No. 787,141. PATENTED APR. 11, 1905.

H. M. BARBER.

OFFSET MECHANISM FOR PRINTING MACHINES.

APPLICATION FILED NOV. 21, 1904.

7 SHEETS—SHEET 1.

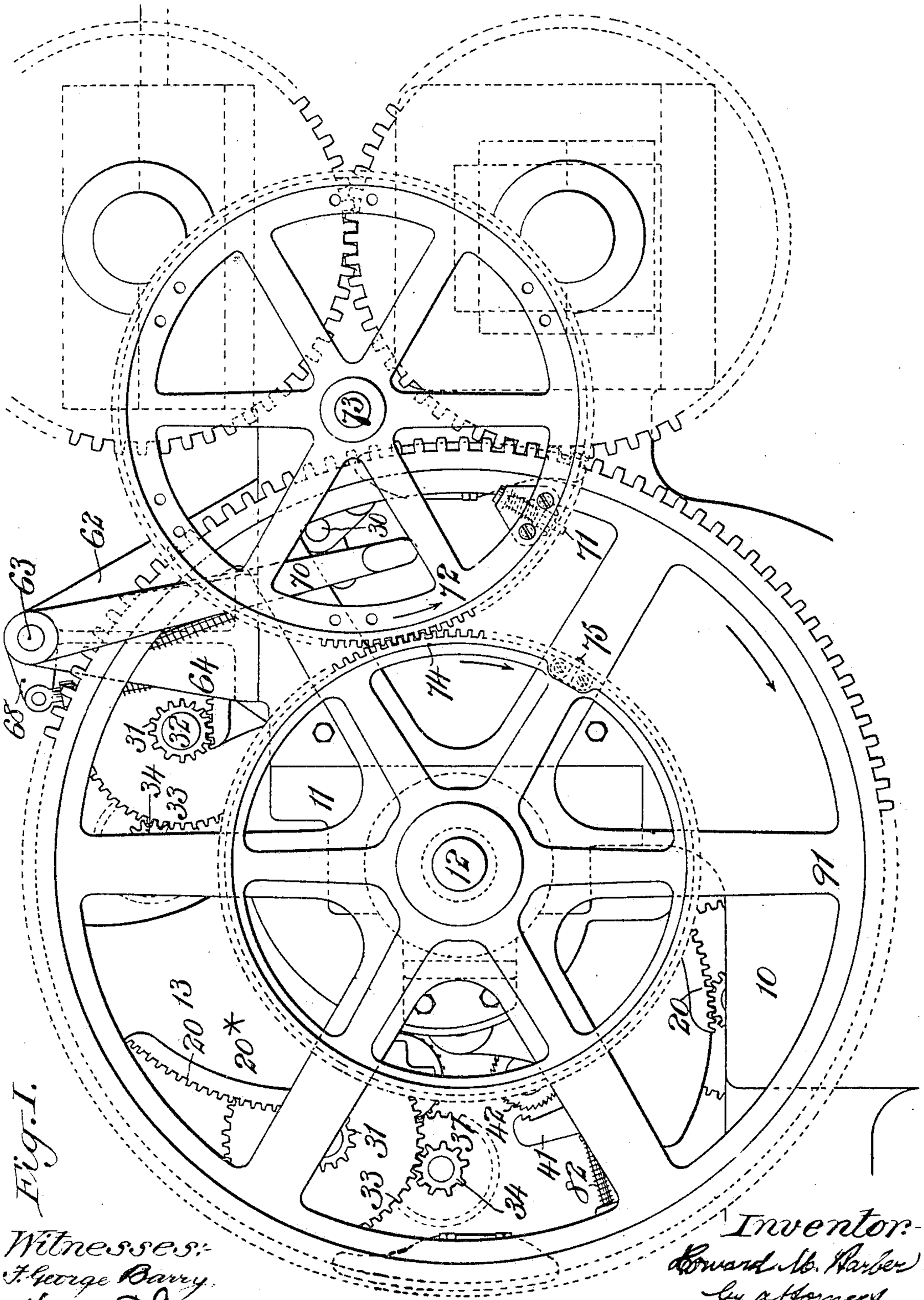

Fig. 1.

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7 SHEETS—SHEET 2.

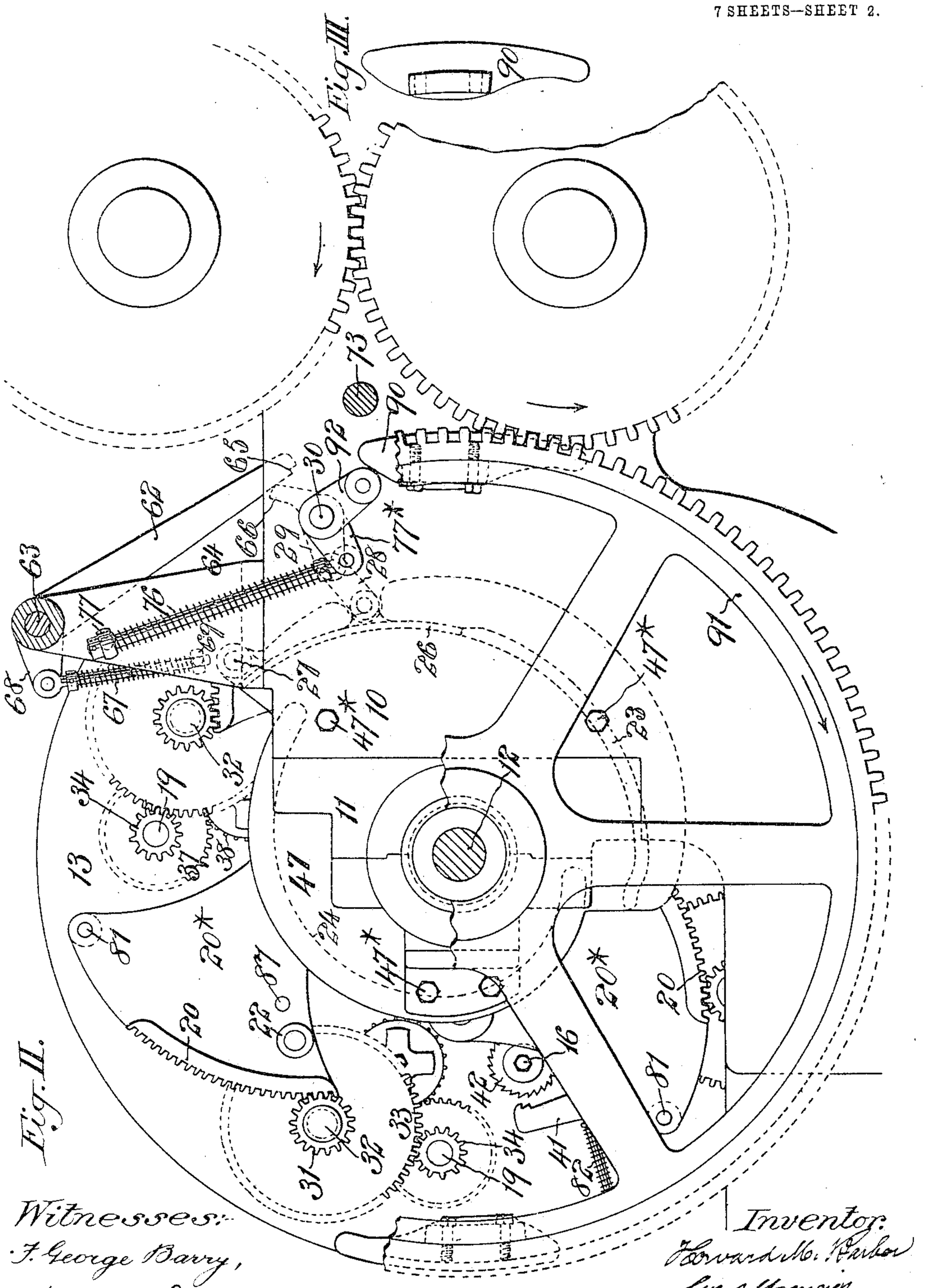

Fig. II.

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7 SHEETS—SHEET 3.

Fig. I.

