N° 21,117 A.D. 1912

Date of Application, 17th Sept., 1912

Complete Specification Left, 15th Mar., 1913—Accepted, 24th July, 1913

PROVISIONAL SPECIFICATION.

Improvements in Spring Motors and Driving Trains of the Clockwork Type.

I, FRANK HORNBY, of 274, West Derby Road, Liverpool, Manufacturer, do hereby declare the nature of this invention to be as follows:—

In the construction of small working models made up from standard parts comprising perforated strips and plates connected by bolts and nuts, the perforations besides being available for bolting the parts together acting also as bearings for the reception of shafting to carry pulleys or gear wheels, a simple and efficient type of spring motor is frequently required for building into the model for the purpose of driving the working parts thereof. Such a spring motor should have a powerful spring drive, a brake mechanism, and a reversing gear, and should also be of such a nature that it may be detachably connected to the standard parts from which the model is built up, and be capable of being easily and adjustably coupled by means of its driven shaft to the rotating elements, or the like, of the model.

According to the present invention, a simple type of spring motor driving through a clockwork train is provided having the above advantages, the gear train being mounted within side plates perforated round their edges with holes pitched at equal distances apart. Such an arrangement enables the side plates to be easily and detachably connected by means of bolts and nuts to the perforated strips or plates used in the construction of the model. In place of providing the edges of the plates with a continuous series of holes, slots may be formed in the edges corresponding in width to the holes and of such length as to extend throughout one or more pitch lengths of the holes. These slots provide for adjustable connections, where holes would not be in position. The spring, of the usual volute type, drives a primary spur wheel engaging and driving a small pinion on the secondary arbor. This secondary arbor may for convenience be called the A arbor. The A arbor is provided with a gear wheel which drives an escapement train, or the like, fitted with a brake, preferably of the disc type, and adapted to be engaged frictionally by a spring controlled pin. The pin barrel containing the spring is fixed and provided with cam faces, and the outer end of the pin is fitted with a turn button also provided with cam faces adapted to engage those on the spring barrel. The action of the cam faces is such that if the button is turned in either direction its cam faces tend to ride up those of the spring barrel, moving the button and pin axially and relieving the frictional pressure of the pin on the brake disc. By rotating the button sufficiently, the cam faces pass each other and the button and pin are locked in the off position, reversed rotation of the button allowing the spring to press the brake pin on the disc and arrest the mechanism. The A gearwheel permanently meshes with another gearwheel or pinion which may be termed the B gearwheel. Mounted upon a spindle in the side plates at some little distance from the teeth of the A and B gearwheels is another pinion which may be termed the C pinion. The spindle of this C pinion forms,

[*Price 8d.*]

or coincides axially with, the pivot of a reversing lever, and pivotally carried on this lever so as to lie in the curved angle formed by the adjacent teeth of the A and B gearwheels is a fourth pinion, which may be termed the D pinion. The position of the A, B, and C wheels being fixed, and the D pinion being pivoted on the lever, movement of the lever to one or other side will cause engagement of the D pinion with either the A or B gearwheels, and as the D and C pinions are mounted on the lever so as to be always in mesh the direction of rotation of the C pinion will be reversed according as to whether the D pinion is in engagement with the A or B gearwheels. Another gearwheel C^1 may be mounted on the C spindle adapted to engage a large gearwheel E pivotally carried on a second lever, the second lever oscillating about the C spindle in such manner that the gearwheels C^1 and E are always in mesh. Opposite perforations may be formed in the side plates on either side of the travel of the large gearwheel E, and spindles may be detachably fitted in these perforations, to which spindles are secured gear pinions with either one of which the large gearwheel E is adapted to be engaged by the operation of the second lever. A locking mechanism may be provided on the second lever, this locking mechanism consisting of a pin head or the like projection on the lever riding past two or more perforations in the side plate, the lever being so resiliently mounted with reference to the perforations that the projection on the lever will engage the perforations and spring therein. A loose driving pulley may be also mounted on the C spindle with a clutch mechanism adapted to engage with a fixed clutch element on the spindle, whereby the driving pulley may be clutched to the spindle or allowed to ride loosely thereon.

In a modification the brake disc is engaged by a cam arm on a lever pivotally mounted in the side plates, the lever if desired being spring controlled axially on its pivot, whereby a resilient engagement of the cam arm and the edge of the brake disc may be provided.

Dated this 16th day of September, 1912.

For the Applicant,

A. J. DAVIES,
Patent Agent by Examination,
37, Moorfields, Liverpool.

COMPLETE SPECIFICATION.

Improvements in Spring Motors and Driving Trains of the Clockwork Type.

I, FRANK HORNBY, of 274, West Derby Road, Liverpool, Manufacturer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

In the construction of small working models made up from standard parts comprising perforated strips and plates connected by bolts and nuts, the perforations besides being available for bolting the parts together acting also as bearings for the reception of shafting to carry pulleys or gear wheels, a simple and efficient type of spring motor is frequently required for building into the model for the purpose of driving the working parts thereof. Such a spring motor should have a powerful spring drive, a brake mechanism, and a reversing gear, and should also be of such a nature that it may be detachably connected to the standard parts from which the model is built up, and be capable

of being easily and adjustably coupled by means of its driven shaft to the rotating elements, or the like, of the model.

According to the present invention, a simple type of spring motor driving through a clockwork train is provided having the above advantages, the gear train being mounted within side plates perforated round their edges with holes pitched at equal distances apart. Such an arrangement enables the side plates to be easily and detachably connected by means of bolts and nuts to the perforated strips or plates as used in the construction of models on the system referred to above. In place of providing the edges of the plates with a continuous series of holes, slots may be formed in the edges corresponding in width to the holes and of such length as to extend throughout one or more pitch lengths of the holes. These slots provide for adjustability in the connection of the motor side plates to the model, where the usual pitched holes would not be in correct position.

