No. 663,465. Patented Dec. 11, 1900.

K. PUTTKAMMER & F. ORTHMANN.

PROGRAM CLOCK.

(Application filed Jan. 9, 1900.)

(No Model.) 3 Sheets—Sheet 1.

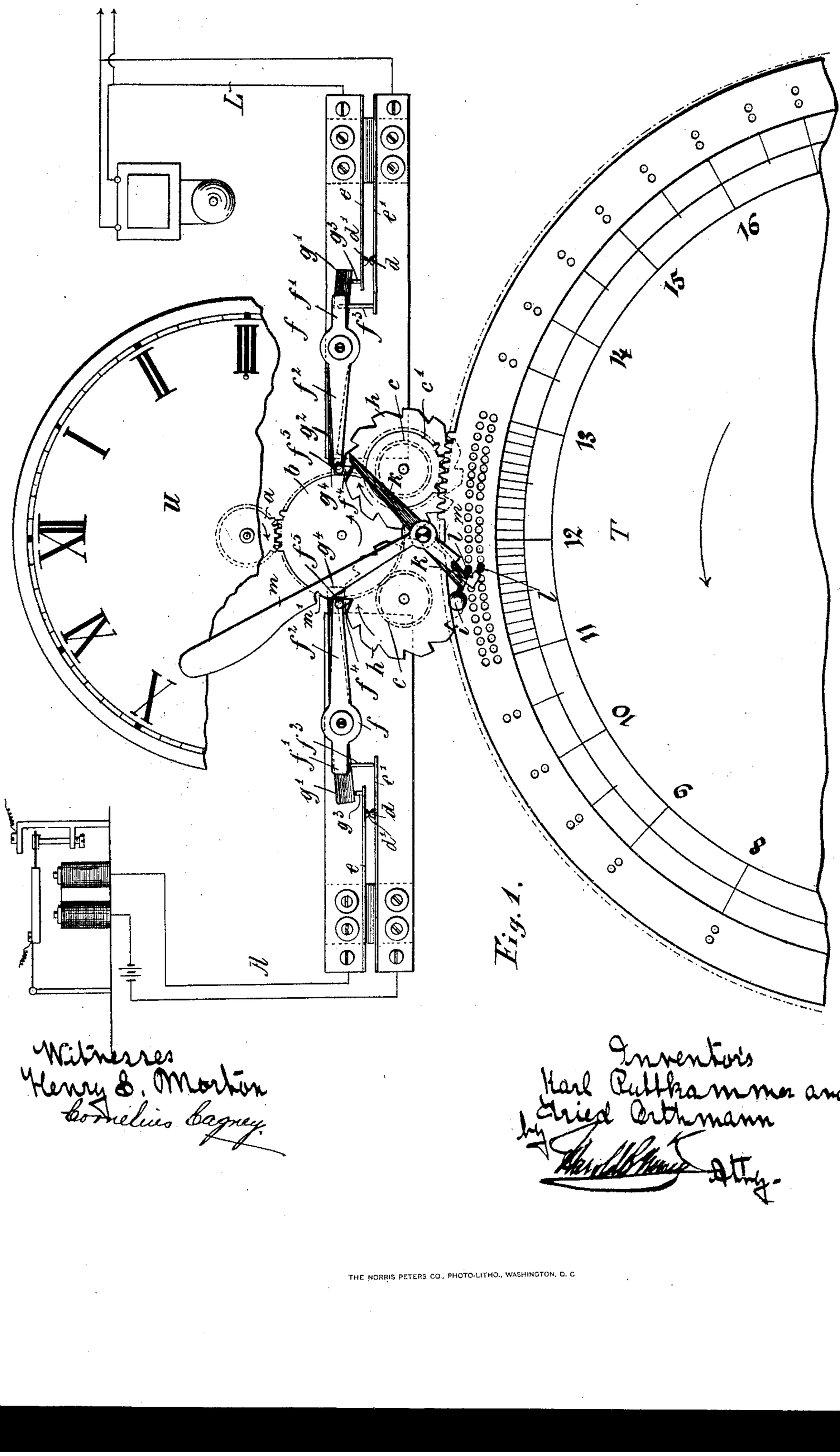

Fig. 1.

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Fig. 2.

