

No. 637,596.

Patented Nov. 21, 1899.

E. HETT.

MECHANISM FOR MAKING PRINTING SURFACES.

(Application filed Oct. 4, 1899.)

(No Model.)

16 Sheets—Sheet 1.

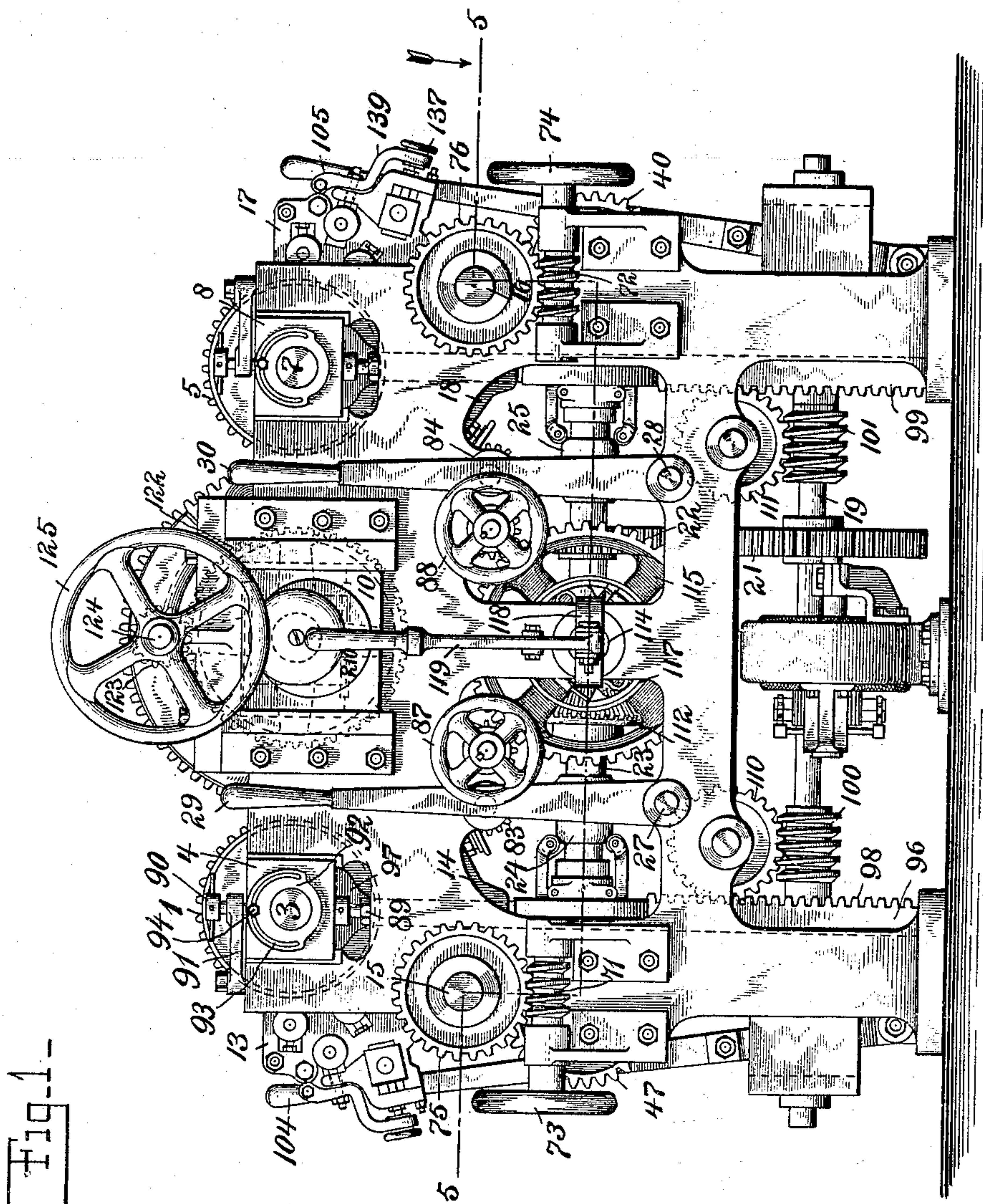