The invention is illustrated in the accompanying drawings, in which, Fig. 1. is an edge view of a motor constructed in accordance with this invention, Fig. 2. being a face view of the motor looked at from the left side of Fig. 1. and having the left side plate, as seen in that figure, removed for clearness. Fig. 3. is a view analogous to Fig. 2. but looked at from the right of Fig. 1., the right side plate as seen in that figure being removed. Figs. 4. and 5. are end and face views respectively, of the brake disc and governor. Fig. 6. a fragmentary detail view of the brake control button, Fig. 7. being a complete view in section of the brake gear. Figs. 8. to 12. show a modification of the motor, Fig. 8. being an edge view, Fig. 9. a face view with the left side plate of Fig. 8. removed, and Fig. 10. a face view with the right side plate of Fig. 8. removed. Fig. 11. is an elevation and Fig. 12. an end detail of the brake and governor mechanism of this modification.

In Fig. 3. certain of the gear wheels and in Fig. 10. the reversing lever are shown dotted for the purpose of facilitating the reading of the drawing.

The spring 1 of the usual volute type is connected to a fixed pin 2 and to the spindle 3 of a primary spur wheel 4, by the usual ratchet and pawl connection, the wheel 4 engaging and driving a pinion 5 on the secondary arbor 6. The spring is wound by a key engaging the squared end 3^b of the spindle 3. On the arbor 6 is a gear wheel 7 driving a gear train 8 on the last spindle 9 of which is a brake disc 10. This spindle 9 also carries a governor 11 of any suitable and usual type. The brake disc 10 is adapted to be frictionally engaged by a spring controlled pin 16, and the stopping or starting of the motor thus readily effected. The pin barrel 12, Figs. 6. and 7., containing a spring 13, is fixed in one of the side plates 14 and is provided with cam faces 15. The pin 16 is normally pressed into engagement with the disc 10 by the spring, and the outer end of the pin is fitted with a milled turn-button 17 within which the pin may be gripped by the set screw 18, whereby its axial projection from the turn-button may be adjusted and the compression of the pin foot against the disc 10 regulated. The turn-button 17 is provided with cam faces 19 similar to, and adapted to engage, those on the spring barrel, the cam faces on the spring casing and on the turn button forming alternate raised steps and recesses which fit together when in the position shown in Fig. 6., and allow the foot of the pin 16 to be pressed by the spring into engagement with the brake disc 10. If the button be turned in either direction from the position shown in Fig. 6., the cam faces on the button ride up those on the fixed spring barrel, causing the button to be moved back axially, and the pin to be retracted against the compression of the spring, thus relieving the frictional pressure of the pin on the brake disc. By rotating the button until the oblique cam faces completely pass each other, and the flat tops of the raised steps engage together, the compression in the spring holds the button locked permanently in such off position, while only a slight rotary movement of the button is required, when the brake is to be released temporarily. Reversed rotation of the button resets the

brake. The gearwheel 7 permanently meshes with another gearwheel or pinion 20, independent of the gear train. Mounted upon the permanent driving spindle 22 in the side plates 14, 21, at some little distance from the teeth of the gearwheels 7 and 20 is another pinion 23. The spindle 22 of this pinion forms, or coincides axially with, the pivot of a reversing lever 24, and pivotally carried on this lever so as to lie in the curved angle formed by the adjacent teeth of the gearwheels 7 and 20 is a fourth pinion 25. The position of the wheels 7, 20, and 23, being fixed, and the pinion 25 being pivoted on the lever 24, movement of the lever to one or other side will cause engagement of the pinion 25 with either of the gearwheels 7 or 20, and as the pinions 25 and 23 are mounted on the lever so as to be always in mesh, the direction of rotation of the pinion 23 will be reversed according as to whether the pinion 25 is in engagement with the gearwheels 7 or 20. In this way the direction of rotation of the driving spindle 22 may be altered by operating the lever 24. On the driving spindle 22 is fixed a dog clutch element 26, the teeth 27 of which are adapted to engage with clutch teeth 28 on a grooved driving pulley 29 which is slidable axially on the driving spindle 22 to engage or disengage the clutch. Another gearwheel 30 may be fixed on the spindle 22 adapted to engage a large gearwheel 31 pivotally carried on a second lever 32, the lever 32 oscillating about the spindle 22 in such manner that the gearwheels 30 and 31 are always in mesh. Perforations may be formed in both side plates 14 and 21 on either side of the travel of the large gearwheel 31, and auxiliary driving spindles 33, 34, may be detachably fitted in these perforations, to which spindles are secured gear pinions 35, 36, with either one of which the large gearwheel 31 is adapted to be engaged by operating the lever 32. In this way by moving the lever 32 to one side or the other the gear wheel 31 may be caused to drive either of the spindles 33, 34, and the rotary direction of each spindle varied according to the position of the reversing lever 24. A locking mechanism may be provided on the second lever, this locking mechanism consisting of a pin head or the like projection on the lever riding past two or more perforations in the side plate, the lever being so resiliently mounted with reference to the perforations that the projection on the lever will engage the perforations and spring therein. The side plates 14 and 21 are perforated along all four edges at 37, the perforations being pitched at equal distances apart whereby the motor may be connected to the standard perforated parts in connection with which the apparatus is adapted to be used, and at suitable positions in the edge of the side plates slots 38 may be formed extending throughout one or more pitch lengths of the perforations 37, such slots providing for adjustability in connecting the motor plates to the other parts of the model, where correctly pitched holes would not come exactly in position. The holes for the spindles 33, 34, are also made at distances from the outer perforations 37 corresponding to even multiples of the pitch lengths of the perforations 37, the extended spindles 34, 35, being utilized for driving the moving parts of the models.

In the modification shown in Figs. 8. to 12. the spring 1^a wound by a key fitting the squared end 3^b of the spindle 3^a drives the spindle 3^a of the primary spur wheel 4^a, which drives a pinion 5^a on the secondary arbor 6^a as before, the gear wheels 7^a driving a gear train 8^a on the last spindle 9^a of which is the brake disc 10^a, and a governor 11^a. The brake disc 10^a is adapted to be frictionally engaged by a cam lip 16^b on a lever 16^a, pivoted at 16^c and pressed outwardly by a spring 16^d. As the lever 16^a is thrown over, the lip 16^b engages the disc 10^a compressing the spring 16^d, and the gear train may thus be started or stopped. The gear wheel 7^a permanently meshes with a pinion 20^a independent of the gear train, another pinion 23^a being mounted some distance from the gear wheels 7^a, 20^a, upon a driving spindle 22^a which forms the pivot of the reversing lever 24^a. A pinion 25^a carried on the lever 24^a and permanently in mesh with the pinion 23^a is adapted to be meshed with either of the gears 7^a,

20ª, and the direction of rotation of the spindle 22ª varied. The spindle 22ª is extended, as shown in Fig. 8., and by fitting gear wheels thereon may be utilized for driving the models in which the motors are built up. The edges of the side plates of the motor are perforated with a series of equally pitched holes 37ª, as previously described.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A spring motor comprising, a gear train, a brake on said gear train, a gear wheel driven by the train but independent of its sequence, a reversing lever, a driving spindle forming the reversing lever pivot, and a gear wheel pivotally carried on the reversing lever and adapted to be meshed with either the independent gear or its driving wheel.