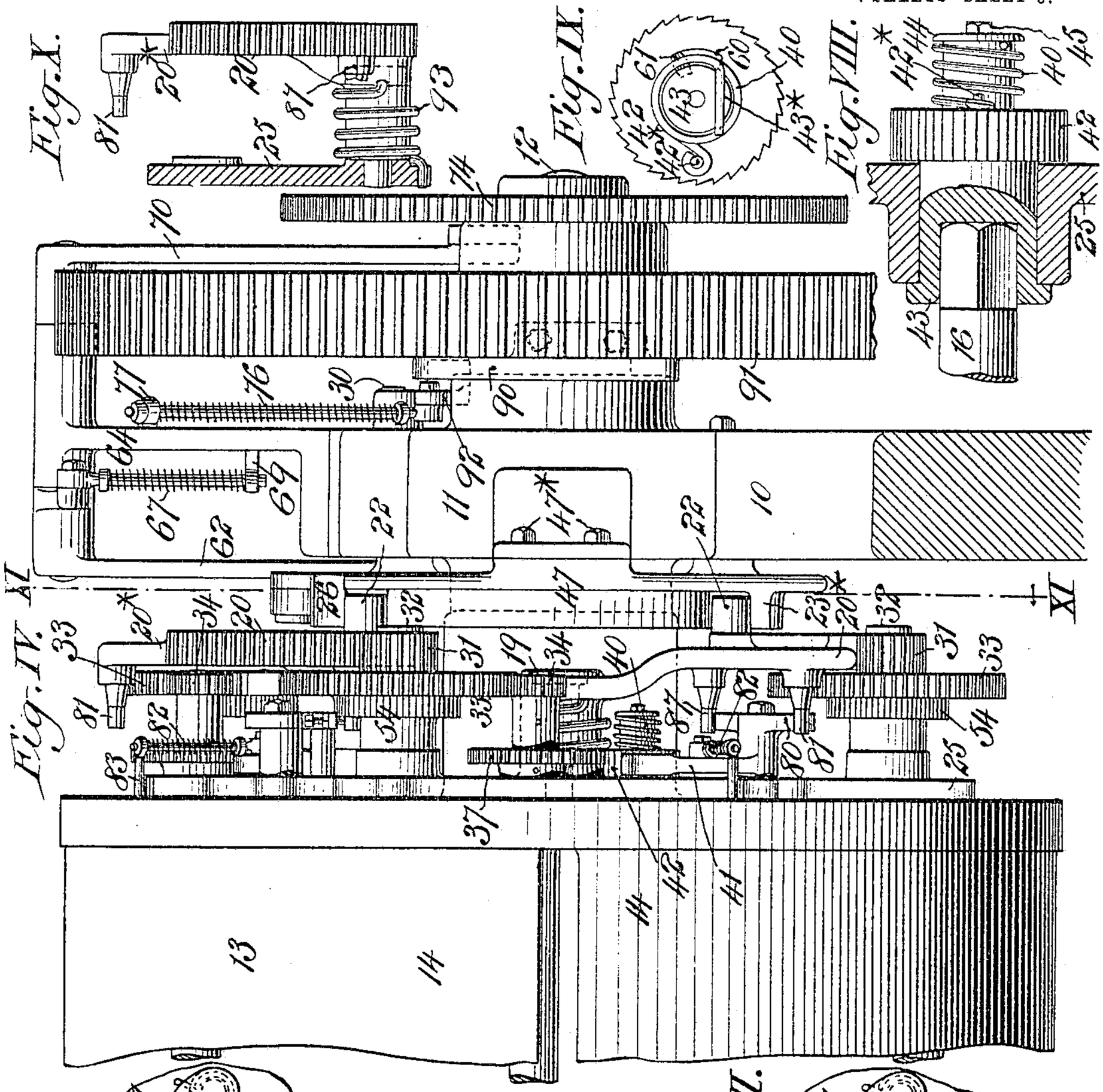


Fig. II.

Fig. III.

Fig. V.

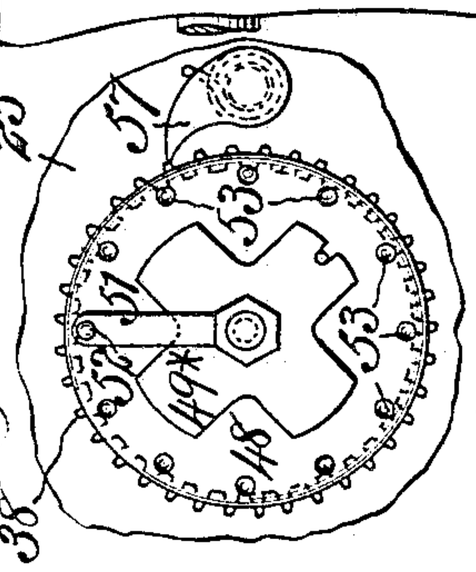


Fig. VI.

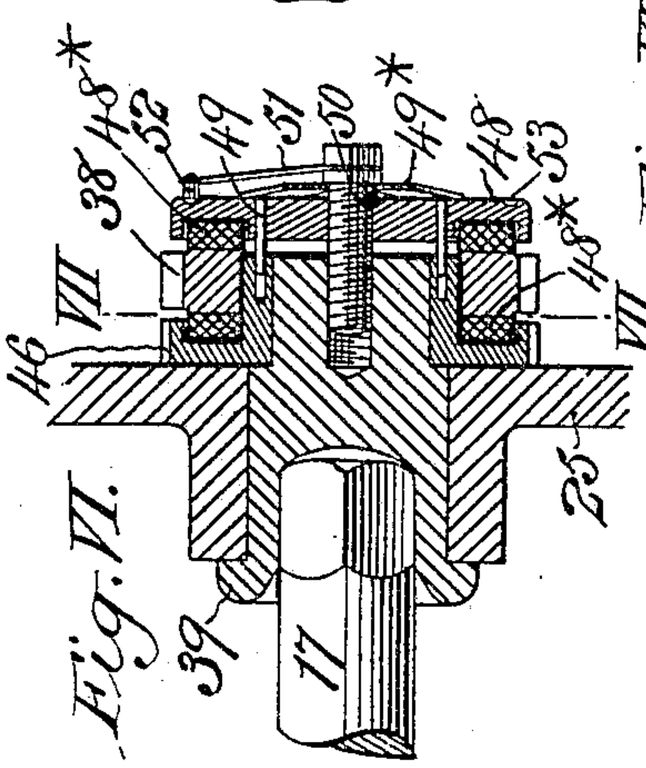
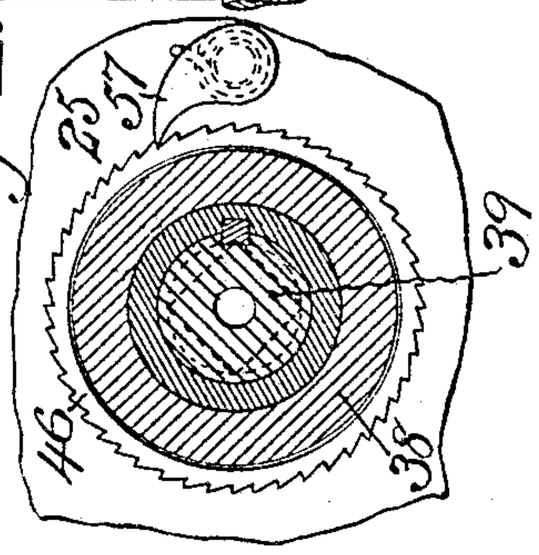


Fig. VII.



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7 SHEETS—SHEET 4.

Fig. XII.

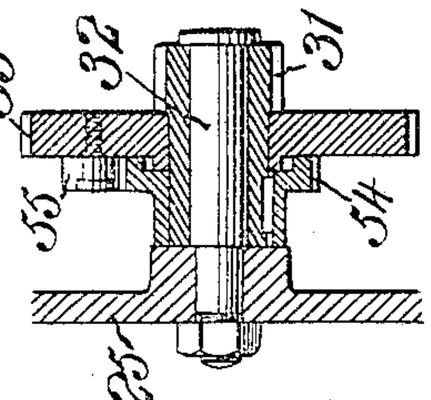

Fig. XIII.

