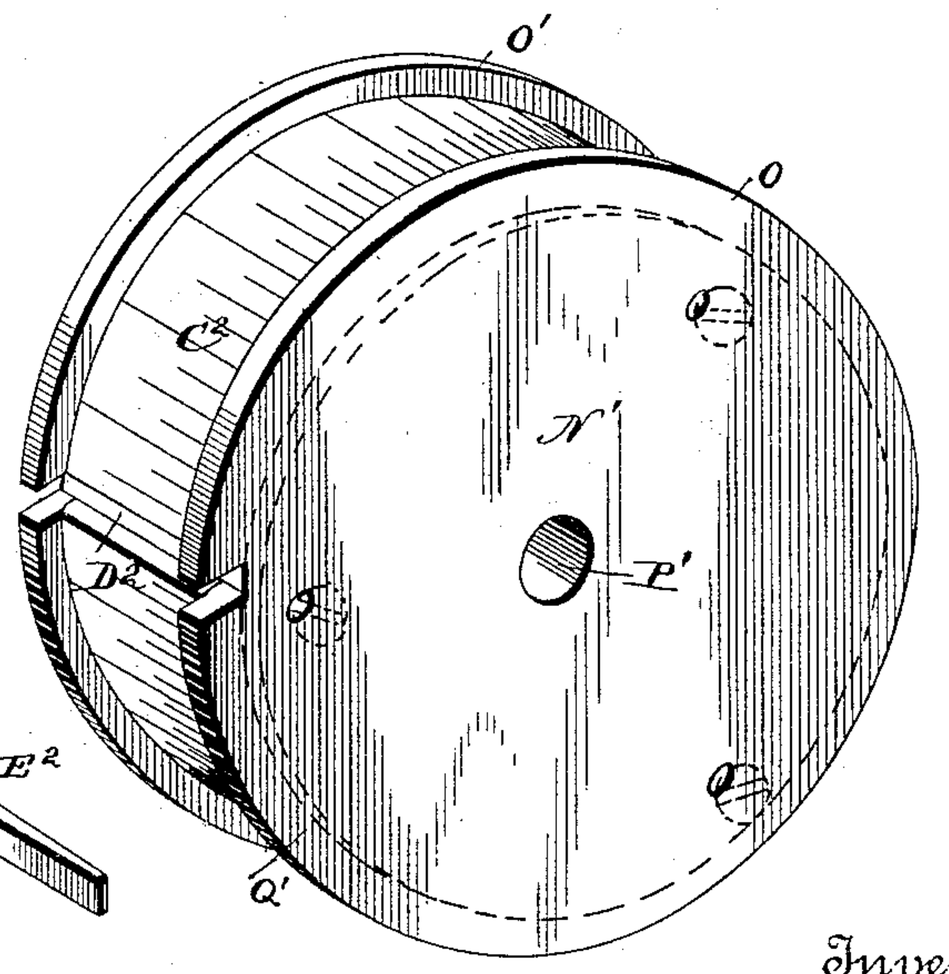


Fig. 7.



Witnesses,
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Inventor.
Solon M. Terry,
By his Attorneys.
Louis Bagger & Co.

UNITED STATES PATENT OFFICE.

SOLON M. TERRY, OF PITTSFIELD, MASSACHUSETTS.

REGISTER AND RECORDER FOR REVOLVING SHAFTS.

SPECIFICATION forming part of Letters Patent No. 384,479, dated June 12, 1888.

Application filed June 10, 1887. Serial No. 240,894. (No model.)

To all whom it may concern:

Be it known that I, SOLON M. TERRY, a citizen of the United States, and a resident of Pittsfield, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Indicators and Recorders for Revolving Shafts; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a plan view of my new and improved device or mechanism for recording the revolutions of shafts and the occurrence of irregularities in the same. Fig. 2 is a similar view taken, however, with the dials of the clock and also the dials of the mechanism for registering the number of revolutions of a shaft removed. Fig. 3 is a detail perspective view of the said mechanism for registering the number of revolutions of a shaft. Fig. 4 is a sectional view through the mechanism for registering the number of revolutions of a shaft, taken on line 4 4 of Fig. 1. Fig. 5 is a perspective detail view of the mechanism for registering any irregularities which may occur in the revolution of a shaft, and also for indicating the time of day at which the said irregularity occurs. Fig. 6 is a sectional view taken on line 6 6 of Fig. 1, and Fig. 7 is a perspective detail view of the adjustable registering-drum.