Fig. 1—

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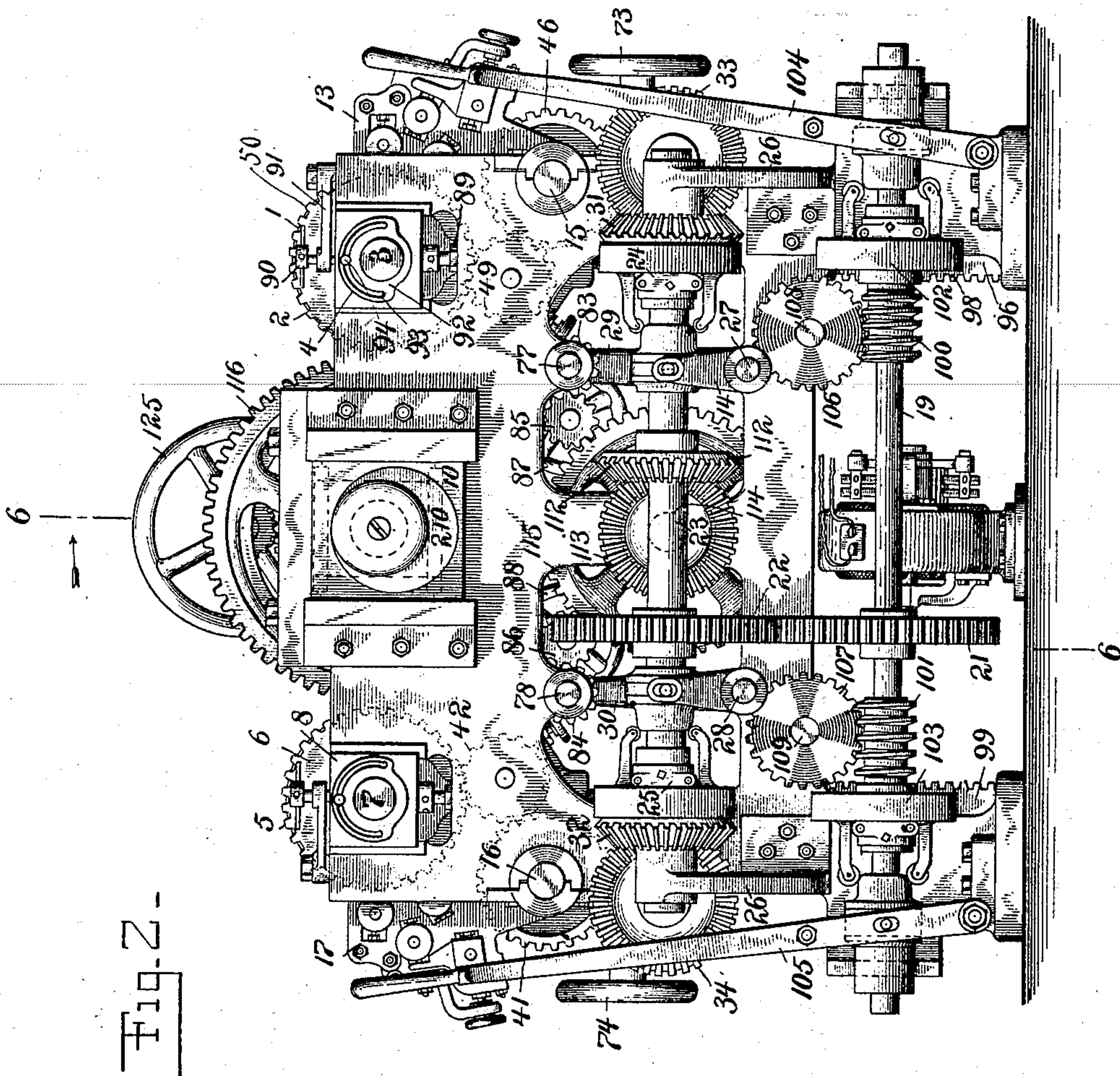
E. HETT.

MECHANISM FOR MAKING PRINTING SURFACES.

(Application filed Oct. 4, 1899.)

(No Model.)

