(No Model.) 2 Sheets—Sheet 1.

C. C. WORTHINGTON.

ENGINE REGISTER.

No. 476,588. Patented June 7, 1892.

Fig. 1.

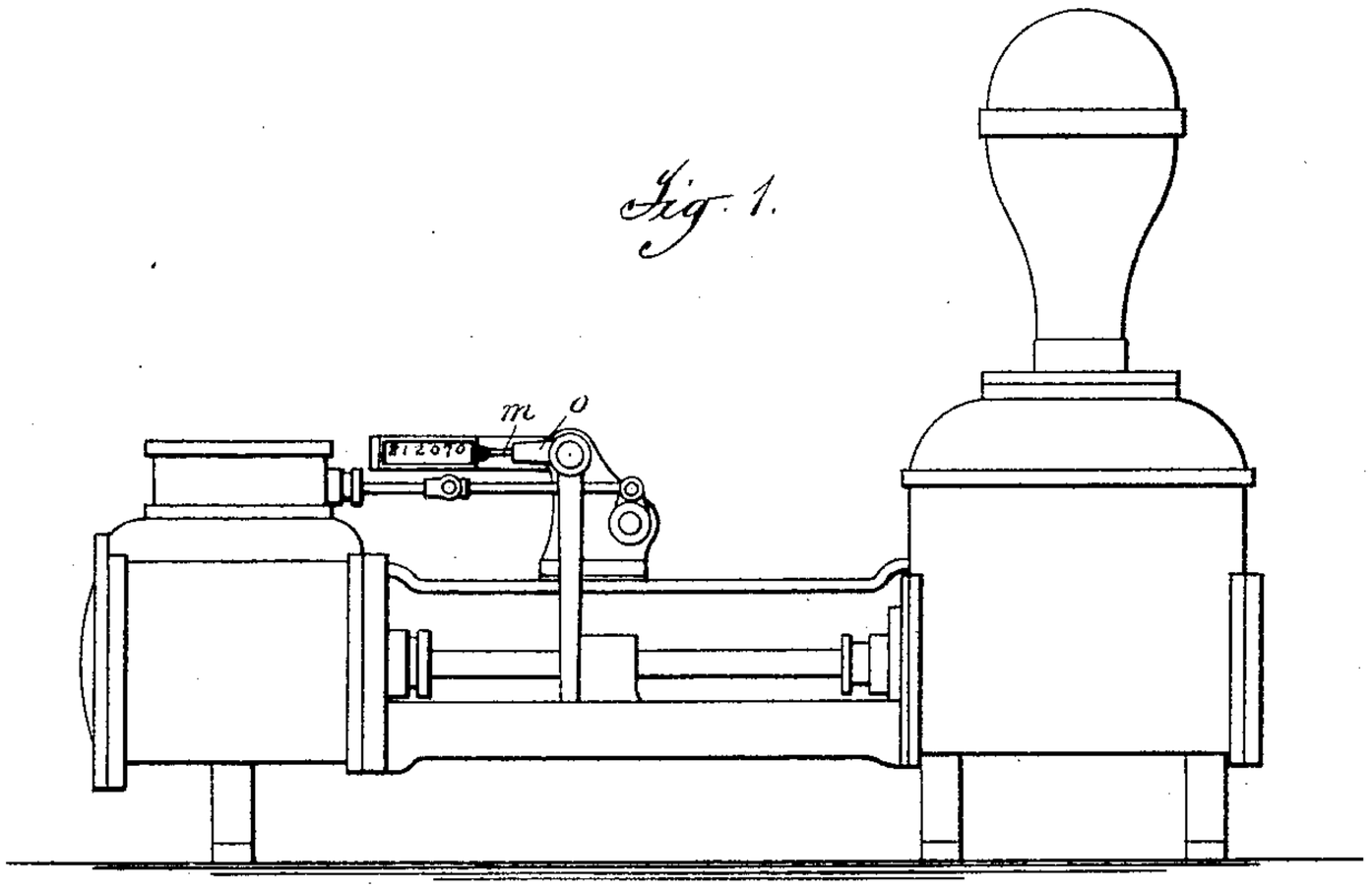


Fig. 2.