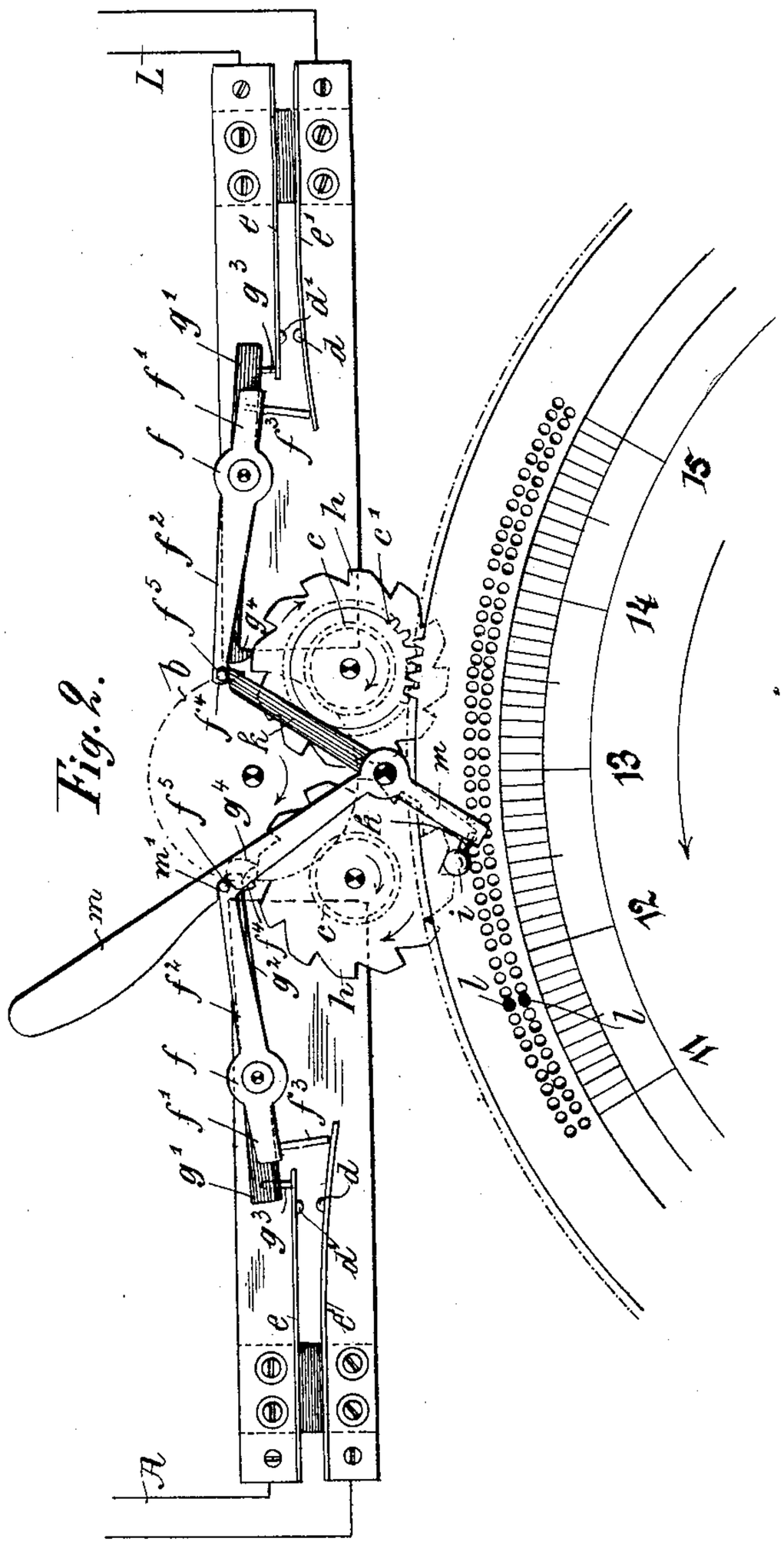

Fig. 3.