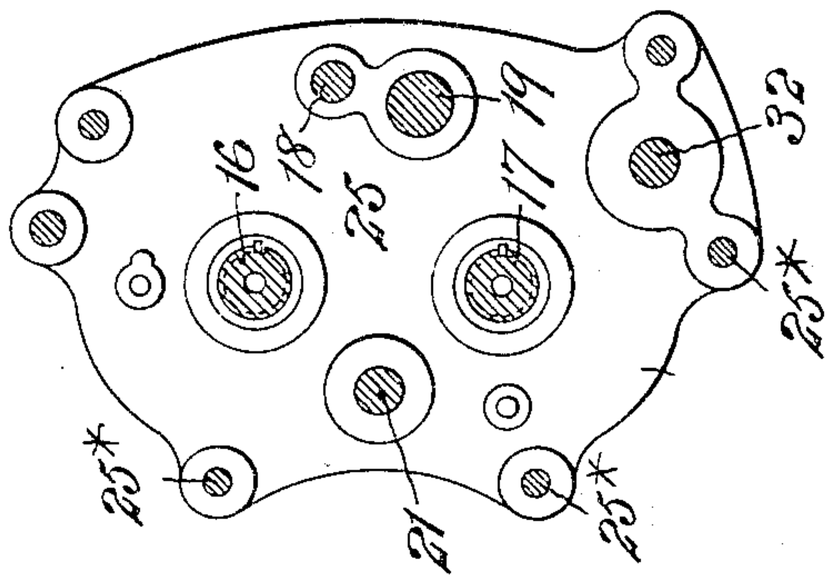

Fig. XI.

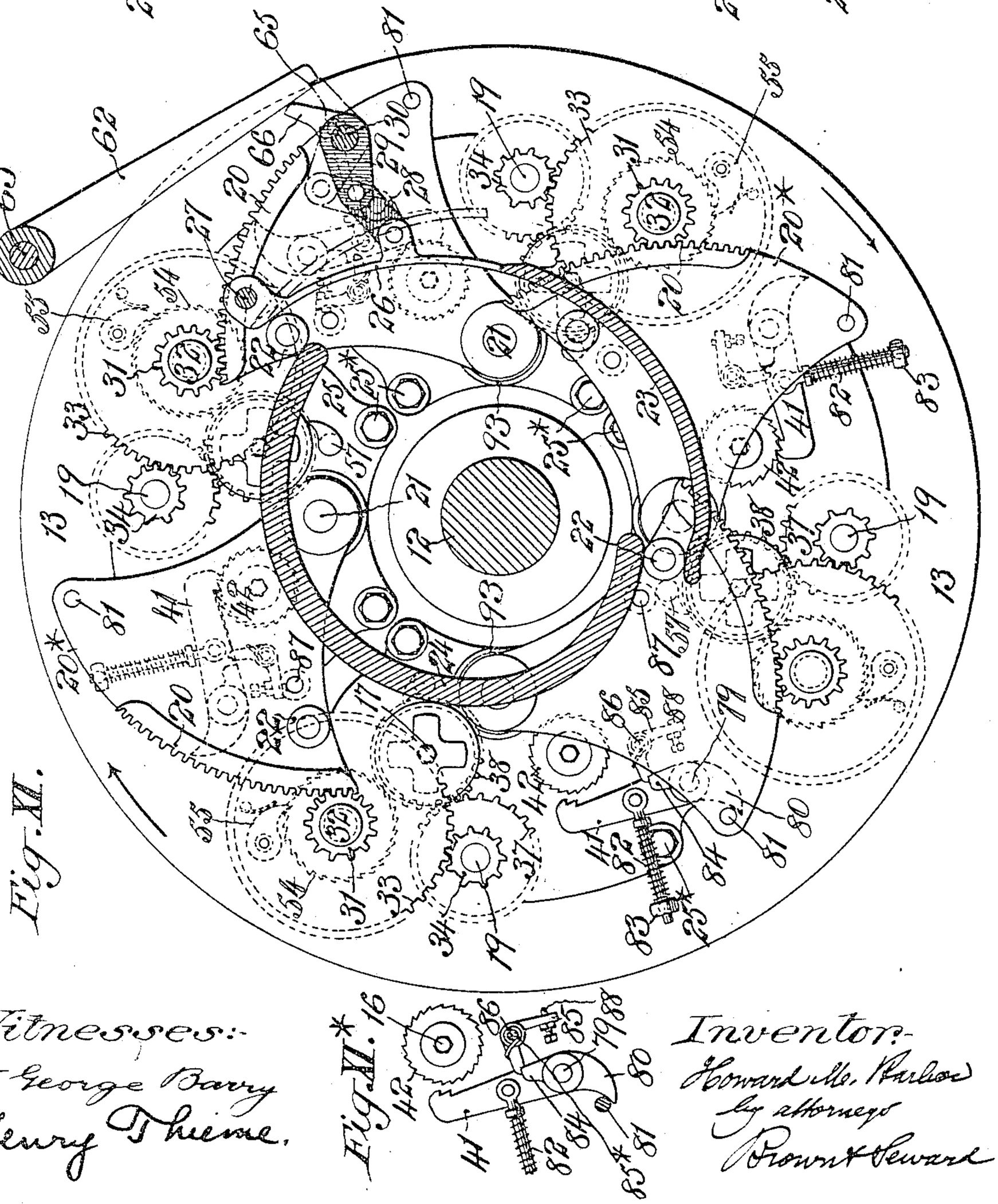

Fig. XI*.

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7 SHEETS—SHEET 5.

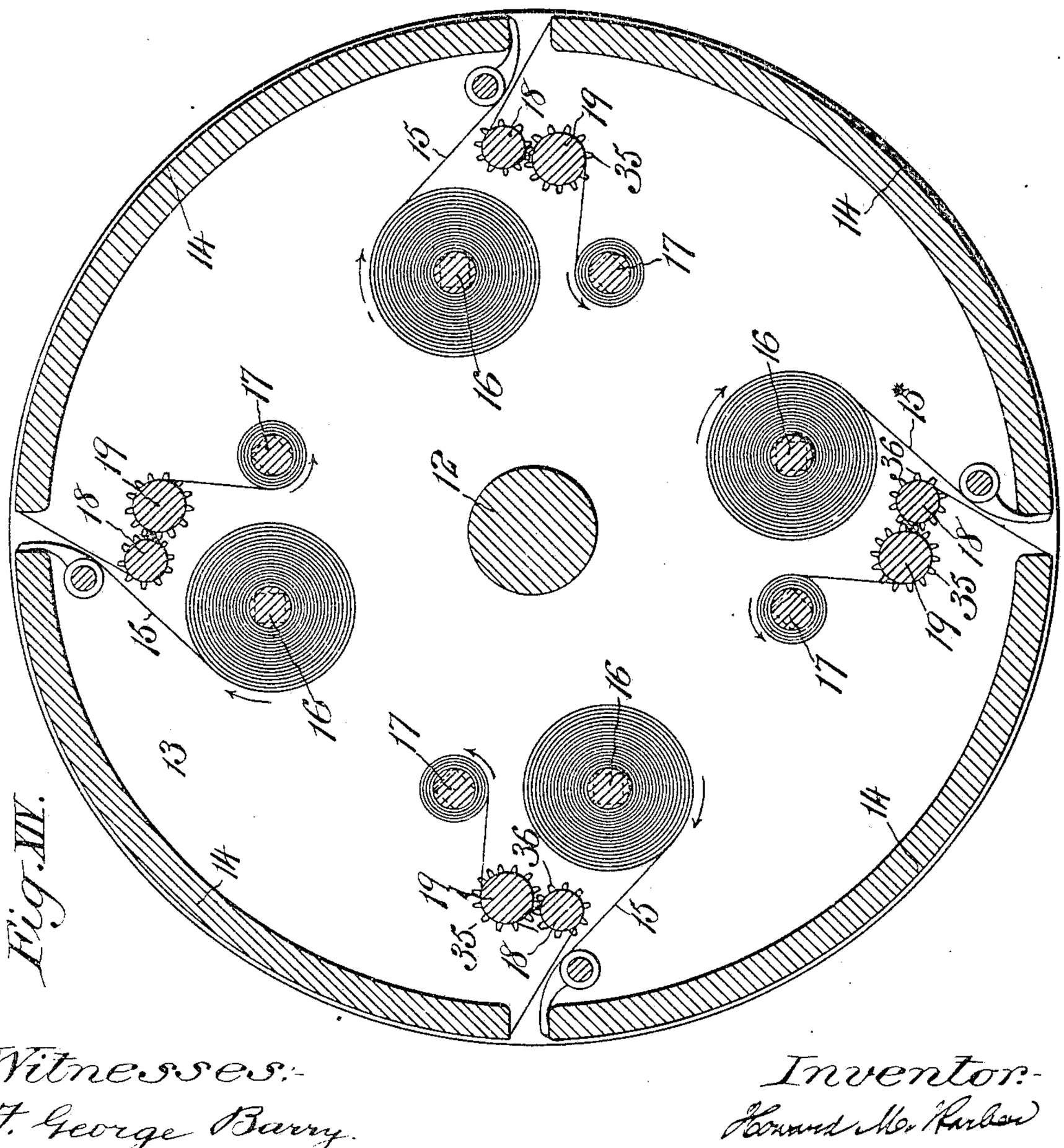

Fig. III.