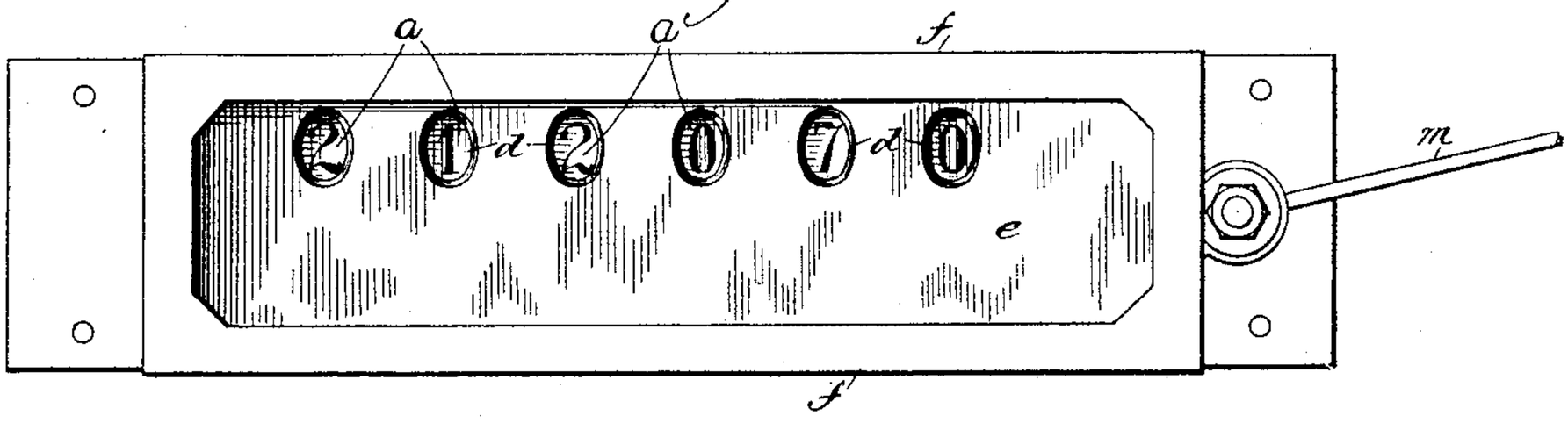
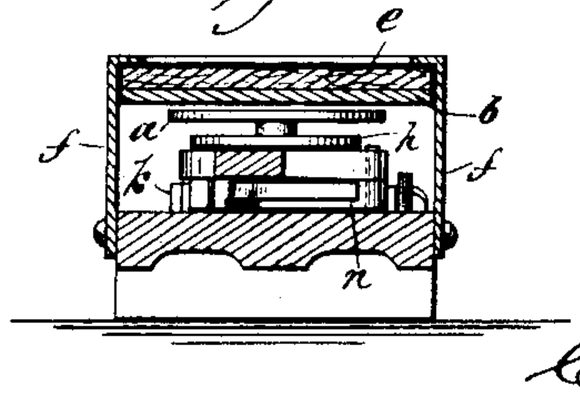


Fig. 6.