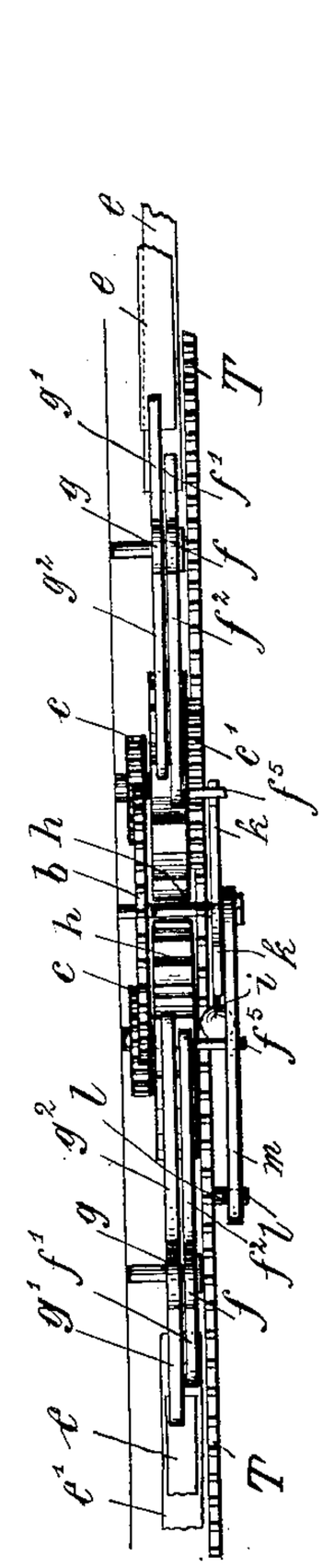

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Fig. 4.