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7 SHEETS—SHEET 6.

Fig. XV.

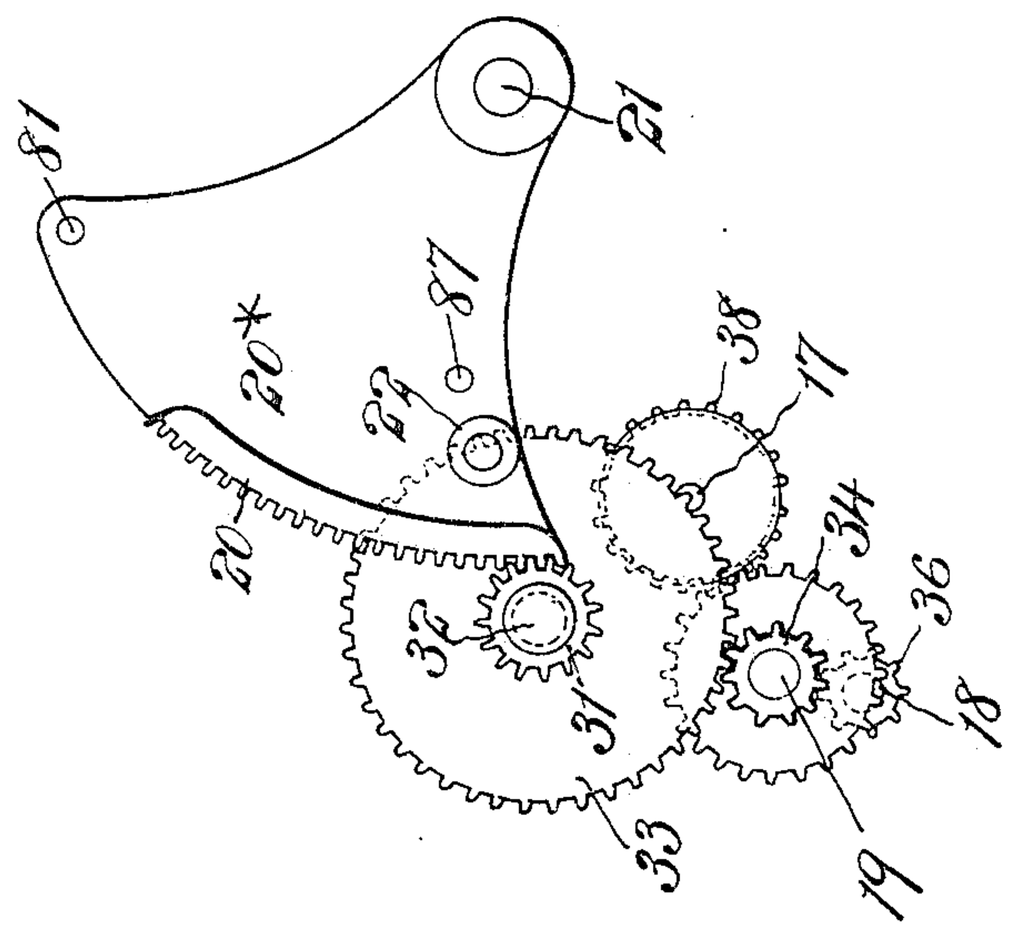
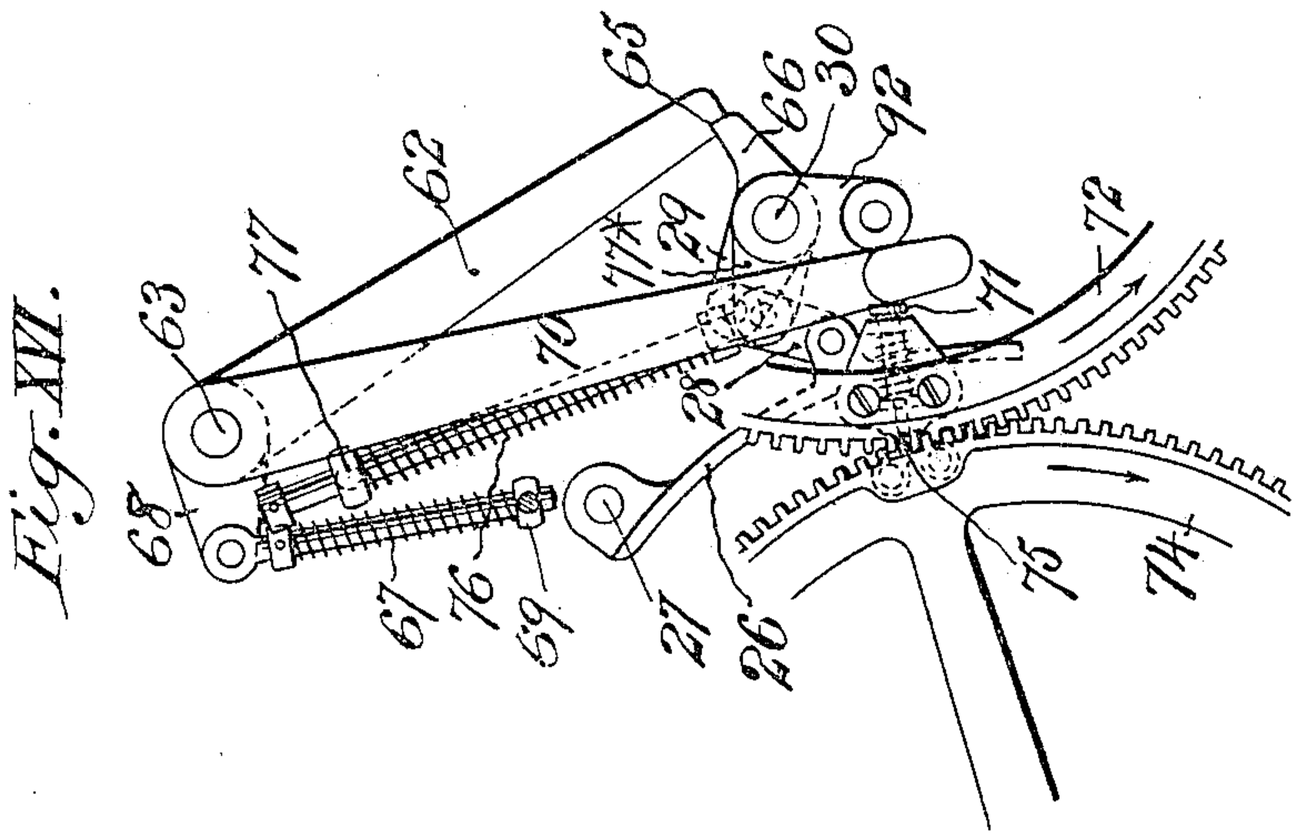


Fig. XVI.



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7 SHEETS—SHEET 7.

Fig. XVIII.