The same letters of reference indicate corresponding parts in all the figures.

My invention consists in a new and improved device or mechanism for registering the number of revolutions of a shaft running any kind of machinery in manufacturing establishments where accuracy of speed is required, and also for registering any irregularities which may occur in the speed of the revolutions of a shaft, and for indicating or recording the time of day and the day of the week at which the said irregularities occurred; and my invention will be hereinafter fully described and claimed.

Referring to the several parts by letter, A indicates the mechanism for registering the number of revolutions of a shaft, and I will first fully describe this mechanism.

B B indicate a front and rear metallic disk, which are secured parallel to one another by the short pillars C. In these disks is journaled transversely a shaft, D, the rear end of which extends back of the rear disk, B, and has rigidly secured upon it a large toothed wheel, E. This large gear-wheel E is adapted to mesh with a pinion, F, which is mounted on the end of the drive-shaft G, to which my invention is applied, the said pinion F being, in a working-machine, formed with twelve teeth, while the large gear-wheel E is formed with one hundred and twenty teeth, so that it will require ten revolutions of the drive-shaft G, the revolutions of which are being measured, to revolve the first shaft, D, of the mechanism A once. The number of teeth of the pinion F and of the large wheel E may of course be greater or less than those here described; but the same proportion should exist between the number of teeth of the two—that is to say, the number of teeth of the large wheel E should be ten times as great as those of the pinion on the shaft the revolutions of which are to be registered—so that it will always require ten revolutions of the said shaft G to revolve the first shaft, D, once.

Upon the outer middle portion of the shaft D is formed or secured rigidly a pinion, H, the teeth of which mesh with the teeth of a gear-wheel, I, which is rigidly secured upon the outer middle part of a second shaft, J, which is journaled in the disks B B, and which is also provided with a pinion, K, (shown in dotted lines in Fig. 3 of the drawings,) which in turn meshes with a gear-wheel, L, on a third shaft, M, journaled between the disks B B; and three other shafts, N, O, and P, are journaled in the said disks B B, each of the said shafts between the disks being provided with a pinion and a gear-wheel which intermesh in the manner described, so that the first shaft turns the second, the second turns the third, the third turns the fourth, the fourth turns the fifth, and the fifth turns the sixth.

The outer ends of the several shafts extend through their bearings in the outer disk, B, and their outer ends are tapered, as clearly shown in the sectional view Fig. 4 of the drawings, and a dial, R, is secured upon the outer face of the outer disk, B, and has six separate circular scales marked on its outer