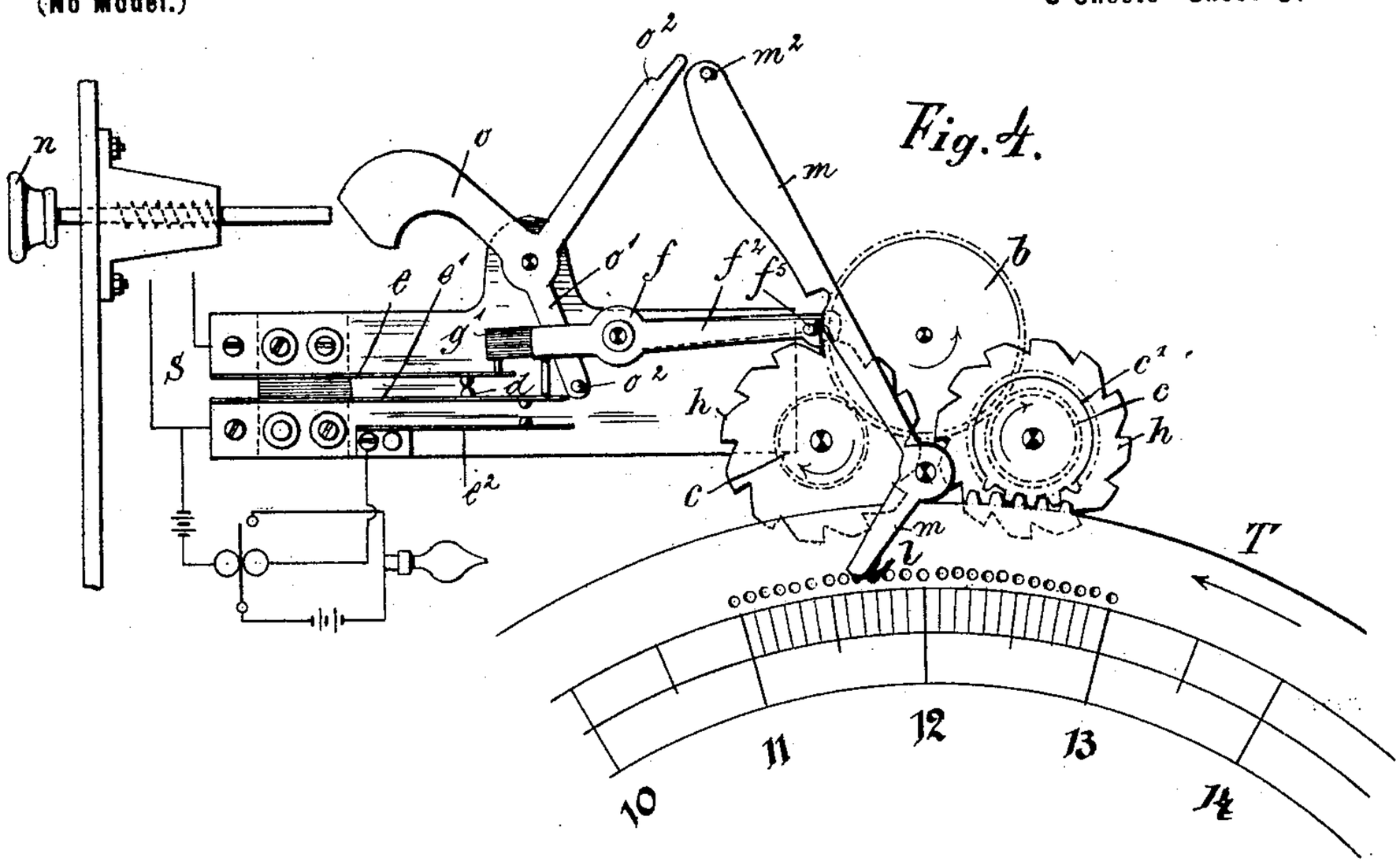
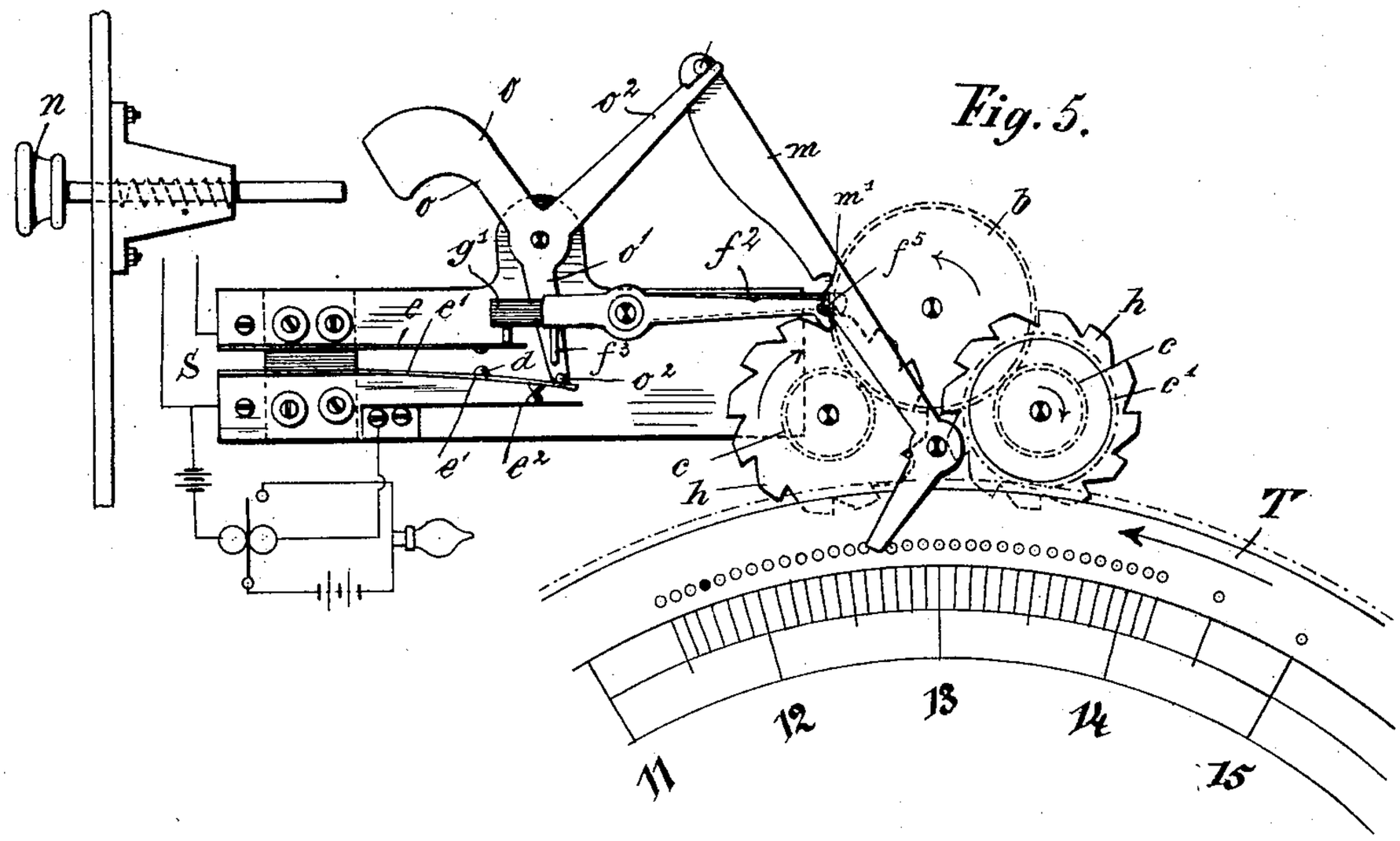


Fig. 5.