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Attys

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

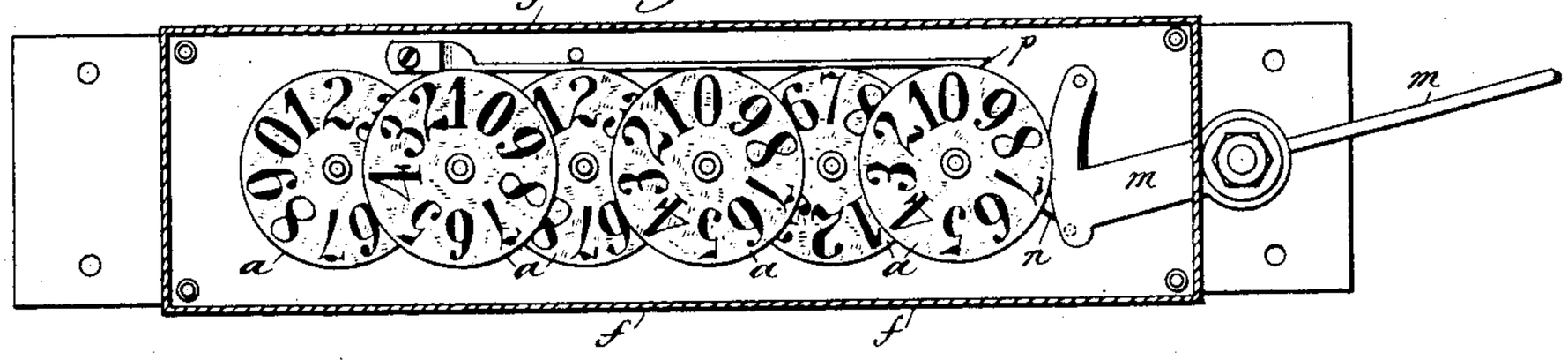


Fig. 1.

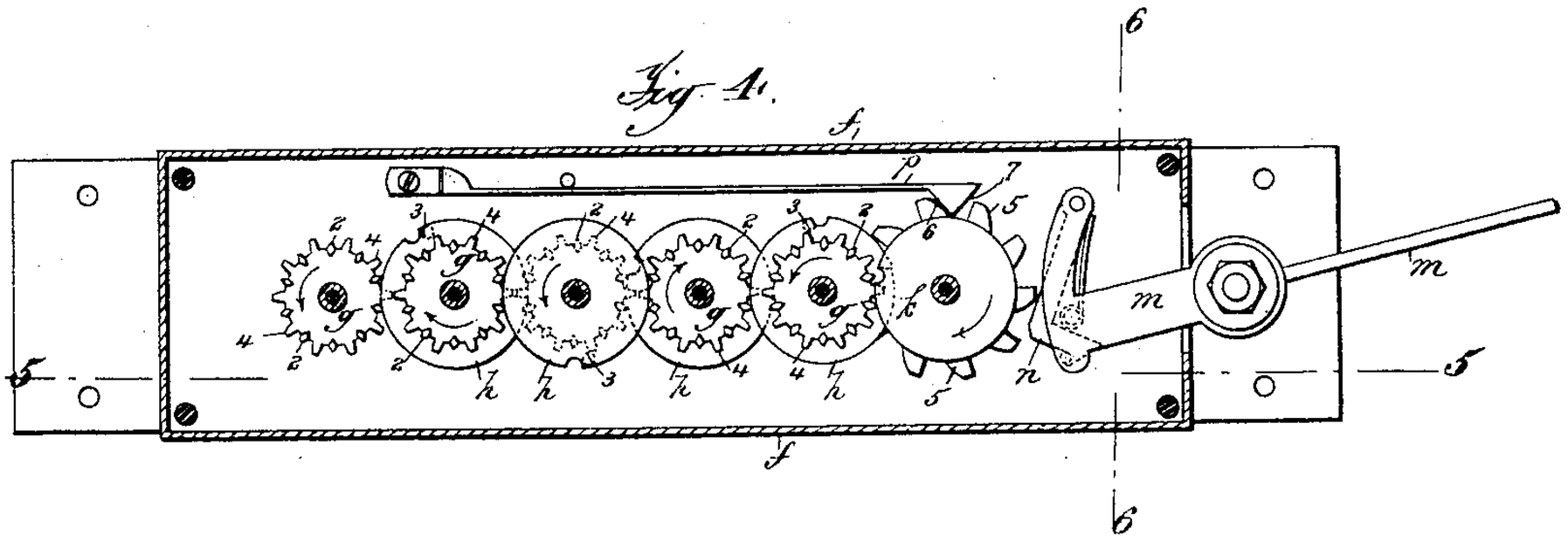
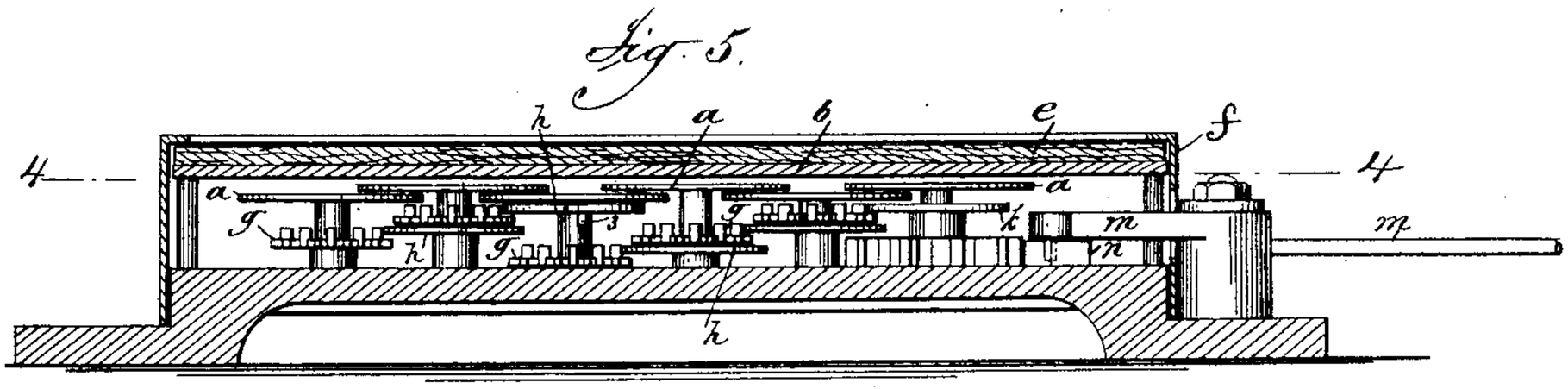