2. A spring motor comprising, a gear train, a brake on said gear train, a gear wheel driven by the train but independent of its sequence, a reversing lever, a driving spindle forming the reversing lever pivot, a gear wheel pivotally carried on the reversing lever and adapted to be meshed with either the independent gear or its driving wheel, and side plates to the motor having a series of equally pitched perforations along their edges.

3. A spring motor comprising, a gear train, a gear wheel driven by the train but independent of its sequence, a reversing lever, a driving spindle forming the reversing lever pivot, and a gear wheel pivotally carried on the reversing lever and adapted to be meshed with either the independent gear or its driving wheel, a brake on the gear train consisting of a disc on one of the spindles, a pin engaging the disc, a pin barrel, a spring normally pressing the pin against the disc, cam steps on the barrel, a turn-button adapted to relieve the pin from the disc, and cam steps on the button engaging those on the barrel.

4. A spring motor comprising, a gear train, a brake on said gear train, a gear wheel driven by the train but independent of its sequence, a reversing lever, a driving spindle forming the reversing lever pivot, a gear wheel pivotally carried on the reversing lever and adapted to be meshed with either the independent gear or its driving wheel; a second lever pivoted on the driving spindle, a pinion on the spindle meshing with a gear wheel pivotally mounted on the second lever.

5. A spring motor comprising, a gear train, a brake on said gear train, a gear wheel driven by the train but independent of its sequence, a reversing lever, a driving spindle forming the reversing lever pivot, a gear wheel pivotally carried on the reversing lever and adapted to be meshed with either the independent gear or its driving wheel, a second lever pivoted on the driving spindle, a pinion on the spindle meshing with a gear wheel pivotally mounted on the second lever, detachable auxiliary driving spindles, pinions on said auxiliary spindles, the second lever being adapted to engage its gear wheel with either of the auxiliary spindle pinions.

6. The improved spring motors, substantially as described and shown in the accompanying drawings.

Dated this 14th day of March, 1913.

For the Applicant,

A. J. DAVIES,
Patent Agent by Examination,
37, Moorfields, Liverpool.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1913.

A.D. 1912 Sep. 17. No. 21,117.
HORNBY'S Complete Specification.

[This Drawing is a full-size reproduction of the Original.]

Fig. 1.

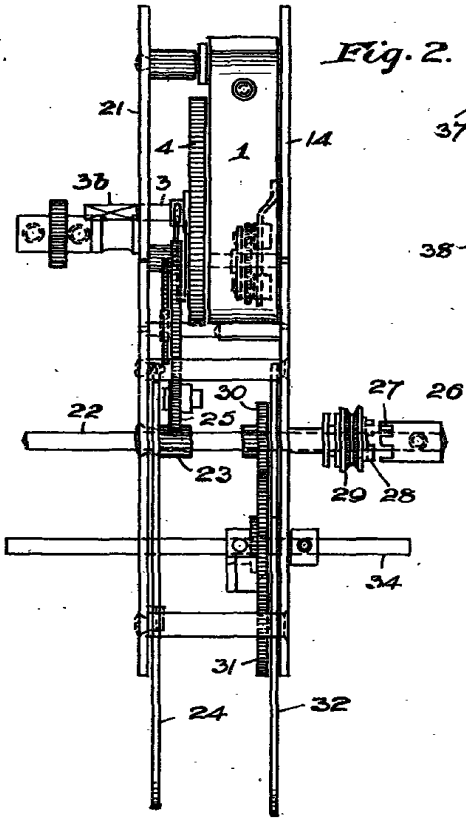

Fig. 2.

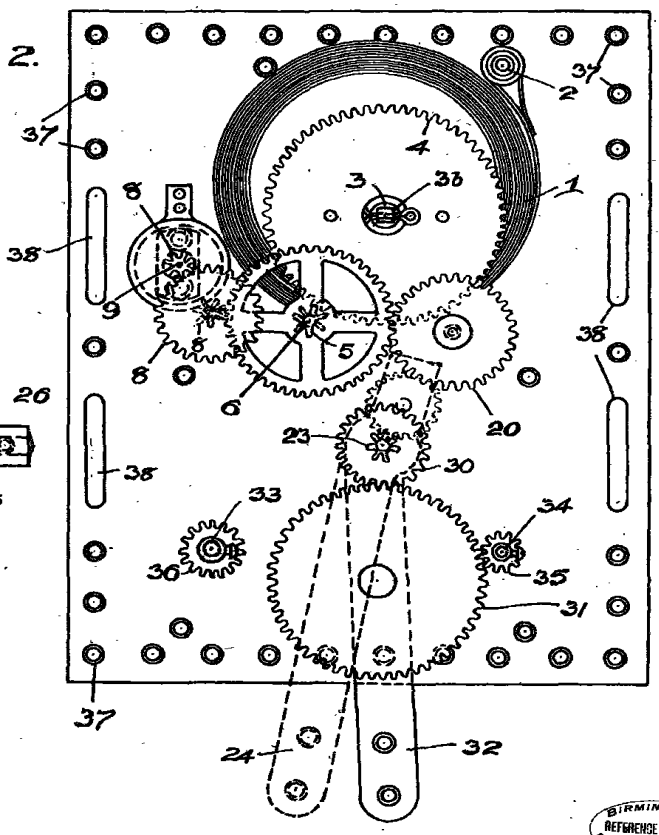

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Fig. 1.