face or side, each of the said scales being marked with a series of numerals running from 0 to 9 and arranged in a circle, as shown. Now, on the outer tapered end of each of the six shafts of the recording mechanism A is mounted an indicator-hand, U, each of the said indicator-hands being secured firmly to the inner flat end of an adjustable cap, S, the said cap being formed with a central tapered aperture, T, (see Fig. 4,) extending from its inner end, while the head of this cap is milled for convenience in turning it with the fingers. The outer end of each of the six shafts lies in the center of its respective scale on the dial R, so that the indicator-hands U sweep or pass over these scales. Now, this mechanism A for registering the number of revolutions of a shaft having been secured in operative position, with the pinion F on the end of the said shaft G meshing with the large gear-wheel E on the inner end of the first shaft, D, of the said mechanism, (the disks B B being supported by the frame-pieces V at a slight distance away from the vertical back plate, W, to allow room for the rearwardly-extending end of the first shaft, D, and the large gear-wheel E on the same,) it will be seen that, as the said pinion F has only one-tenth the number of teeth of the large gear-wheel E, each revolution of the shaft G, whose revolutions are being counted, will turn the first shaft, D, one-tenth of a revolution, so that the indicator-hand or pointer U, which is set at the 0 before the shaft starts, will travel over the scale to the figure 1, indicating that the drive-shaft G has completed one revolution, and when the said drive-shaft has completed ten revolutions the point of the said indicator-hand on the first dial will have traveled around the said dial-scale back to the 0 at the beginning of the scale. Now, the pinion H on the first shaft, D, has in a working-machine one-tenth the number of teeth in the gear-wheel I on the second shaft, J, with which it meshes, and in like manner each one of the pinions on the several shafts of this mechanism have one-tenth of the number of teeth of the gear-wheel of the said shafts with which they mesh, so that it will take ten revolutions of the second shaft to revolve the third shaft once, ten revolutions of the third shaft to revolve the fourth shaft once, and so on to the end of the series of shafts. Now, when the first shaft, D, has completed one revolution, and the end or point of the indicator-hand of the said shaft has traveled around, as described, to the figure 0 again, the drive-shaft G has completed one hundred revolutions, and the pinion H on the first shaft, D, has turned the second shaft, J, one revolution through its gear-wheel I, and the index-hand on the outer end of the said second shaft has traveled from 0 to 1 on the scale for the second shaft, or rather on the second scale; and in like manner when the drive-shaft has finished a second ten revolutions and the indicator-hand of the first shaft has traveled around again from 1 to 0, the indicator-hand of the second shaft is moved on from the numeral 1 to the numeral 2, the first scale indicating tens from zero to nine, the second scale indicating hundreds, the third thousands, the fourth ten thousands, the fifth hundred thousands, and the sixth millions, and the shafts and scales might be extended, if required, to indicate larger numbers, but these are in all ordinary cases amply sufficient. As each shaft completes the tenth revolution, it moves the next shaft in the series forward one tooth, and the several index-hands indicate on their respective scales the precise number of revolutions of each shaft, so that at any moment the number of revolutions which have been made by the drive-shaft whose revolutions are being counted or numbered can be read off at a glance, the first scale or dial and its pointer being adapted to indicate revolutions of the drive-shaft from ten up to one hundred, the second indicating hundreds—that is, if the pointer or index-hand of the second dial stands or points to 3, then the drive-shaft has made three hundred revolutions, to which are to be added the number 5, 6, or 8, as the case may be, which the first dial indicates. The other dials indicate in the same manner, so that, beginning with the dial of the highest number—the last or sixth—and looking at each dial in turn back to the first, the exact number of revolutions which the drive-shaft G has made can be read at any moment. When the machinery is stopped at the end of the day, the number of revolutions can be thus read off, and when the machinery is to be started again to begin the next day's work the indicator-hands are all turned back to the figure 0 of their respective scales, this being accomplished by merely turning the several taper caps S, to the inner ends of which the indicator-hands are secured, around on the tapered outer ends of the several shafts until the pointers come to the 0 at the beginning of the scales, when the mechanism is ready to start again to register the day's work. The taper caps, which have the index-hands mounted on their inner ends, fit closely and tightly on the tapered outer ends of the several shafts, so that they will not slip or move around on the said shafts, but will only move under a firm pressure of the fingers, and must be turned purposely.

From the foregoing description, taken in connection with the accompanying drawings, the construction and manner of operation of my improved mechanism for registering the number of revolutions of a shaft will be readily understood. It will be seen that this mechanism is comparatively simple and very strong in construction, and that it will perform its work with great efficiency and accuracy. I will now proceed to describe the mechanism which operates in conjunction with this before-described mechanism to record any irregularities which may occur in the revolution of the drive-shaft whose speed is being registered, and which also indicates and records the time of day, and

also the day of the week, at which this irregularity occurred.