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES C. WORTHINGTON, OF IRVINGTON, NEW YORK.

ENGINE-REGISTER.

SPECIFICATION forming part of Letters Patent No. 476,588, dated June 7, 1892.

Application filed May 25, 1889. Serial No. 312,027. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. WORTHINGTON, a citizen of the United States, residing at Irvington, county of Westchester, and State of New York, have invented certain new and useful Improvements in Engine-Registers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to an engine-register—that is to say, an apparatus for registering the number of strokes made by the engine.

It is the especial object of the invention to provide a register for this purpose which shall operate in such manner as to make a complete and accurate register of the number of strokes made by the engine regardless of the length of said strokes. In crank-engines the strokes are of course always of the same length, and as a consequence there is no necessity of providing means in the register for registering strokes of different lengths; but in direct-acting engines, where the movement of the piston is not regulated and controlled by a crank, the stroke of the engine varies widely, sometimes being of maximum length and at other times falling very much below the maximum length. To provide an effective register, therefore, for use in connection with such engines, it is necessary to so organize the register and the mechanism through which it receives motion from the piston-rod of the engine that each stroke will be registered regardless of its length. This is accomplished in the register constituting the present invention in the manner which will now be described.

In the accompanying drawings, Figure 1 is a side elevation of an ordinary direct-acting pumping-engine provided with a registering mechanism constructed according to the present invention. The registering mechanism is shown in this view as located in an arbitrary position simply for illustrating the manner in which the motion of the piston-rod may be communicated to the registering mechanism. It is to be understood, however, that the register may be located in any suitable position upon or adjacent to the engine, any suitable form of connection being provided for transmitting motion from the piston-rod to the registering mechanism. Fig. 2 is an enlarged front elevation of the register. Fig. 3 is a similar view with the face-plate containing the sight-openings removed. Fig. 4 is a section taken on the line 4 of Fig. 5. Fig. 5 is a section taken on the line 5 of Fig. 4, and Fig. 6 is a section taken on the line 6 of Fig. 4.