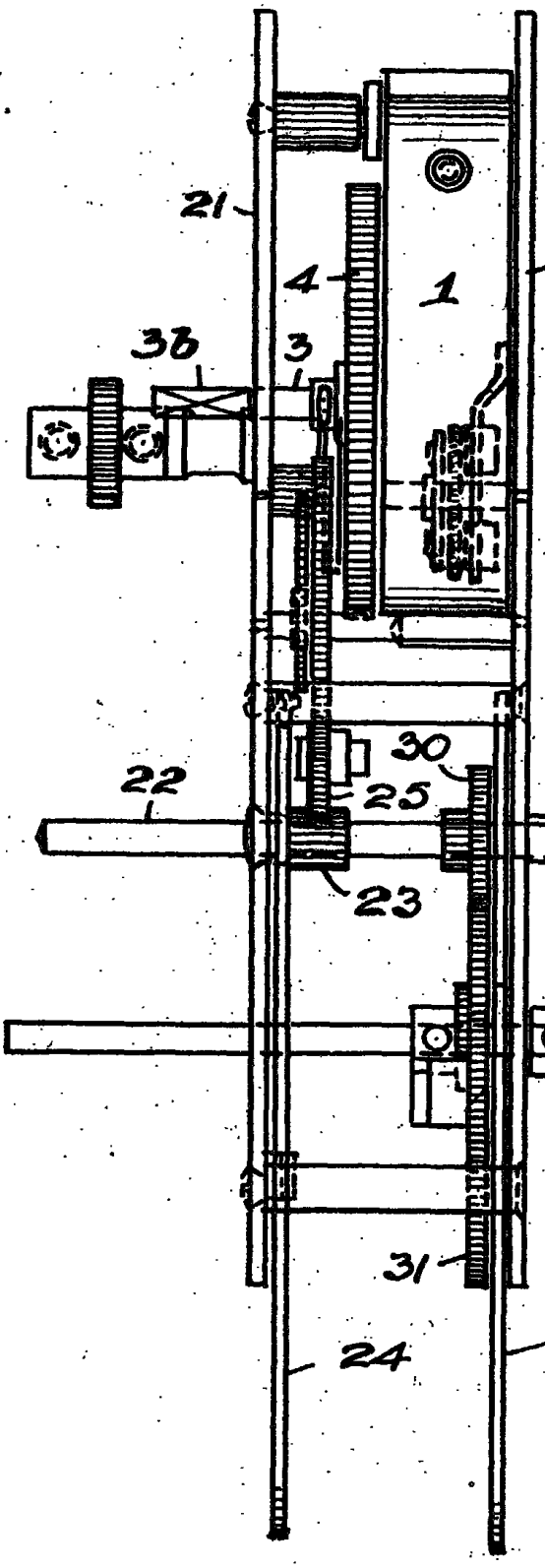
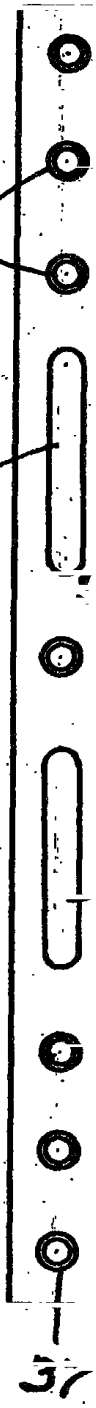


Fig. 2.



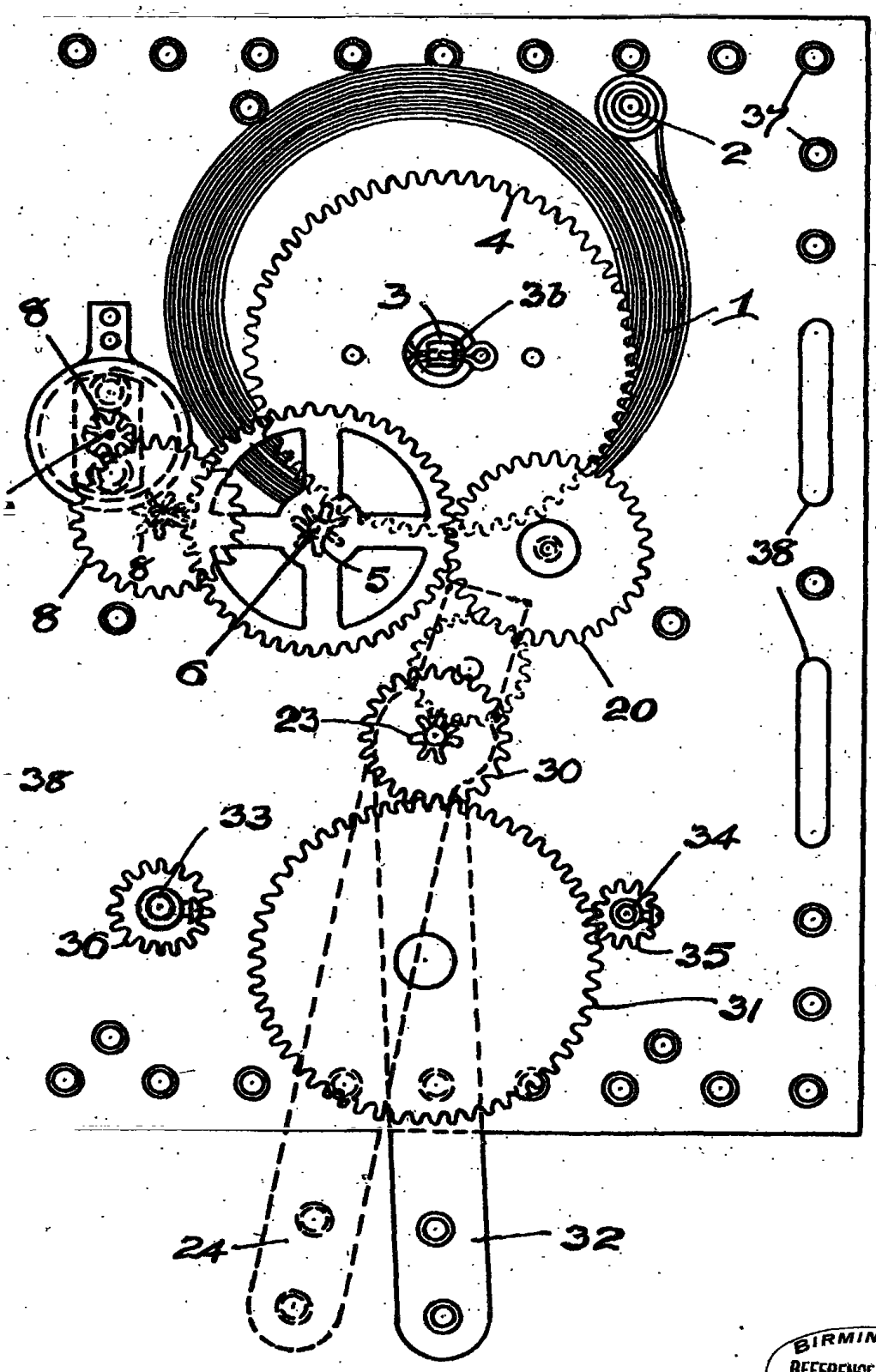


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Fig. 3.