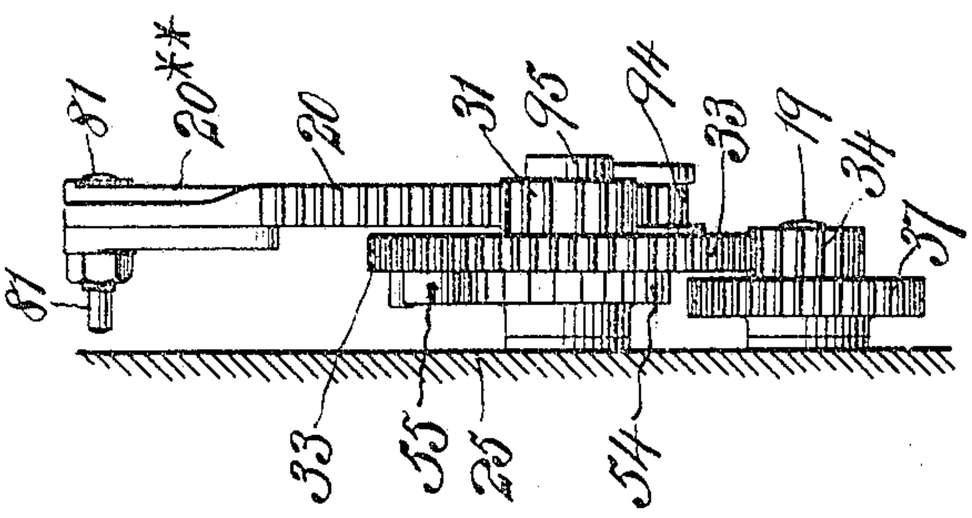
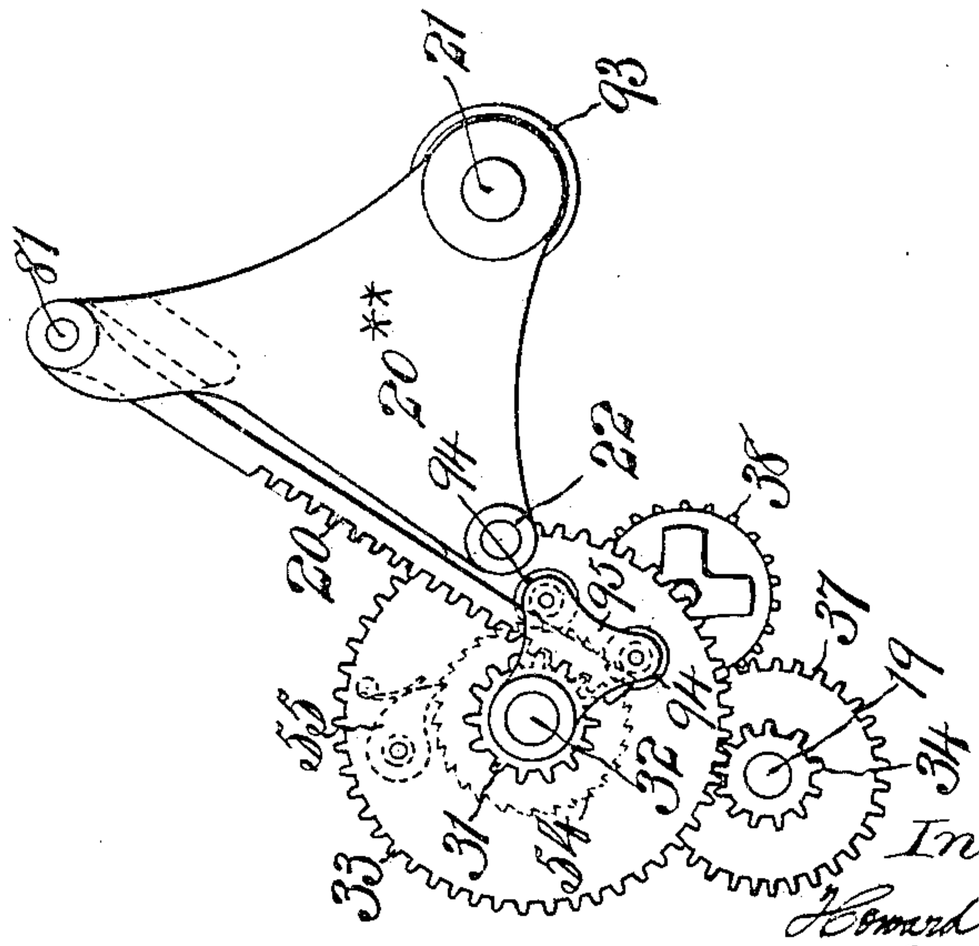


Fig. XVII.



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No. 787,141. Patented April 11, 1905.

UNITED STATES PATENT OFFICE.

HOWARD M. BARBER, OF STONINGTON, CONNECTICUT, ASSIGNOR TO C. B. COTTRELL & SONS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

OFFSET MECHANISM FOR PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 787,141, dated April 11, 1905.

Application filed November 21, 1904. Serial No. 233,654.

To all whom it may concern:

Be it known that I, HOWARD M. BARBER, a citizen of the United States, and a resident of Stonington, in the county of New London and State of Connecticut, have invented a new and useful Improvement in Offset Mechanism for Printing-Machines, of which the following is a specification.

This invention relates to provision for the shifting of the tympan or tympans upon the surface or surfaces of the impression-cylinder of a printing-machine to which it or they is or are attached; and it consists in the novel means illustrated by the accompanying drawings, and hereinafter described and claimed, for automatically producing and controlling the shifting movements whereby certain important advantages hereinafter explained are obtained.

Figure I, in the accompanying drawings, is a side view of the cylinder and such other parts of a printing-machine as are necessary to the illustration of my invention and are visible from the outside of the machine, the cylinder having four tympans and as many sets of rollers therefor. Fig. II is a corresponding elevation with some of the parts omitted to expose others to view; Fig. III, a side view of a cam to be hereinafter described. Fig. IV is an elevation corresponding with Fig. I, but taken transversely thereto and showing part of the framing in section. Figs. V, VI, VII, VIII, IX, and X are views of certain details, which will be hereinafter explained, Figs. V to IX being on a larger scale than Figs. I, II, III, IV; Fig. XI, a vertical section taken parallel with Figs. I and II in the line XI XI of Fig. IV as viewed from the right; Fig. XI*, a view corresponding with Fig. XI of some details which are partly hidden in said figure; Figs. XII and XIII, detail views to be hereinafter explained; Fig. XIV, a transverse section of the impression-cylinder and the rollers contained therein for carrying and feeding the tympan; Fig. XV, a diagram of the train of gearing for shifting one of the tympans. Fig. XVI is a side view of the tripping mechanism for putting the shifting mechanism into operation; Fig. XVII, a side view illustrating a modification of the shifting mechanism; Fig. XVIII, a front view corresponding with Fig. XVII.

10 designates the framing of the machine, containing the journal-box 11 for the shaft 12 of the impression-cylinder 13, which may either have its peripheral portion divided and separated into a number of arcs 14 equal to the number of impression-faces and corresponding tympans 15 that may be desired or may be constructed with only one impression-face and provided with a corresponding single tympan. In the example represented there are four impression-faces 14 and corresponding tympans 15. For each tympan there is represented as provided within the cylinder a set of four tympan-rollers, of which two, 16 17, are tympan-carrying rollers and two, 18 19, are feed-rollers. The rollers 16 are the supply or let-off rollers, from which the tympans are taken to the impression-faces 14, and those 17 are the winding or take-up rollers, onto which the smutted portions of the tympans are taken from the said faces. The several carrying-rollers and feed-rollers, which are best shown in Fig. XIV, are journaled in bearings in plates 25, secured by bolts 25* on the heads of the cylinder 13. Fig. XIII represents one of these plates, of which there is one for each set of rollers at each end of the cylinder. The said plates may be considered as parts of the cylinder-heads.

The feed-rollers 18 19 and carrying-rollers 17 derive their movements at the proper intervals of time for shifting the tympans from reciprocating toothed racks 20, one for each tympan. These racks in all the figures of the drawings in which they appear, except in Figs. XVII and XVIII, which will be hereinafter separately described, are of curved form and constructed on the arcs of sectors 20* and may be termed "toothed" sectors. The said sectors are pivoted, as shown in Fig. XI, by pivots 21 to the plates 25 on one of the heads of the cylinder on different sides of its shaft,

and by their swinging or reciprocating to-and-fro motion on these pivots they operate the several trains of gearing through which the several rollers are set in motion, these reciprocating movements being effected at the proper determined times through rollers 22, which are pivoted to them and which run inside of one, 23, and outside of another, 24, of two stationary cams, which are formed eccentrically to the cylinder on a plate 47, bolted to the journal-box 11 inside of the side framing 10 by bolts 47*, the entry of the said rollers between the said cams at the proper times being produced and controlled by a swinging curved switch 26, which is pivoted to the stationary cam-plate 47 by a fixed pivot 27 and operated, as hereinafter described, by means of a toggle 28 29, which connects it with a short rock-shaft 30, fitted to a bearing in the side framing 10. The curvature of the inner face of this switch so conforms to the inner curvature of the cam 23 that it may form a continuation thereof.