Referring to the figures, it is to be understood that the register consists, primarily, of a number of disks *a*, having numbers from "0" to "9" arranged either upon their faces or on their peripheries in the manner common in registers. Located above the disks *a* is a face-plate *b*, which is provided with a number of sight-openings *d*, which are so arranged as to expose one figure upon each of the disks, different figures being successively brought into position to be exposed through the openings as the disks are rotated in the manner common in registering apparatus. The plate *b* will usually be covered by a glass plate *e*, so as to protect the apparatus from dirt which otherwise would pass through the openings *d*, and the latter is inclosed in a suitable casing *f*. The disks *a* are mounted upon sleeves turning on studs, and the sleeves are provided with disks *g*, having laterally-projecting studs 2, which are engaged by disks *h*, mounted on the sleeves of the adjacent disks *h*, so as to prevent the disks from turning except at the proper time. The turning of the disks is effected by means of studs 3, which project from the disks *h* and engage with laterally-projecting teeth 4, carried by the disks *g*, these parts being arranged so that the second disk *a* is moved one-tenth of a rotation at the end of each complete rotation of the first disk *a* and the third disk *a* one-tenth of a revolution at the end of each complete revolution of the second disk *a*, and so on throughout the entire series. The mechanism as thus far described is substantially the same as is common in registering mechanisms and will be readily understood by those familiar with the art without a more particular description.

For the purpose of setting the train of disks *a* in operation, so as to cause them to register the number of strokes made by the engine, the sleeve upon which the first disk of the series is mounted is provided with a

ratchet-wheel *k*, having ten teeth 5, which are arranged to be engaged by a pawl which is oscillated from the piston-rod or other moving part of the engine, so as to rotate the ratchet-wheel and the disk *a* with which it is connected with a step-by-step movement, the disk being rotated one step, so as to bring a number into position, so as to be exposed through the sight-opening above that disk at each stroke of the engine.

Where the strokes of the engine are of uniform length, as in the case of crank-engines, the step-by-step movement can be readily imparted to the ratchet-wheel *k* and to the disks of the series by an ordinary pawl, which is retracted over a tooth of the ratchet-wheel as the engine makes its stroke in one direction and engages with the tooth to impart a partial rotation to the ratchet-wheel as the engine makes its return stroke. In the case of direct-acting engines, however, the strokes vary in length, as before stated, being at some times of the maximum length and again at other times so short that a pawl operated in the ordinary manner would fail to be retracted sufficiently to pass over the tooth of the ratchet-wheel, or if it passed over the tooth of the ratchet-wheel it might not be advanced sufficiently to give the required partial rotation to the ratchet-wheel to bring the next figure on the disk into proper position to be exposed through the sight-opening and the next tooth of the ratchet-wheel into proper position to be engaged by the pawl upon the next stroke, and thus such short strokes would fail to be registered. It is therefore necessary in order to provide for contingencies of this character to so organize the pawl mechanism for operating the ratchet-wheel *k* that a very slight movement of the driving-pawl, which receives its motion from the piston-rod of the engine or from some other moving part which moves synchronically with the piston-rod, and is therefore moved a distance proportioned to the length of the stroke, will be sufficient to cause the ratchet-wheel *k* to move the required distance, and it is also necessary to so organize the pawl mechanism that the ratchet-wheel will be operated just as the engine passes the middle of its stroke. For the purpose, therefore, of imparting the necessary movement to the ratchet-wheel *k* there is provided a lever *m*, which is fulcrumed upon a stud rising from the base of the register and is provided at its inner end with a pivoted spring-pressed pawl *n*, the operating end of which is arranged to engage with the teeth 5 of the ratchet-wheel *k*. The outer end of the lever *m* is connected in any suitable manner with the piston-rod or some other moving part of the engine, as before explained.

As shown in Fig. 1, the lever *m* is connected to a rock-arm *o*, extending from one of the rock-shafts, through which the valve of the engine is operated, and which shaft is in turn rocked from the piston-rod of the engine. It is to be remarked, however, that this connection is purely arbitrary, as any other form of connection may be employed and the lever *m* may be connected to any other suitable moving part of the engine. The pawl *n* is so arranged that upon being retracted over one tooth of the ratchet-wheel *k* it will pass over and take in behind that tooth just after the engine has passed the middle of its stroke going in one direction. If the engine is making a long stroke, the pawl will be retracted idly during the remainder of that stroke, its carrying-arm *m* having such length that the path of movement given to said pawl will be in such an arc that the pawl will be carried away from the ratchet-wheel, and consequently not engage a second tooth. If, however, the engine is making a very short stroke, the lost motion of the pawl after it passes the ratchet-tooth will be little or nothing, but the pawl, having passed the tooth, will be in position to engage with it as the engine makes its return stroke in the reverse direction, and thus move the ratchet-wheel a distance equal to that between two ratchet-teeth. The ratchet-wheel may be prevented from moving backward when the pawl *n* is retracted by a suitable friction device, such as a spring pressing upon its shaft or against some portion of the wheel or by means of an ordinary detent.