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UNITED STATES PATENT OFFICE.

KARL PUTTKAMMER AND FRIEDRICH ORTHMANN, OF CHARLOTTENBURG, GERMANY.

PROGRAM-CLOCK.

SPECIFICATION forming part of Letters Patent No. 663,465, dated December 11, 1900.

Application filed January 9, 1900. Serial No. 817. (No model.)

To all whom it may concern:

Be it known that we, KARL PUTTKAMMER, merchant, residing at 4 Pestalozzistrasse, and FRIEDRICH ORTHMANN, engineer, residing at 13 Goethestrasse, Charlottenburg, in the Kingdom of Prussia, German Empire, subjects of the German Emperor, have invented certain new and useful improvements in automatic mechanism for giving signals at predetermined times, chiefly designed for use in factories and the like; and we 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.

This invention relates to a signal-clock, by means of which one or more occurrences may be signaled or one or more signs given at predetermined points of time, in uniform or irregular succession, by means of which both sets of operations may be carried into effect. For example, a factory-owner may desire bells to be rung each morning to notify the commencement of work, the commencement and termination of a breakfast, dinner, or tea interval, and also the closing hour in the evening, and at the same time he may want an apparatus which will indicate the time the workmen enter the factory, and which will be started each morning and midday at the same hour. It is also frequently desired to close an electric circuit—such as an illuminating-circuit, for example—for a certain period of time, and then to interrupt the same at a fixed time and to effect these operations automatically. Many similar operations will, moreover, readily suggest themselves. A signal-clock which answers those requirements is represented in the drawings.

Figure 1 is an elevation showing the parts in position when the two electric circuits L and A are closed; Fig. 2, the same view showing the parts in position when the two electric circuits L and A are opened. Fig. 3 is a plan view to Fig. 2. Figs. 4 and 5 exhibit a modification for three electric circuits, showing the parts in position when the third circuit is closed and opened.

By way of example we will assume that signal-bells arranged upon a circuit L and a workmen-controller apparatus arranged upon a second circuit A are to be operated by the clock U, the controlling apparatus being actuated at definite periods of time from the actuation of the signals, but entirely independently thereof. It is obvious that many combinations may be effected.

In order to obtain the results above set forth, it is necessary that the circuits upon which are arranged the bells and the controlling apparatus should be adapted to be closed by the clock at any desired times, which are capable of alteration at will. This is effected by means of adjustable contacts arranged upon a disk on which divisions are marked. The division-disk T is constantly caused to rotate by the clockwork U by means of a train of wheels *a b c c'*, owing to the gearing *c'* of the last wheel in the toothed circumference of the division-disk T. The division-disk T is divided into twenty-four parts in order to correspond to the division of the day into hours. Each hour-space is divided into twelve parts, so that each of the divisions within the hour-spaces corresponds to five minutes. By means of this disk circuits are closed at predetermined times, thereby actuating various appliances. These points of time may be decided upon in either uniform or irregular succession and independently one of the other. If, for example, it is desired to actuate the apparatus which is arranged upon the controller-circuit A at 11.45 and at the same time to cause the bells arranged upon the signal-circuit L to ring, upon the division-disk holes are provided at intervals one from the other corresponding to five-minutes intervals of time upon as many concentric circles as there are objects to be effected. These holes serve for the reception of pins or lugs, which may be inserted in the hole corresponding to the desired points of time. Thus, for example, if it is desired, as above stated, to actuate the appliances arranged upon the controller and signal-circuits A and L at 11.45, as is shown in Fig. 1, plugs are inserted in the two adjacent holes corresponding to the time 11.45. In the same manner any other event may be notified by the insertion of plugs in appropriate holes, of course only at the shortest intervals of time which are marked upon the division-disk. These plugs effect the actua-