16 Sheets—Sheet 2.



WITNESSES:

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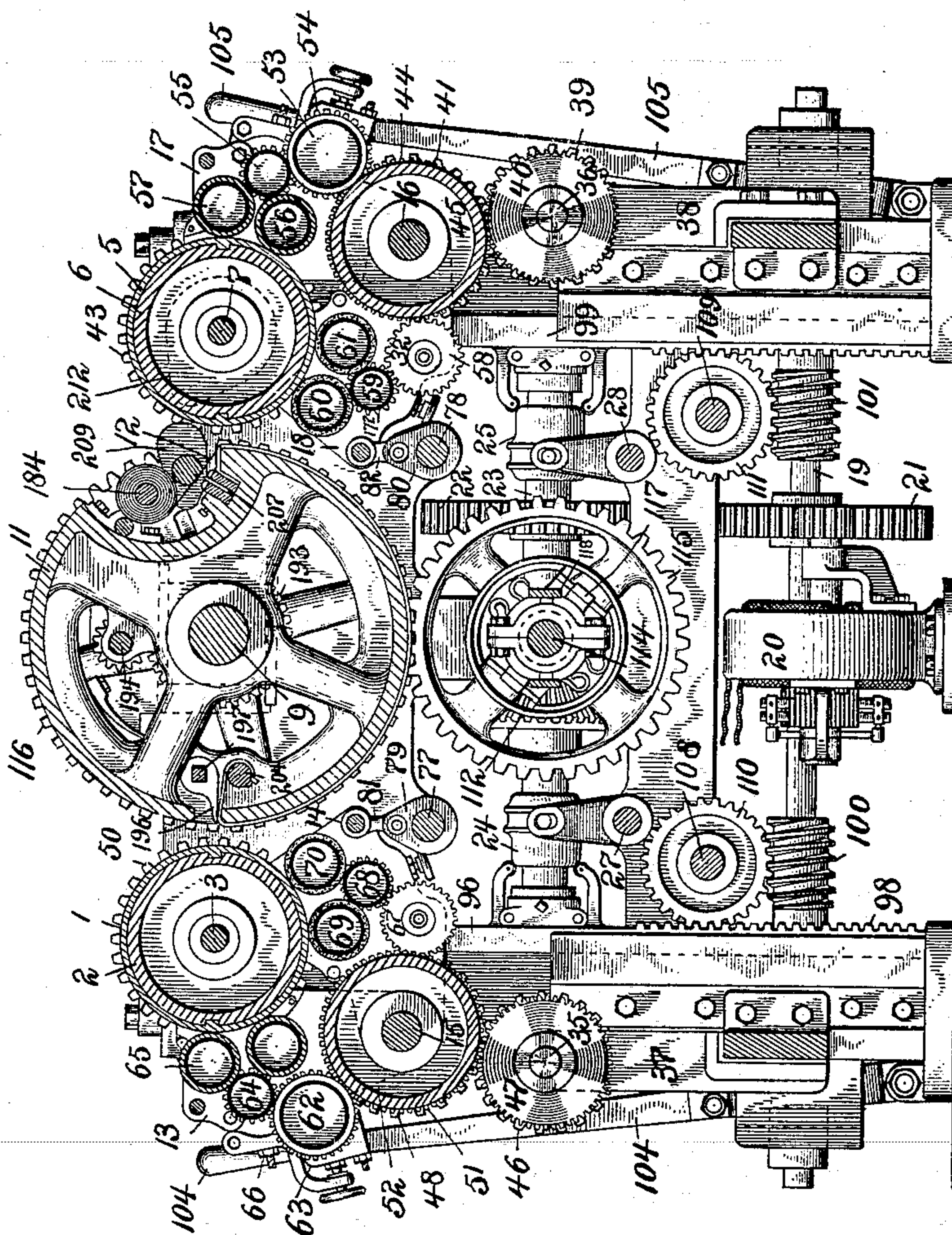
MECHANISM FOR MAKING PRINTING SURFACES.

(Application filed Oct. 4, 1899.)

(No Model.)

16 Sheets—Sheet 3.

Fig. 3-



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No. 637,596.