The gearing between the toothed sectors 20 and the feeding and take-up rollers is partly shown in Figs. I, II, IV, and XI; but the entire train for one of the tympans is shown separately in Fig. XV. Each sector meshes for the purpose of driving its respective rollers with a corresponding pinion 31, which turns loosely on a fixed stud 32, Figs. XI, XII, XV, secured in the plate 25, and there is attached to said pinion a larger gear 33, which meshes with a pinion 34, fast on the feed-roller 19, and so drives the said roller, which, being geared by gears 35 36, Fig. XIV, inside of the cylinder with the other feed-roller, 18, drives the latter. The said roller 19 also carries outside of the cylinder a gear 37, which meshes with a gear 38, provided outside of the cylinder on one of the journals of the take-up roller 17, and so drives the latter. This journal is represented as constituted by a socket 39, (shown in axial section in Fig. VI and in cross-section in Fig. VII,) which has one end of the roller fitted into it, as shown in Fig. VI, with a square, so that both turn together. The said journal has fast upon it a ratchet-wheel 46, which is engaged by a pawl 57, pivoted to the plate 25, as shown in Fig. VII, the section of which is taken in the line VII VII of Fig. VI, the said ratchet-wheel and pawl serving to hold the take-up roller against the tension of the tympan and retain on the said roller the portion of the tympan taken up thereon.

The supply or let-off roller 16 does not require to be and therefore is not represented as geared with or driven by the toothed sector, but is represented as intended to be turned for unwinding the tympan from it by the draft of the tympan itself when said roller is liberated, as will be hereinafter described, by the tripping of a locking-pawl 41, Figs. XI, XI*. This pawl, except while the shifting of the tympan is taking place, is engaged with a ratchet-wheel 42 on the journal of said roller. This journal, like that above described for the take-up roller, is represented in partly-sectional detail views, Figs. VIII and IX, as constituted by a socket 43, to which the roller is fitted with a square, so as to turn with it. In order to maintain the tension of the tympan, and yet obviate the danger of its being torn by the sudden stoppage of the rotation of the supply-roller when its locking-pawl 41 comes into operation after shifting, the ratchet-wheel is fitted loosely to the journal and permitted to turn a little way thereon by making the keyway 60, which receives the key 61 for attaching it to the journal, wider than the key, as will be understood by reference to Fig. IX. This turning movement is controlled by a coil-spring 40, which surrounds the outer portion of the journal, one end of said spring being fastened to the ratchet-wheel by a pin 42* and the other end being fastened to the journal by passing through a slot 43*, cut across the end of the latter, as shown in Fig. IX, and being confined in said slot by a cap-plate 44, secured to the end of the journal by a screw 45, screwing into the end of the latter. The said spring 40 allows the locking-pawl 41 to engage the ratchet-wheel and stop the free rotation of the supply-roller before the tympan-shift is completed. Thus the final amount of tympan required to complete the shift is obtained by the yielding of the spring, thus insuring at all times a tightly and smoothly drawn top sheet without breaks, which might be caused by suddenly stopping the rotation of the supply-roller.

To control the movement of the take-up roller 17 according to the diameter of the body of tympan upon it, a constantly-acting friction device is applied between the journal 39 of said roller and the gear 38, through which the said roller receives motion. This device is shown in the view Fig. VI, before referred to, and in Figs. V and VII, Fig. V being a face view and Fig. VII a cross-section in the line VII VII of Fig. VI. The said device consists of a spring-actuated clamp, between the two members of which the said gear is contained, as shown in Fig. V. One member of the clamp is constituted by the outer face of the ratchet-wheel 46, before mentioned, which is fast to the roller-journal and on the hub of which the gear is fitted to turn independently. The other member of said clamp is a disk 48, attached to the hub of said ratchet-wheel, so as to turn with it, by means of dowel-pins 49, fast in said disk and entering holes in said hub. Leather washers 48* are applied between the gear 38 and ratchet-wheel 46 and disk 48. The pressure is applied to the clamp member 48 to produce the friction necessary for driving the roller by means of a spring 49*, (represented in Fig. IV as a cruciform concavo-convex disk,) the said pressure being produced and adjusted

by a screw 50, which passes through the spring and screws into the end of the journal and the head of which bears against the spring. To secure the proper adjustment, there is fastened fixedly to the head of the screw an elastic arm 51, furnished with a teat 52, which enters one of a series of notches 53 in the outer face of the clamp member. The movement imparted to the gear 38 by its respective toothed rack 20 should be a little more than sufficient to give the take-up roller the necessary movement for shifting the tympan the distance necessary to present a clean portion on the face of the cylinder when the circumference of the body of the tympan contained on said roller is the smallest. Then as the said body increases the said gear will slip more and more in its clamp, and so obviate injuriously increasing tension on the tympan and liability to tear it. The friction may be adjusted at intervals between the successive shiftings of the tympan by means of the screw 50.

In order that the sectors 20* should act during their respective movements in one direction only on the trains of gearing hereinbefore described to produce the operations of the feed-rollers and take-up roller for shifting the tympans, the first gear 31 of each train, which turns loosely on its stud 32, has the second gear fitted to its hub, as shown in the section Fig. XII, to turn thereon, and the connection between the gears, by which 31 drives 33, consists of a ratchet-wheel 54, keyed to the hub 31, and a pawl 55, attached to 33, so that in the return movements of the racks 20 there is no movement of the feed and take-up rollers, the latter rollers being locked by their respective pawls 57 and ratchet-wheels 46.

It has been hereinbefore mentioned that the movements of the sectors 20* on their pivots 21 to produce the operations of the several tympan-rollers is produced at the proper times by rollers 22 on the several sectors running inside of one, 23, and outside of the other, 24, of the two stationary cams under the direction of the swinging switch 26. This switch at all times but when the shift is to be made is locked, as will be presently described, in the position shown in dotted outline in Fig. XI, in which it is inoperative and allows the rollers 22 on the sectors 20* to pass outside of and clear of the cam 23, where they are inoperative, the sectors being then all held in the position relatively to the cylinder and to their gears 31, in which the uppermost of said sectors is represented in Figs. II and XI. This position of the sectors is maintained in part by the locking-pawl 41 locking the ratchet-wheel 42 on the let-off rollers and in part by a strong coil-spring (see Fig. X) around the hub of the sector, one end of said spring being fastened to the sector and the other end to the plate 25. The locking of the switch 26 in the inoperative position described is effected partly by means of a lever-arm 62 on a rock-shaft 63, working in a bearing in a stand 64 on the top of the side framing the said arm having in its end a notch 65, which receives, as shown in dotted outline in Fig. XI, the end of a toe 66 on the rock-shaft 30. This engagement of the toe and notch, with the toggle 28 29, bent as shown in Fig. XVI and in dotted outline in Fig. XI, is retained partly by a spring 67, Figs. II and IV, applied between an arm 68 on the rock-shaft 63 and an abutment 69 on the stand 64, and partly by a pushing-spring 76, applied between an abutment 77 on the stand 64 and an arm 77* on the rock-shaft 30, the said spring 67 exerting a constant tendency to press the lever-arm 62 toward the toe and the spring 76 acting to force the toe 66 upward into the notch 65. This disengagement leaves the toggle free to be acted upon by the spring 76, which straightens it, and so throws the switch 26 into the position shown in full outline in Fig. XI, in which it connects with the cam 23. When the proper time for the shift arrives, the lever-arm 62 is thrown out of engagement from the toe 66 through the agency of a tripping-arm 70 on the rock-shaft 63, which is acted upon, as shown in Fig. XVI, by the inner end of a tappet 71, carried by a spur-gear 72, which is fitted to turn on a fixed stud 73 on the framing and which meshes with and derives constant rotary motion from a gear 74 with a different number of teeth and which is fast on the cylinder-shaft and carries a tappet 75. The tappet 71 is fitted to slide radially toward and from the center of its gear 72 and has applied to it a coil-spring by which it is pressed outward to a position in which during the rotation of its gear 72 it passes by the tripping-lever arm 70 without moving it until the time arrives for the shift, when the said tappet is pushed inward far enough to strike said arm by means of the fixed tappet 75 on the gear 74, which then arrives opposite to its outer end. The said gears 72 73 and their tappets and their action upon the tripping-lever to start the shifting mechanism are such as are described in United States Letters Patent No. 467,637, and therefore need only very brief description here. It has been just stated that the said gears have different numbers of teeth. Suppose, for example, that 74 has one hundred and thirty and that 72 has one hundred and twenty-nine teeth, it being desired to shift the tympan during every one hundred and thirtieth revolution of the cylinder. Every time the gear 74 makes a revolution the gear 72 lacks one tooth of the full revolution, so that during one hundred and thirty revolutions of the gear 74 the gear 72 will make only one hundred and twenty-nine revolutions. Therefore in every one hundred and thirtieth revolution of the said gear