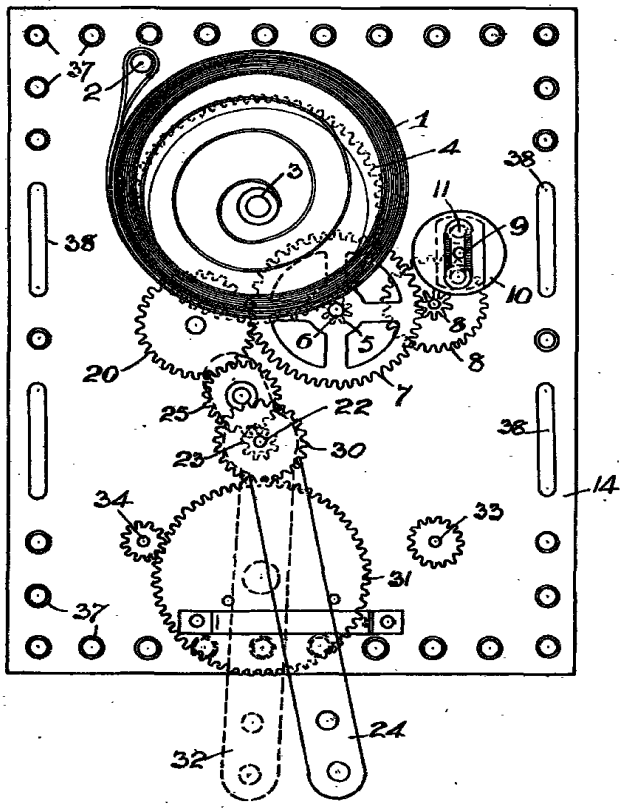

Fig. 4.

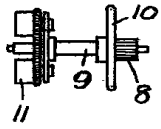

Fig. 5.

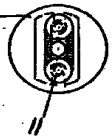

Fig. 6.

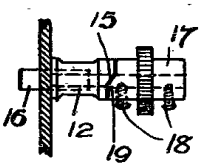

Fig. 7.

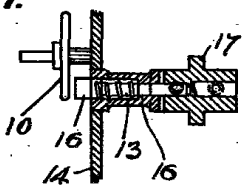

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Fig. 3.

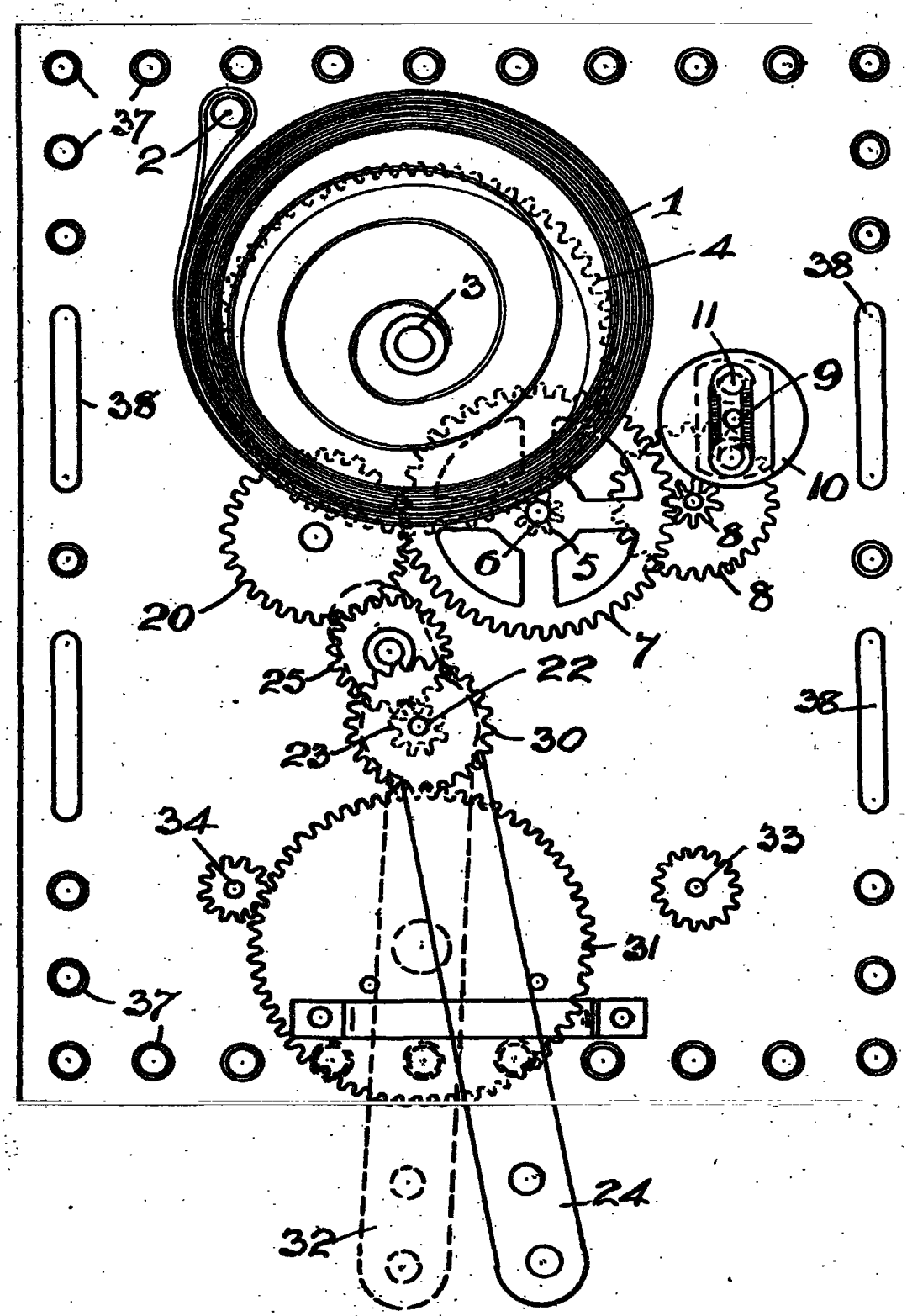


Fig. 4.