Upon one of the shafts in the registering mechanism A is secured a lug, A′, and upon the main back plate, W, is pivoted or pivotally mounted in any ordinary and suitable manner a lever, B′, the upper end of which is engaged by the said lug on each revolution of the shaft on which the lug is mounted; and it will be seen that on each revolution of this shaft, indicating a certain number of revolutions of the drive-shaft G, to which my invention is applied, the said lug will trip or swing the lever B′, which has secured on its lower end by a set-screw, D′, a sharp point, C′, and the lower end of the lever B′ is normally held with the point of the marker C′ in contact with the strip of paper or the like on the recording-drum by means of a coiled spring, E′, as shown, a stop, F′, regulating the inward stroke of the lower end of the said lever, preventing the point of the marker from striking the record-paper with too much force.

Upon the main vertical back plate, W, to the right hand of the registering mechanism A, is mounted a clock mechanism, G′, consisting of an entire clock of the ordinary construction, and either a marine or a pendulum clock may be employed; but, for convenience, I prefer to employ a marine chronometer, on account of its requiring less space and running in any position. This clock or chronometer is of the usual construction, with the exception that a broad-toothed or gear wheel, H′, is rigidly secured upon the rear portion of the mainspring-shaft I′ of the clock, the rear end of the said shaft being extended for that purpose. Above and to one side of this clock mechanism is secured to the main vertical back plate, W, a bearing-plate, J′, which extends out at right angles to the vertical back plate, W, and is bent down at right angles, and its outer portion extends parallel with the vertical back plate, W. In the outer end of this bearing J′ is formed a slot, L′, leading to a curved bearing, M′, from which a reduced slot, N², extends, the slot L′ being inclined downward as well as outward, as shown, for convenience in placing the recording-drum in position and removing it from engagement with the clock mechanism when it is desired to adjust the drum or to wind the clock. This recording-drum N′ may be of wood or other suitable material, having the wide periphery formed with the end flanges, O′ O′, and having a central opening, P′, extending partly or entirely through it from its outer end. Upon the outer end of this wooden drum is secured by screws, or in any other manner, a metal disk or plate, Q′, on the center of which is secured a pillar, R′, and upon the outer end of this pillar is rigidly and diametrically secured a large gear-wheel, S′. This pillar R′, and also the metal plate on which it is secured, is formed with a central longitudinal screw-threaded aperture, T′, with which the central opening, P′, of the wooden drum registers, as shown in the sectional view Fig. 6 of the drawings, and in this screw-threaded aperture T′ fits and works the main or body portion of a screw, U′, which is provided toward its outer end with a fixed head or collar, V′, having the projecting and outwardly-curved lug W′. The drum having been screwed upon this screw to the desired point, as hereinafter described, the screw is placed in its operative position by slipping its upper or outer end above the said collar V′ in and through the slot L′ until it reaches the bearing M′ at the inner end of the said slot, when, the outer surface of the collar bearing against the inner surface of the bearing-plate J′, the outwardly-projecting end of the lug W′ will fit in the reduced slot N′, and thus prevent the screw from turning in the bearing, and the screw is firmly, though adjustably, secured in this bearing by means of the adjustable screw-cap A², having the finger-piece B² at its outer end and adapted to be screwed on the outer end of the screw U′, the inner end of this screw-cap being somewhat dished or concaved, so that when the nut has been screwed down tight upon the bearing-plate J′ the entire outer circular edge of its inner end will bite or bind tightly against the outer surface of the bearing-plate J′, as clearly shown in the sectional view Fig. 6 of the drawings, and thus effectually prevent the screw U′ from moving or slipping in its bearing as the drum works upon it.

Upon or around the wide periphery of the drum N′, between the annular end flanges of the same, is removably secured a record strip, C², of paper or other suitable material, having the hours and divisions of hours printed upon it, this strip being secured upon the drum in any suitable manner; but this may be conveniently done by forming a recess, D², transversely across the edge or periphery of the drum at one point, inserting the ends of the paper strip in the said recess, and securing them therein by means of a wedge-piece or key, E², by which arrangement the strip can be readily removed at the end of the week and replaced by a fresh strip.