74 the two tappets come together and the tappet 71 pushes out the tripping-lever arm, and so disengages the lever-arm 62 and toe 66, leaving the toggle 28 29 free to be straightened by the pressure of the spring 76, and thereby to push the switch 26 into the operative position, (shown in full outline in Fig. XI and dotted in Fig. II,) in which it forms a prolongation of the cam 23.

For the purpose of throwing out the switch 26 into the inoperative position shown in dotted outline in Fig. XI there is carried by the ylinder a cam 90. (Represented in Fig. II as bolted to the cylinder-driving gear 91 and shown detached in Fig. III.) This cam in the next revolution of the cylinder after the shift of the tympans strikes an arm 92, which is fast on the rock-shaft 30, and so moves the said arm toward the center of the cylinder and produces the flexure of the toggle 28 29, by which the switch is thrown out, at the same time bringing the toe 66 into the engagement with the notch 65 of the lever-arm 62, by which the switch is so locked out, its position being then such that as the sectors are carried round by the cylinder in the positions relatively thereto, in which the two upper sectors are shown in Fig. XI, their rollers 22 will pass by it and outside of the cam 23 without any movement of the sectors on their pivots 21 being produced.

It has been hereinbefore mentioned that except during the time of making the shift of a tympan its supply-roller 16 is locked by the engagement with its ratchet-wheel 42 of its locking-pawl 41. The pawls 41 are pivoted, as shown in Fig. XI, to the cylinder-head plates 25 by pivots 79 and each provided with a backwardly-projecting heel 80, which at the proper times for starting the shift is acted upon by means of a stud 81, projecting from the inner face of its respective sector, to throw the pawl out of engagement, the engagement being at other times retained by a spring 82, applied between the said pawl and an abutment 83 on the cylinder-head. To provide for retaining this disengagement during the shift, the pawls are each provided on one side with a projection 84, which engages, as shown in Fig. XI and also in the detail view Fig. XI*, in a notch in one arm of an elbow-shaped detent 85, which is pivoted to the plate 25 by a pivot 86, and this latter engagement is caused to be retained by a coil-spring 85*, applied in a well-known manner between the said detent and its pivot until another stud 87 on the sector strikes the end of a screw 88 in the other arm of the detent 85 just before the stoppage of the shifting movement, and so releases the projection 84 of the pawl and allows the latter to be reëngaged with the ratchet-wheel 42 by the pressure of its spring 82. The adjustment of the screw 88 to project more or less from the elbow provides for the action of the stud 87 to reëngage the stop-pawl with its ratchet-wheel in proper time for the stoppage of the supply-roller 16.

All parts of the shifting mechanism and their several and respective operations having now been explained, I will briefly describe their successive operations in making a shift, first supposing the switch 26 to have just been thrown into the operative position shown in full outline in Fig. XI and the roller 22 of that sector 20*, which is in the upper right-hand portion of that figure, having just been brought to the switch by the rotation of the cylinder in the direction of the arrow shown upon the latter. The continued rotation of the cylinder carries the said roller 22 along the inner face of the switch 26 and along the inner face of the cam 23, and by its so running along the sector is caused to turn on its pivot in the opposite direction to that in which the cylinder itself turns. During the latter part of this movement of the sector the unlocking of the ratchet-wheel of the supply-roller is produced by the action of the stud 81 of the sector upon the heel 80 of the locking-pawl 41. The latter now being engaged by the detent 85 is held out of engagement with the ratchet-wheel 42 on the supply-roller until the shift is completed, as hereinafter described. During the whole of the movement of the sector in the direction described no movement of the tympan takes place, the gear 31 then turning on the stud 32 without turning the gear 33, because the ratchet-wheel 54 slips past the pawl 55. The further continued rotation of the cylinder carries the roller to the cam 24, and by the passing of said roller over this cam the movement of the sector is reversed, thus producing the turning of the gear 33 in the proper direction to produce, through the gears 34 37 38, the turning of the take-up roller 17 and the shifting of the tympan. As this movement of the sector is nearly completed the stud 87 the reoncomes into operation on the point of the screw 88 of the detent 85, and so releases the locking-pawl 41 of the supply-roller and allows it to come into operation on the ratchet-wheel on said roller.

During a single revolution of the cylinder the operation hereinabove described with reference to one tympan-shifting sector and the mechanism through which it acts on its respective tympan takes place with respect to all four tympans, one after another, and during the next revolution of the cylinder the cam 90 on the cylinder-gear 91 comes into operation on the arm 92 of the rock-shaft 30, and so throws out the switch 26 to its inoperative position, where it remains until, after the determined number of revolutions of the cylinder, the tappets 71 75 again come together for repeating the shifting of each of the tympans, as described, during a single revolution of the cylinder.

An important feature of the example which

I have selected for illustration of my invention and have herein particularly described is that the radii of the sectors which produce the shifting movement is less than the radius of the impression-cylinder to which they are applied. This makes in the space between the circumference of the cylinder and its shaft room for as many of these sectors as may be necessary for the shifting of as many tympans as it may be desirable to apply to one cylinder, each sector coming entirely within the space included between the cylinder-shaft and an arc corresponding with that portion of the circumference of the cylinder to which its respective tympan is applied.

In the modification of my invention shown in Figs. XVII and XVIII the reciprocating toothed rack 20 instead of being in the form of an arc and constructed directly on a sector consists of a straight bar pivoted at one end to a swinging piece 20^{**} in the form of a bell-crank lever, which is pivoted to the cylinder by a pivot 21 in the same way in which the toothed sector 20^{*} is pivoted thereto. The said straight rack 20 is confined in engagement with the gear 31 by means of two rollers 94 in a yoke 95, which is fitted to the stud 32 so as to be capable of the necessary slight oscillation thereon. The lever 20^{**} resembles the sector 20^{*}, except that the curved rack 20, integral with the latter sector, is omitted and the pivoted straight rack substituted, and the said lever is provided, like the sector, with a similar cam-roller 22 and a similar stud 81 for tripping the locking-pawl of the tympan-supply roller. This stud 81 is represented as utilized for the pivotal connection of the straight rack with the lever 20^{**}.

The tympan-shifting mechanism operated by a cam-actuated rack possesses great advantage over other tympan-shifting mechanisms which are thrown into operation by means of clutches which necessarily revolve at a high rate of speed and have to be engaged to make the shift and disengaged as soon as the shift is completed. With the clutch-operated mechanism the tympan travels at the same speed throughout the entire operation and is subjected to a severe shock at the engagement of the clutch. By the mechanism herein described, operated by a cam-actuated rack, the tympan is started and stopped so gradually that all shock is eliminated, and owing to the very gradual movement imparted to it at the commencement and end of the shift it may be operated at a higher rate of speed without danger of breakage, always leaving a smooth tightly-drawn top sheet to receive the offset.

What I claim as my invention is—

1. The combination with the impression-cylinder of a printing-machine and tympan-rollers applied within said cylinder, of a reciprocating rack carried by said cylinder, gearing between said rack and rollers through which movement is transmitted directly from said rack to said rollers, and means for producing the movement of said rack by the revolution of the cylinder.

2. The combination with the impression-cylinder of a printing-machine adapted to receive a plurality of tympans and provided with a corresponding number of sets of tympan-rollers, of a corresponding number of reciprocating racks carried by the cylinder-head at different points thereon, gearing between each of said racks and its respective set of tympan-rollers through which movement is transmitted from the rack to the rollers, and a means common to all of said racks for producing their movements by the revolution of the cylinder.