tion of the appliances arranged upon the circuits A and L in the following manner: If the signal-circuit L (right halves of Figs. 1 and 2) is open (position in Fig. 2) and it is desired that it shall be closed, (position in Fig. 1,) it is necessary that the contacts $d\,d'$ of the contact-springs $e\,e'$ in said circuit should touch each other. In the position of repose the said contacts $d\,d'$ are maintained separated by means of the pair of two levers f and g, the arms $f'\,g'$ of which are provided with pins f^3 g^3 at one end, while the other arms $f^2\,g^2$ form pawls $f^4\,g^4$. The pawls $f^4\,g^4$ are acted upon by the teeth of a wheel h, which is caused to constantly rotate by means of the wheel b of the clockwork. This wheel h is provided with twelve teeth and completes one revolution in an hour, so that one tooth corresponds to a period of five minutes. The pawl g^4 on one of the two-armed levers g constantly slides over the teeth or falls into the intervals between the teeth of the pawl-operating wheel h, while the pawl f^4 is maintained in a raised position upon its pivot f^5 by means of a lever k with the weight i. Now as the contact-pin f^3 of the lever-arm f' is held so long that it depresses the contact-spring e', consequently when the pin f^5 rests upon the weighted lever k the two contacts $d\,d'$ are maintained apart. The pawls $f^4\,g^4$ of the two-armed levers f and g, lying on the right hand in Figs. 1 and 2, are not situated at the same distance from the pivot of the lever, the one pawl g^4 being nearer, so that assuming the rotation of the wheel h in the direction of the clock-hands the other pawl f^4 will fall between two teeth sooner than the pawl g^4 of the first. The second pawl f^4 falls between two teeth when the pin f^5 on the lever-arm f^2 is released by the movement of the lever k upon the corresponding lever. This takes place when the said lever k strikes against a plug in the division-disk. It follows from this that in the case supposed—that is to say, at 11.45—if a pin l strikes against the supporting-lever k the latter is caused to be moved, the pin f^5 of the corresponding lever-arm f^2 loses its support, and the pawl f^4 falls into an interval between two teeth of the wheel h, while the other pawl g^4 slides upon a tooth. By this means the arm f' of the lever f is raised, and the contact-spring e' springs upward then by causing the contacts $d\,d'$ to touch, and consequently close the circuit. Owing to the fact that during this time the one pawl g^4 slides upon a tooth the spring e is firmly maintained and cannot bend upward. The contact continues as long as the pawl g^4 slides upon the tooth and is interrupted as soon as it falls between two teeth, and the pin g^3 is raised, so that the spring e' flies up and removes the two contacts $d\,d'$ from one another. Upon the division-disk T continuing to rotate the pin l is carried under the supporting-lever k, and the weight i again brings the lever back into the first position. In the meantime the pawl f^4 of the lever f slides over a tooth of the wheel h and is raised beyond the highest point which the lever k occupies; but the pawl f^4 is held in the path of the lever k, so that the pawl f^4, if it slides from the tooth, falls upon the lever k instead of between two teeth. The pin f^5 of the double-armed lever f therefore rests on the lever k, so that if it is desired that no contact should take place five minutes later the supporting-lever k is able to stop the engagement of the pawl f^4 by means of its pin, and no contact can take place.

It will of course be obvious that the duration of the contact is dependent upon the varying distance of the pawls $f^4\,g^4$ from the pivot of the double-armed levers f and g, and that the contact therefore continues as long as the pawl g^4 slides upon the teeth, assuming that the supporting-lever k or the bent lever m has released the double-armed lever f and that the contact is interrupted when the said pawl g^4 falls into an interval between two teeth.