The drum is arranged or "set" at the beginning of the week's work by screwing it up upon the screw U′ before the screw is secured in its bearing, adjusting the drum upon the screw, so that when the screw is moved into its bearing and firmly secured therein by tightening the nut or cap A² the teeth of the large gear-wheel S′ on the outer end of the pillar R′ will mesh with the teeth of the wide gear-wheel H′ on the mainspring-shaft I′ near the outer end of the said broad gear-wheel, as shown, so that as the lever B′ is tripped at each revolution of the shaft of the registering mechanism A, which has the lug A′, the point of the marker C′ will strike and perforate the paper strip on the drum near the inner edge of the same. Now, the screw U′ is formed with a coarse thread, so that when the drum N′ has been revolved once in twelve hours by the clock mechanism it will have fed far enough

in on the screw U′, on which it works, (the drum being turned by the meshing gear-wheels in the direction indicated by the arrow in Fig. 1 of the drawings, so that as it is thus revolved it will gradually screw off of the screw, moving back,) so that the next row of perforations made by the marker during the next revolution of the recording-drum will be clear of the first row, and therefore perfectly legible, standing away from them on the record-strip. In the drawings the screw is formed with thirty-two threads to the inch, so that at the end of twenty-four hours, when the drum has made two revolutions, it will have worked back one-sixteenth of an inch, and the two rows of incisions made during the two revolutions will be one sixteenth of an inch apart. It will thus be seen that as the drive-shaft of the machinery whose revolutions are to be registered and irregularities detected revolves the number of revolutions for any given time are registered by the mechanism A, as previously fully described, and the lug on one of the shafts of the said mechanism will swing or trip the lever B′ once for each revolution which it makes, the marker on the lower end of the said lever striking the paper slip on the recording-drum each time the lever is tripped and making an incision or aperture which is clear and legible, and as the drum is revolved steadily once every twelve hours by noting the spaces between the said perforations any irregularity in the speed of the drive-shaft of the machinery can be instantly detected, and also the time of day at which the said irregularity occurred, and as the drum feeds itself back on the screw U′ as it revolves, so as to leave a clear space between each row of perforations, it will be seen that not only the time of day but also the day of the week can be seen, and is thus recorded. The drum and the record-strip are made of sufficient width to afford room for the entire week's record, and at the end of the week the record paper or slip is removed and filed away, and forms a record which can be referred to at any time to see the amount of irregularity in the shaft's revolutions on any particular day and the exact hour of that day at which the said irregularity occurred.

The lug A′ can be placed or secured on any shaft of the mechanism A, according to the frequency with which the incisions on the printed strip may be desired, and is a fixed factor, as it only makes an incision when the drive-shaft G, whose revolutions are being registered, has made the number of revolutions indicated by the pointer of the said shaft to which the lug is attached; therefore, knowing the number of revolutions the shaft G has made when this index hand has made one revolution over its dial, each incision in the paper record band or strip will record that number of revolutions, and when the distance between the incisions on the record-band vary the exact irregularity in the speed of the drive-shaft can be readily computed.

At the beginning of a week's work a fresh record-strip is placed around the periphery of the drum, as described, and the drum is then screwed upon its supporting-screw U′, so that its gear-wheel will mesh with the outer part of the thick gear-wheel on the mainspring-shaft of the clock mechanism, and the screw is then slid into position in its bearing, with the lug on its collar fitting in the reduced slot to prevent the screw from turning in the bearing when the screw-cap A^2 is screwed down to bind the screw firmly in its operative position, the edge of the cap binding firmly against the bearing-plate, as described, the drum being adjusted on the screw, so that if the word is to start, for instance, at seven o'clock the figure 7 on the printed strip will register with the point of the marker. When the clock is to be wound up, the screw-cap is loosened and the gear-wheel of the drum moved out of engagement with the broad gear-wheel of the clock mechanism, and is slid back to engage again with the said gear-wheel when the clock has been wound and secured by tightening the screw-cap.