3. The combination with the impression-cylinder of a printing-machine adapted to receive a plurality of tympans and provided with a corresponding number of sets of tympan-rollers, of a corresponding number of reciprocating racks carried by the cylinder-head at different points, gearing between each of said racks and its respective set of tympan-rollers through which movement is transmitted from the rack to the rollers, and a stationary cam for producing the movements of the several racks in succession by and during one revolution of the cylinder.

4. The combination with the impression-cylinder of a printing-machine and a tympan-winding roller in said cylinder, of a reciprocating rack carried by said cylinder, and gearing between said rack and roller through which movement is transmitted directly from said rack to said roller during the movement of the rack in one direction only.

5. The combination with the impression-cylinder of a printing-machine and tympan-rollers applied within said cylinder, of a reciprocating rack carried by said cylinder for producing the movement of said rollers and a spring applied to said rack for holding it in an inoperative position.

6. The combination with the impression-cylinder of a printing-machine and tympan supply and take-up rollers in said cylinder, of a reciprocating rack carried by said cylinder and gearing between said rack and the take-up roller for turning the latter, a locking device applied to the supply-roller, and a projection on said rack for disengaging said device and liberating the latter roller.

7. The combination with the impression-cylinder of a printing-machine and a tympan-winding roller in said cylinder, of a reciprocating rack carried by said cylinder, gearing between said rack and winding-roller including a gear on said roller through which motion is transmitted from said rack to said roller, and a spring-controlled friction device between said gear and said roller.

8. The combination with the impression-cylinder of a printing-machine and tympan supply and take-up rollers in said cylinder, of

a reciprocating rack carried by said cylinder and gearing between said rack and the take-up roller for turning the latter, a ratchet-wheel on the supply-roller and a locking-pawl on the cylinder-head for engaging with said ratchet-wheel to lock the said roller, a projection on the rack for disengaging the pawl from the ratchet-wheel, a detent on the cylinder-head for holding the pawl disengaged, and a projection on the rack for producing the disengagement of the detent from the locking-pawl.

9. The combination with the impression-cylinder of a printing-machine and tympan supply and take-up rollers in said cylinder, of a reciprocating rack carried by said cylinder and gearing between said rack and the take-up roller for turning the latter, a ratchet-wheel on the supply-roller and a locking-pawl on the cylinder-head for engaging with said ratchet-wheel to lock the said roller and a spring between said ratchet-wheel and the supply-roller.

10. The combination with the impression-cylinder of a printing-machine and tympan-rollers applied within said cylinder, of a reciprocating rack carried by said cylinder, gearing between said rack and rollers through which movement is transmitted from said rack to said rollers, stationary cams through which by the revolution of the cylinder the movement of the rack in opposite directions is produced, a switch for producing the engagement of the rack with said cams and automatic means for producing said engagement at predetermined times for shifting the tympan.

11. The combination with the impression-cylinder of a printing-machine and tympan-rollers applied within said cylinder, of a sector pivoted to said cylinder, gearing between said sector and rollers through which movement is transmitted directly from said sector to said rollers, and means for producing the movement of said sector by the revolution of the cylinder.

12. The combination with the impression-cylinder of a printing-machine and tympan-rollers applied within said cylinder, of a sector pivoted to the cylinder and of less radius than the cylinder, gearing between said sector and rollers through which movement is transmitted from said sector to said rollers and means for producing the movement of said sector by the revolution of the cylinder.

13. The combination with the impression-cylinder of a printing-machine adapted to receive a plurality of tympans and provided with a corresponding number of sets of tympan-rollers, of a corresponding number of sectors pivoted to the cylinder-head at different points, gearing between each sector and its respective set of tympan-rollers through which movement is transmitted from the sector to the rollers, and a means common to all of said sectors for producing their movements by the revolution of the cylinder.

14. The combination with the impression-cylinder of a printing-machine adapted to receive a plurality of tympans and provided with a corresponding number of sets of tympan-rollers, of a corresponding number of sectors pivoted to the cylinder-head at different points, gearing between each sector and its respective set of tympan-rollers through which movement is transmitted from the sector to the rollers, and a stationary cam for producing the movements of the several sectors in succession by and during one revolution of the cylinder.

15. The combination with the impression-cylinder of a printing-machine and a tympan-winding roller in said cylinder, of a swinging sector pivoted to said cylinder, gearing between said sector and roller for directly producing the movement of the roller by the swinging of the sector, said gearing comprising means which transmit the so-produced movement to the roller during the movement of the sector in one direction only.

16. The combination with the impression-cylinder of a printing-machine and tympan-rollers applied within said cylinder, of a sector pivoted to said cylinder for producing the movement of the said rollers and a spring applied to said sector for holding it in an inoperative position.

17. The combination with the impression-cylinder of a printing-machine and tympan supply and take-up rollers in said cylinder, of a sector pivoted to said cylinder and gearing between said sector and the take-up roller for turning the latter, a locking device applied to the supply-roller, and a projection on said sector for disengaging said device and liberating the latter roller.

18. The combination with the impression-cylinder of a printing-machine and a tympan-winding roller in said cylinder, of a toothed sector pivoted to said cylinder, gearing between said sector and winding-roller including a gear on said roller through which motion is transmitted from said sector to said roller, and a spring-controlled friction device between said gear and said roller.

19. The combination with the impression-cylinder of a printing-machine and tympan supply and take-up rollers in said cylinder, of a sector pivoted to said cylinder and gearing between said sector and the take-up roller for turning the latter, a ratchet-wheel on the supply-roller and a locking-pawl on the cylinder-head for engaging with said ratchet-wheel to lock the said roller, a projection on the sector for disengaging the pawl from the ratchet-wheel, a detent on the cylinder-head for holding the pawl disengaged, and a projection on the sector for producing the disengagement of the detent from the locking-pawl.

20. The combination with the impression-cylinder of a printing-machine and tympan supply and take-up rollers in said cylinder, of a sector pivoted to said cylinder and gearing between said sector and the take-up roller for turning the latter, a ratchet-wheel on the supply-roller and a locking-pawl on the cylinder-head for engaging with said ratchet-wheel to lock the said roller and a spring between said ratchet-wheel and the supply-roller.

21. The combination with the impression-cylinder of a printing-machine and tympan-rollers applied within said cylinder, of a sector pivoted to said cylinder, gearing between said sector and rollers through which movement is transmitted from said sector to said rollers, stationary cams through which by the revolution of the cylinder the movement of the sector in opposite directions is produced, a switch for producing the engagement of the sector with said cams and automatic means for producing said engagement at predetermined times for shifting the tympan.

22. The combination with the impression-cylinder of a printing-machine and tympan-rollers applied within said cylinder, of a sector pivoted to said cylinder, gearing between said sector and rollers through which movement is transmitted from said sector to said rollers, stationary cams through which by revolution of the cylinder the movement of the sector in opposite directions is produced, a switch for producing the engagement of the sector with said cams, a locking device for holding said switch in an inoperative position, a spring for holding said locking device in operation, a spring for throwing said switch into its operative position and automatic means for unlocking said locking device at predetermined times for shifting the tympan and permitting the latter spring to throw the switch into operation.

23. The combination with the impression-cylinder of a printing-machine and tympan-rollers applied within said cylinder, of a sector 20 pivoted to said cylinder, gearing between said sector and rollers through which movement is transmitted from said sector to said rollers, stationary cams 23, 24, through which by the revolution of the cylinder the movement of the sector in opposite directions is produced, a switch 26 for producing the engagement of the sector with said cams, a locking device consisting of two rock-shafts 30, 63, a toe 66 and a lever-arm 62 on said rock-shafts, a toggle 28, 29, between said rock-shaft 30 and the switch for throwing the switch into and out of its operative position, a spring 76 applied to said rock-shaft 30 for straightening said toggle and throwing the switch into operative position, a spring 67 applied to the rock-shaft 63 for throwing said locking device into operation, a rotary tappet 71 deriving motion from the cylinder, and a lever-arm 70 on the rock-shaft 63 on which said tappet acts to throw said locking device out of operation.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 15th day of November, A. D. 1904.

HOWARD M. BARBER.

Witnesses:
A. R. STILLMAN,
G. BURDICK.