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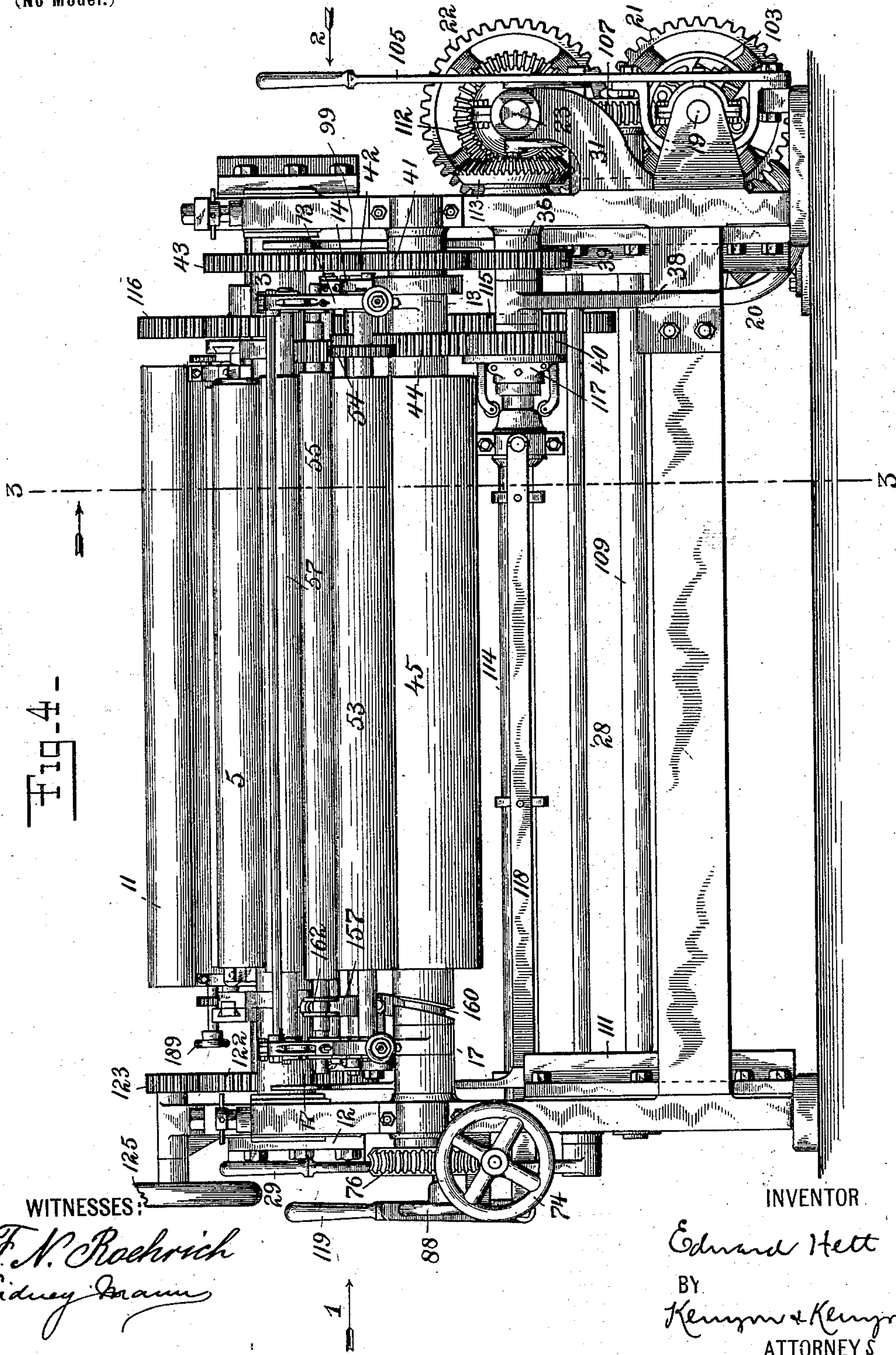
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MECHANISM FOR MAKING PRINTING SURFACES.

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(No Model.)