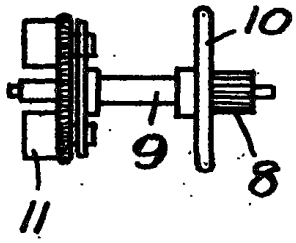
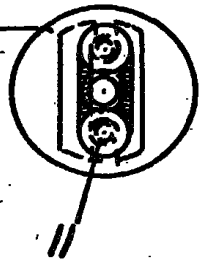


Fig. 5.



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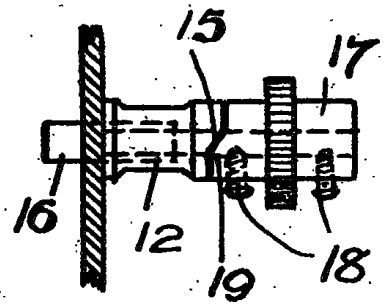

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Fig. 7.

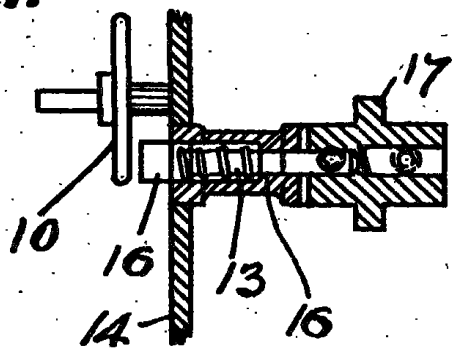

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Fig. 8.

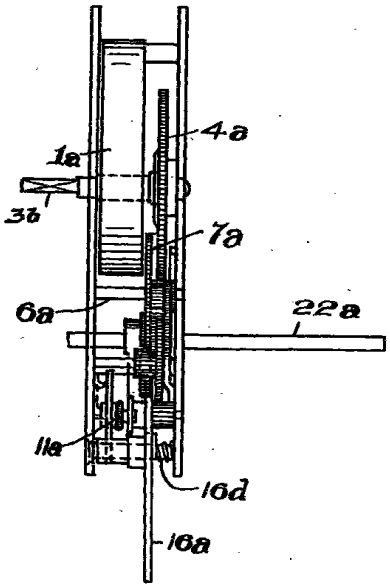

Fig. 9.

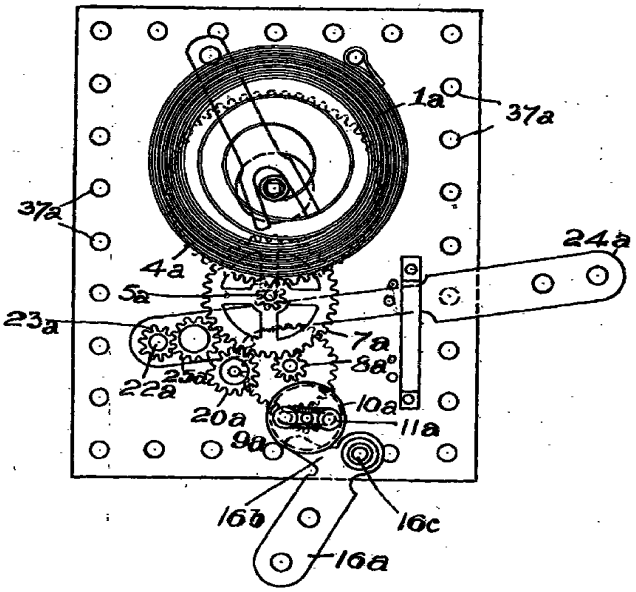

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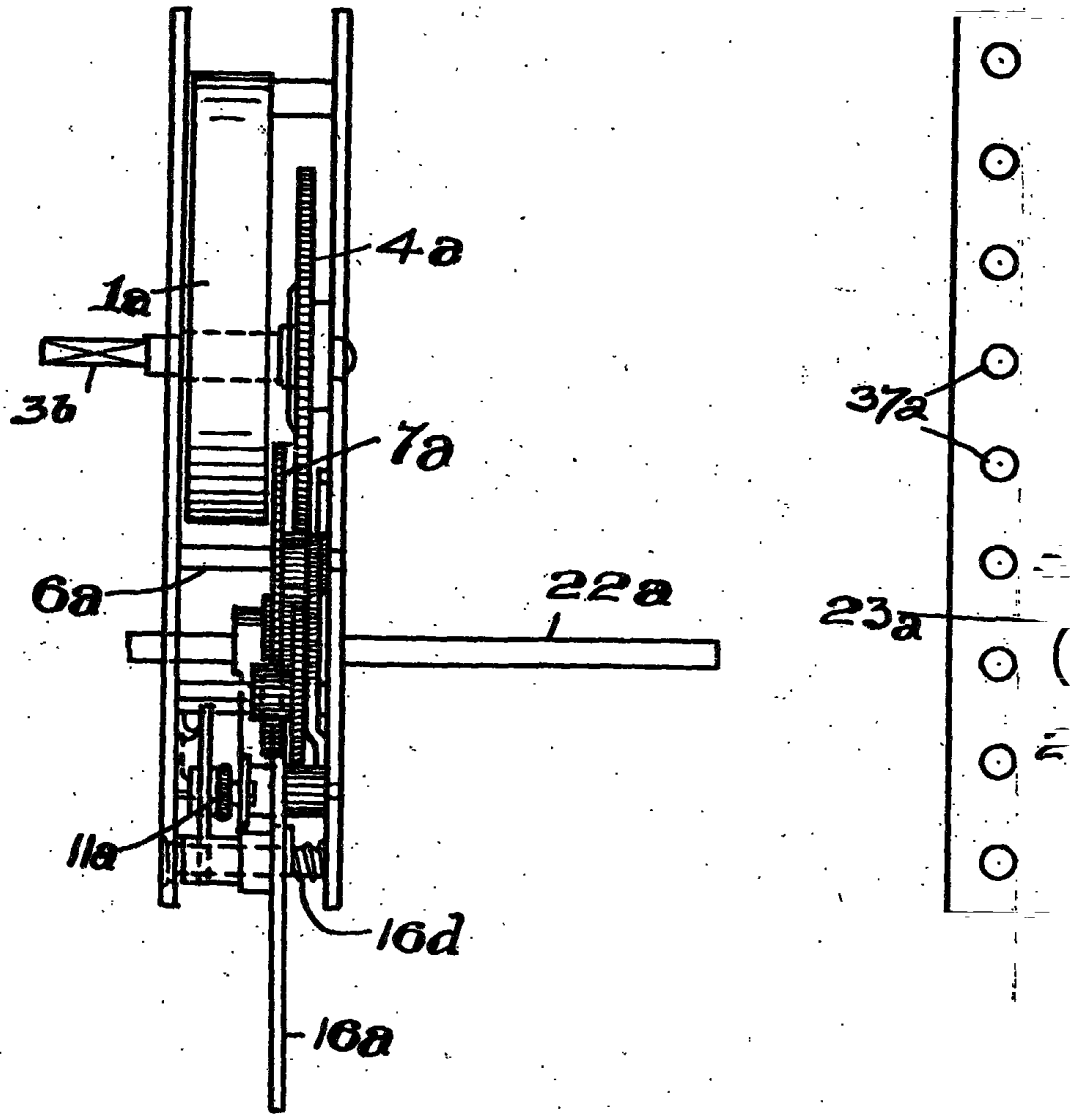
Fig. 8.