As some engines are liable to make such a very short stroke that the distance to which they will move the pawl, and thus carry the wheel, will not be sufficient to bring the next number into position to be exposed through the sight-opening, it is desirable to supplement the pawl *n* with other devices which shall operate to continue and complete the necessary movement of the ratchet-wheel and the disk during any such short movement of the pawl after it has ceased to act, and thus not only bring the next number upon the disk into proper position, but also bring the next tooth 5 of the ratchet-wheel into proper position to be engaged by the pawl after it is retracted at the next stroke of the engine. This result is accomplished by a spring-pressed adjusting and holding pawl *p*, having a head provided with reversely-inclined surfaces 6 7. This head is so positioned with relation to the normal position of the ratchet-wheel *k* that as the ratchet-wheel is advanced by the pawl the incline 6 will ride by the rear side of the tooth 5 with which it is in engagement, so as to permit the tooth to pass the head, and the parts are so positioned that immediately after the engine has passed the center of its stroke the pawl *n* will have moved the ratchet-wheel sufficiently to cause the tooth to pass the point of the pawl *p*, so that the incline 7 will act upon the front side of said tooth, and as soon as the parts arrive in this position, which, as before stated, will be immediately after the engine has passed the center of its stroke, the spring of the pawl *p* will act to force the head of the pawl inward between the ratchet-teeth, and thus cause the incline 7 to act upon the tooth which has just passed

the head and continue and complete the movement of the ratchet-wheel, so as to bring it and the disk *a* into proper position to expose the next number through the sight-opening and bring the proper tooth of the ratchet-wheel into position to be engaged by the pawl *n* when it is retracted upon the return stroke.

What is claimed is—

1. The combination, with a direct-acting engine, of the disks *a*, a registering mechanism, and the connections for imparting motion from one disk to another throughout the series, a ratchet-wheel *k* for moving the units-disk, a driving-pawl engaging said ratchet-wheel, and connections between the pawl and a moving part of the engine, having a movement varying with that of the piston whereby the pawl is retracted behind a tooth of the ratchet-wheel as the engine passes the middle of its stroke in one direction and advanced to drive the ratchet-wheel by said tooth as the engine passes the middle of its stroke in the other direction, substantially as described.

2. The combination, with a direct-acting engine, of the disks *a*, a registering mechanism, and connections for imparting motion from one disk to another throughout the series, a ratchet-wheel *k* for moving the units-disk, a driving-pawl engaging said ratchet-wheel, and connections between the pawl and a moving part of the engine, having a movement varying with that of the piston whereby the pawl is retracted behind a tooth of the ratchet-wheel as the engine passes the middle of its stroke in one direction and advanced to drive the ratchet-wheel by said tooth as the engine passes the middle of its stroke in the other direction, and a spring adjusting and holding pawl *p*, having an inclined surface 7 engaging the ratchet-tooth, substantially as described.

3. The combination, with a direct-acting engine, of the disks *a*, a registering mechanism, and connections for imparting motion from one disk to another throughout the series, a ratchet-wheel *k* for moving the units-disk, lever *m*, swinging pawl *n*, mounted on said lever and engaging said ratchet-wheel, and operating connections between said lever *m* and a moving part of the engine, having a movement varying with that of the piston whereby the pawl is retracted behind a tooth of the ratchet-wheel as the engine passes the middle of its stroke in one direction and advanced to drive the ratchet-wheel by said tooth as the engine passes the middle of its stroke in the other direction, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES C. WORTHINGTON.

Witnesses:
B. W. PIERSON,
LOUIS R. ALBERGER.