From the foregoing description, taken in connection with the accompanying drawings, the construction, operation, and many and decided advantages of my invention will be readily understood. It will be seen that my improved mechanism for registering the number of revolutions of a shaft running any kind of machinery, and also for recording any irregularities which may occur in the speed of the shaft, and for indicating the time of day and the day of the week when the said irregularities occurred, is comparatively simple in construction and exceedingly efficient and accurate in its operation. It can be readily applied to any shaft. The mechanism A registers every revolution of the shaft to which it is applied, so that the number of revolutions can be seen at a glance, while the mechanism can be arranged to start afresh by merely turning or adjusting the several taper screw-caps which carry the index-hands, and an exact record is made of an irregularity in the speed of the drive-shaft which may occur, and also of the hour of the day and the day of the week when the said irregularities occurred, and this record-slip can be filed away at the end of the week for future reference. The whole combined mechanism is inclosed in a metal or wooden box or casing, only allowing the large gear-wheel on the first shaft to project sufficiently to mesh with the pinion of the drive-shaft whose revolutions are to be registered, the casing being of course provided with a hinged front or door, which is opened to adjust the several indicator-hands and to remove and replace the record strip or band.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination, with the clock having the wide gear-wheel mounted on its mainspring-shaft, and the plate J′, having the bear-

ing in its lower end, of the screw having the collar, the screw-cap, the revolving record-drum having the central pillar formed with the longitudinal threaded aperture, and the gear-wheel mounted upon said pillar, substantially as set forth.

2. The combination, with the clock having the wide gear-wheel mounted on its mainspring-shaft, of the bearing-plate having the slot and the bearing at the inner end of the said slot, and the reduced slot, the screw having the collar provided with the lug, the screw-cap, and the revolving record-drum having the central pillar formed with the longitudinal threaded opening and the gear-wheel mounted upon it, substantially as set forth.

3. The combination, with the clock having the wide gear-wheel mounted on its mainspring-shaft, of the bearing-plate formed with the main slot and the bearing at the inner end of the said slot, and having the reduced slot, as described, the screw having the collar provided with the lug, the screw-cap formed with the concaved inner end, and the revolving record-drum having the central pillar formed with the longitudinal threaded opening and the gear-wheel mounted upon it, substantially as and for the purpose herein set forth.

4. The combination, with the mechanism consisting of the parallel disks, the series of shafts mounted therein and having the intermeshing pinions and gear-wheels, the first shaft having the large gear-wheel on its projecting rear end, and one of the said shafts having the lug secured upon it, the dial having the circular scales marked upon it, and the indicator-hands secured upon the outer ends of the said shafts, of the centrally-pivoted spring-actuated lever having the pointed marker at its lower end, and the mechanism consisting of the clock having the wide gear-wheel mounted on its mainspring-shaft, the plate J′, having the bearing in its lower end, the screw having the collar, the screw-cap, the revolving drum having the central pillar formed with the longitudinal threaded opening, the gear-wheel mounted upon said pillar, and the record band or strip of paper or other suitable material removably secured around the said drum, all substantially as set forth.

5. The combination, with the mechanism consisting of the parallel disks, the series of shafts mounted therein and having the intermeshing pinions and gear-wheels, the first shaft having the large gear-wheel on its projecting rear end, and one of the said shafts having the lug secured upon it, the dial having the circular scales marked upon it, and the indicator-hands adjustably secured upon the outer ends of the said shafts, of the centrally-pivoted spring-actuated lever having the pointed marker at its lower end, and the mechanism consisting of the clock having the wide gear-wheel mounted on its mainspring-shaft, the bearing-plate formed with the wide slot, the bearing, and the reduced slot, the screw having the collar provided with the lug, the screw-cap, the flanged drum having the central pillar formed with the longitudinal threaded opening, and the gear-wheel mounted upon said pillar, and the record-strip of paper or other suitable material removably secured around the said drum, all substantially as and for the purpose herein set forth.

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

SOLON M. TERRY.

Witnesses:
ROBT. W. ADAM,
FRED T. FRANCIS.