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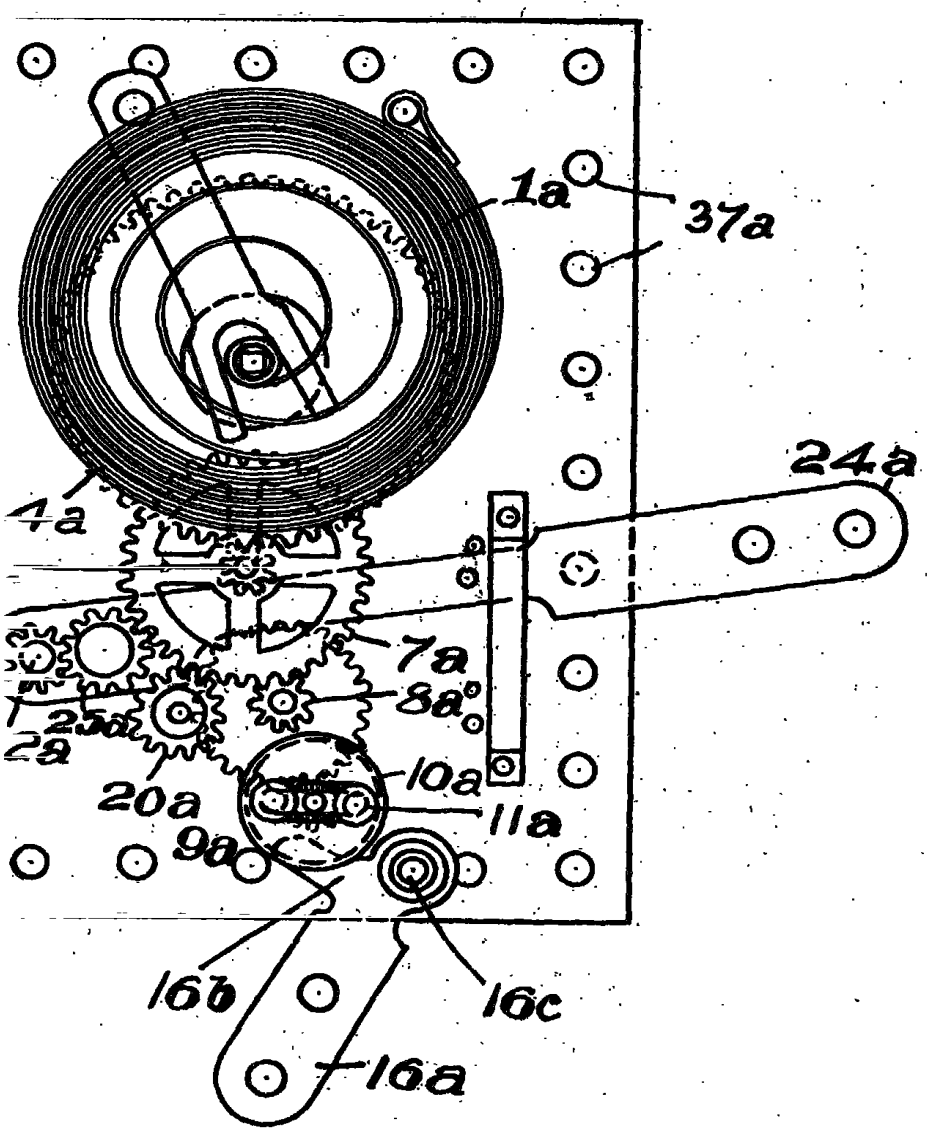

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Fig. 10.

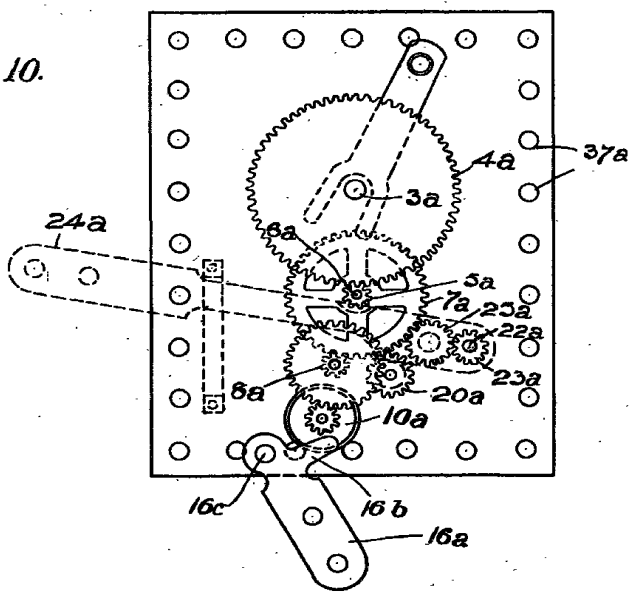
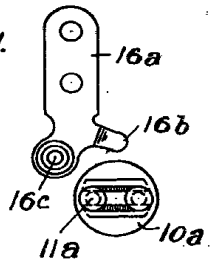


Fig. 11.