The same operation takes place in the controlling-circuit A, (left halves of Figs. 1 and 2.) The second wheel h on the left side being toothed in the same manner and being moved in the same direction as the wheel h on the right side, and the pair of the double-armed levers $f\,g$ is arranged symmetrically to that of the signal-circuit L, the pawl f^4 is nearer to the pivot of the lever f than the pawl g^4. Besides, the lever f is held in that position in which its pin f^3 pressed down the spring e' and removes the contact d from the contact d' by means of a lever m, which is shaped otherwise than the lever k. This is operated in the following manner: Suppose the circuit A, Fig. 1 on the left hand, be closed. Then the two pawls $f^4\,g^4$ slide on the wheel h. This takes place when the lever m, which acts the same part as the lever k in the circuit L, strikes against a pin l of the division-disk. While the wheel h continues in turning, the pawl f^4 slides on a tooth, and the arm f' of the lever f, with the pin f^3, is pressed down and removes the contact d from d'. The circuit A is then interupted, Fig. 2. In order to prevent the tooth f^4 from falling between two teeth of the wheel h while the latter continues in turning, the lever f must be checked in this position. This is performed by the notch m' of the lever m, into which the pawl f^5 falls at that moment when the pawl f^4 has reached the highest point of the tooth. The lever m pressing down owing to its weight attached to its upper arm, the pin f^5 totally comes into the notch m' and remains in it as long as the next pin l of the division-disk T strikes against the lower arm of the lever m.

As already pointed out, the signal-clock, above described, may also be employed for the purpose of automatically closing a circuit at a given time and maintaining the same closed for a given period, again interrupting

it at a predetermined time. For example, Figs. 4 and 5, at a given time an illuminating-circuit S is to be closed a knob *n* is pressed, thereby causing the three-armed lever *o* to pass from the position shown in Fig. 4 to the position shown in Fig. 5, so as to make contact—*i. e.*, the pin o^2 on the arm *o'* presses down the spring *e'* till it forms a contact with the spring e^2, and the arm o^2 of a second bent lever *o* is then supported upon the pin m^2 of the first bent lever *m*. If it is desired that the circuit should be broken at a given time, the corresponding disengaging pin upon the division-disk presses against the first bent lever *m* and rotates this latter so that the pin m^2 on said lever is no longer supported, and the pin o^2 releases the spring *e'*, which then again springs upward, thus interrupting the contact.

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

1. In an electric clock the combination of a rotating division-disk or time-disk, pins adapted to be inserted into the holes in the disk corresponding to the times at which one or more electric circuits are to be closed, there being as many rows of holes for pins on the division-disk as there are electric circuits, a plurality of toothed wheels continually rotated with the division-disk, levers mounted to fall into the teeth of the wheels, and a plurality of levers interfering with the first said levers and actuated by the said pins to release the latter and close the respective electric circuits at the predetermined times, substantially as set forth.

2. The combination in an automatic signal or time-keeping apparatus and with a time mechanism or clock, one or more toothed wheels coactuated therewith, an electrical circuit including a pair of circuit making and breaking contacts, a pair of controlling-levers for moving the said respective contacts, actuated by the teeth and spaces of said wheel or wheels and one tending to open the circuit when not engaging a tooth, the other tending to close the circuit when not engaging a tooth, substantially as set forth.

3. The combination in an automatic signal or time-keeping apparatus and with a time mechanism or clock, one or more toothed wheels coactuated therewith, an electrical circuit including a pair of circuit making and breaking contacts, a pair of controlling-levers for moving the said respective contacts governed by the teeth and spaces of said wheel or wheels and one tending to open the circuit when not engaging a tooth, the other tending to close the circuit when not engaging a tooth, the said levers being respectively engaged by the teeth at differently-timed intervals, substantially as set forth.

4. The combination in an automatic signal or time-keeping apparatus and with a time mechanism or clock, one or more toothed wheels coactuated therewith, an electrical circuit including a pair of circuit breaking and making contacts, a pair of controlling-levers for moving the said respective contacts governed by the teeth and spaces of said wheel or wheels and one tending to open the circuit when not engaging a tooth, the other tending to close the circuit when not engaging a tooth, and means controlled by the said time mechanism or clock for interfering with one of the said levers until actuated by the said time-mechanism or clock, substantially as set forth.

5. The combination in an automatic signal or time-keeping apparatus and with a time mechanism or clock, one or more toothed wheels coactuated therewith, an electrical circuit including a pair of circuit making and breaking contacts, a pair of controlling-levers for moving the respective contacts governed by the teeth and spaces of said wheel or wheels and one tending to open the circuit when not engaging a tooth, the other tending to close the circuit when not engaging a tooth, a disk carrying one or more movable pins and coactuated with the time mechanism or clock, and a lever normally interfering with one of the said controlling-levers and in position to be engaged and moved by said pin or pins to release said controlling-lever, substantially as set forth.

Signed this 27th day of November, 1899, at Berlin, Germany.

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FRIEDRICH ORTHMANN.

Witnesses:
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