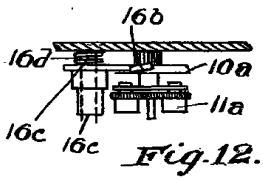


Fig. 12.

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Fig. 10.

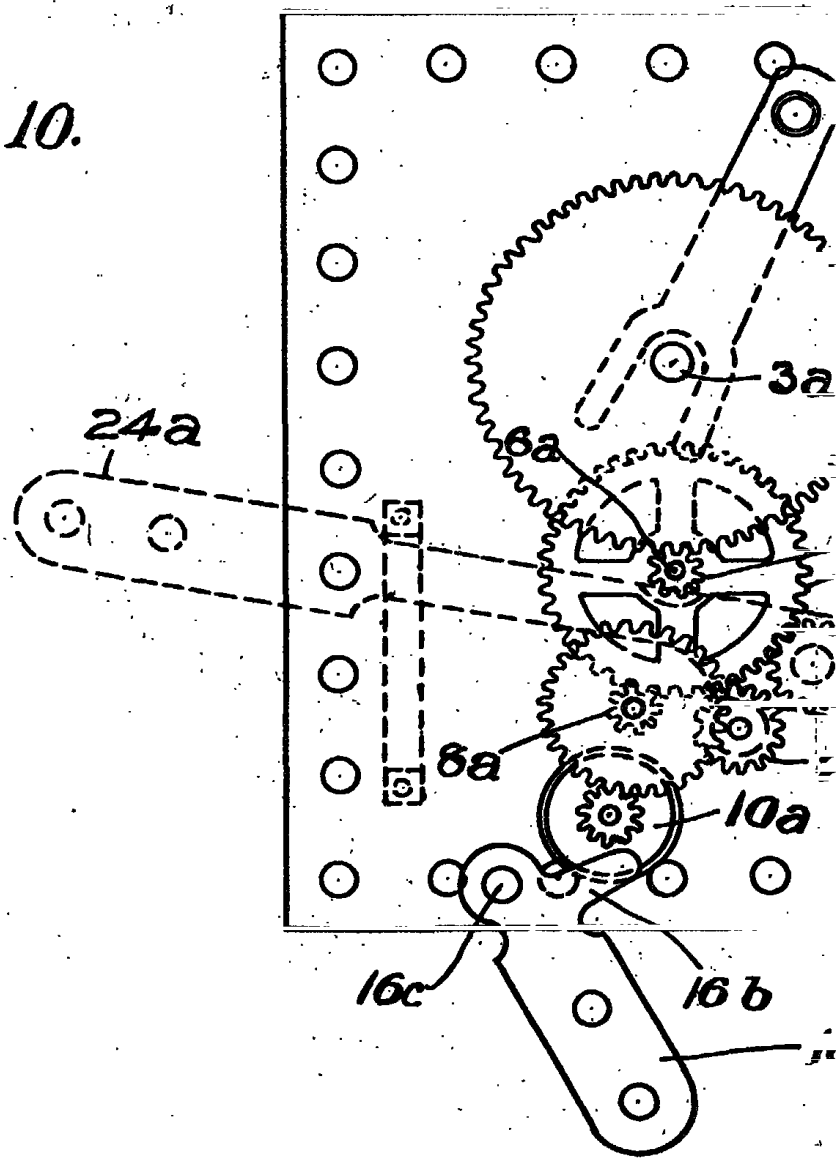
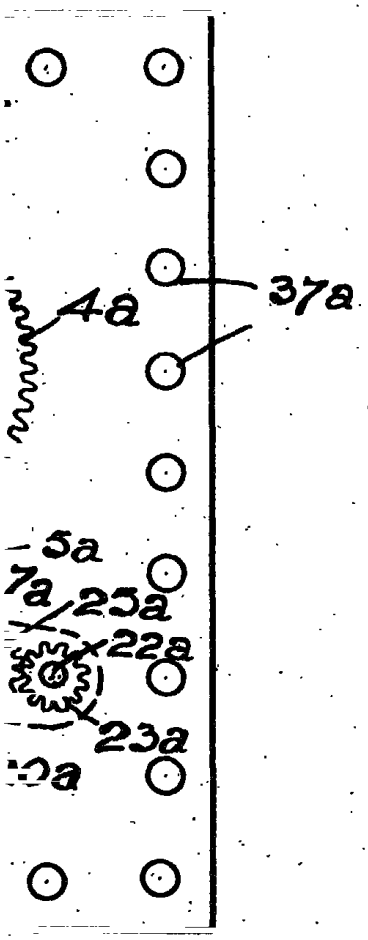
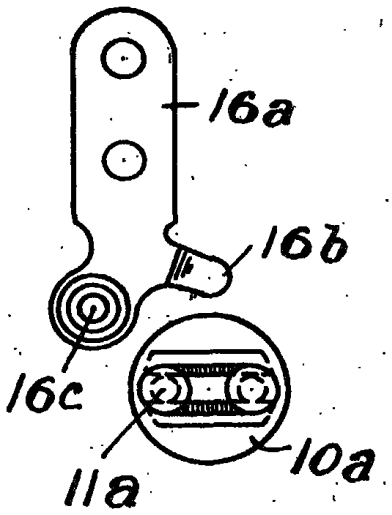


Fig. 11.





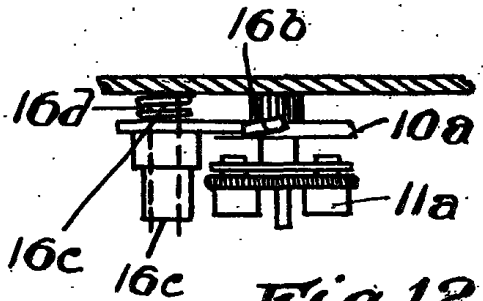


Fig. 12.

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