16 Sheets—Sheet 4.



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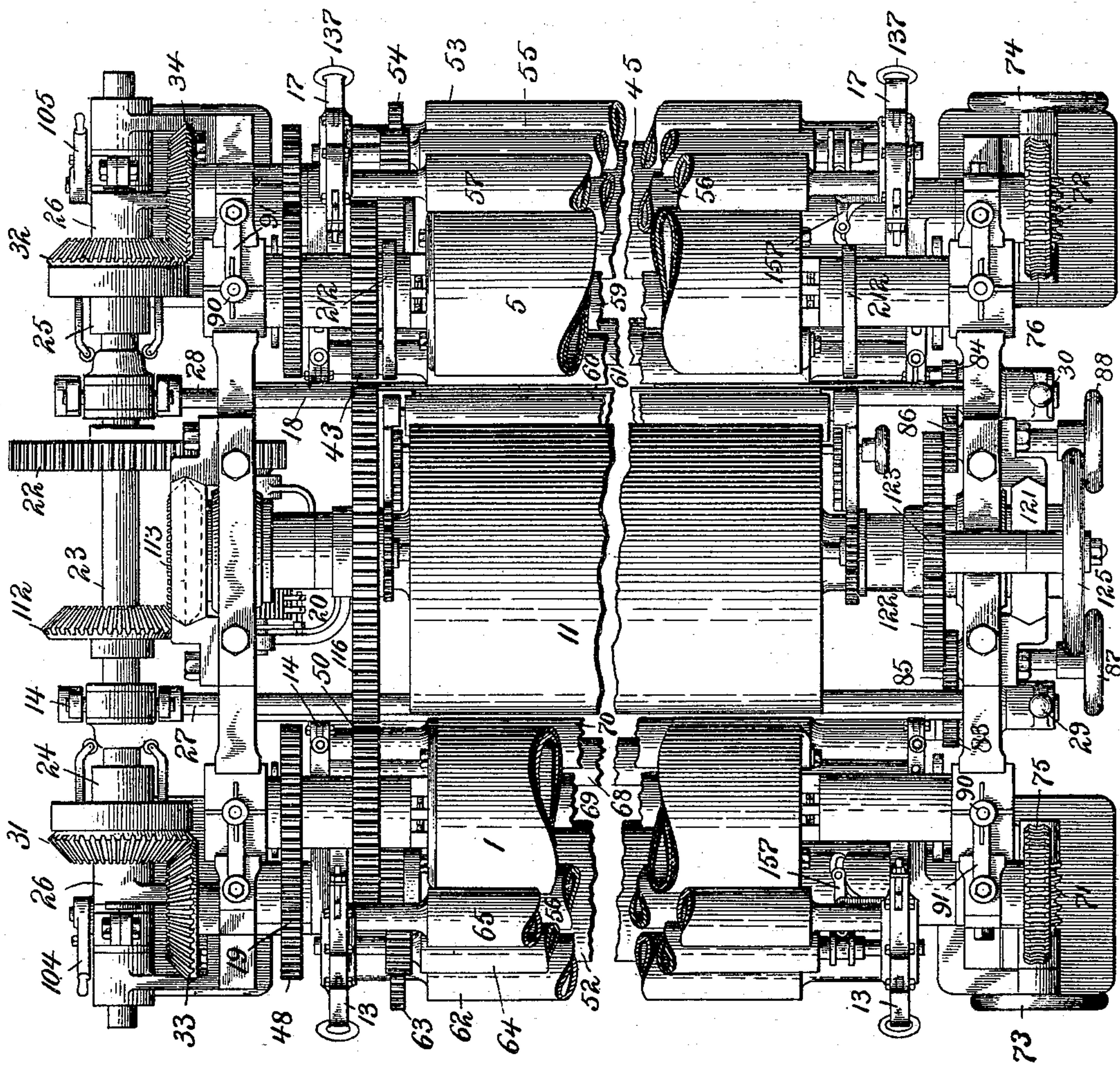
E. HETT.

MECHANISM FOR MAKING PRINTING SURFACES.

(Application filed Oct. 4, 1899.)

(No Model.)

16 Sheets—Sheet 5.



WITNESSES:

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Fig. 4A

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16 Sheets—Sheet 6.

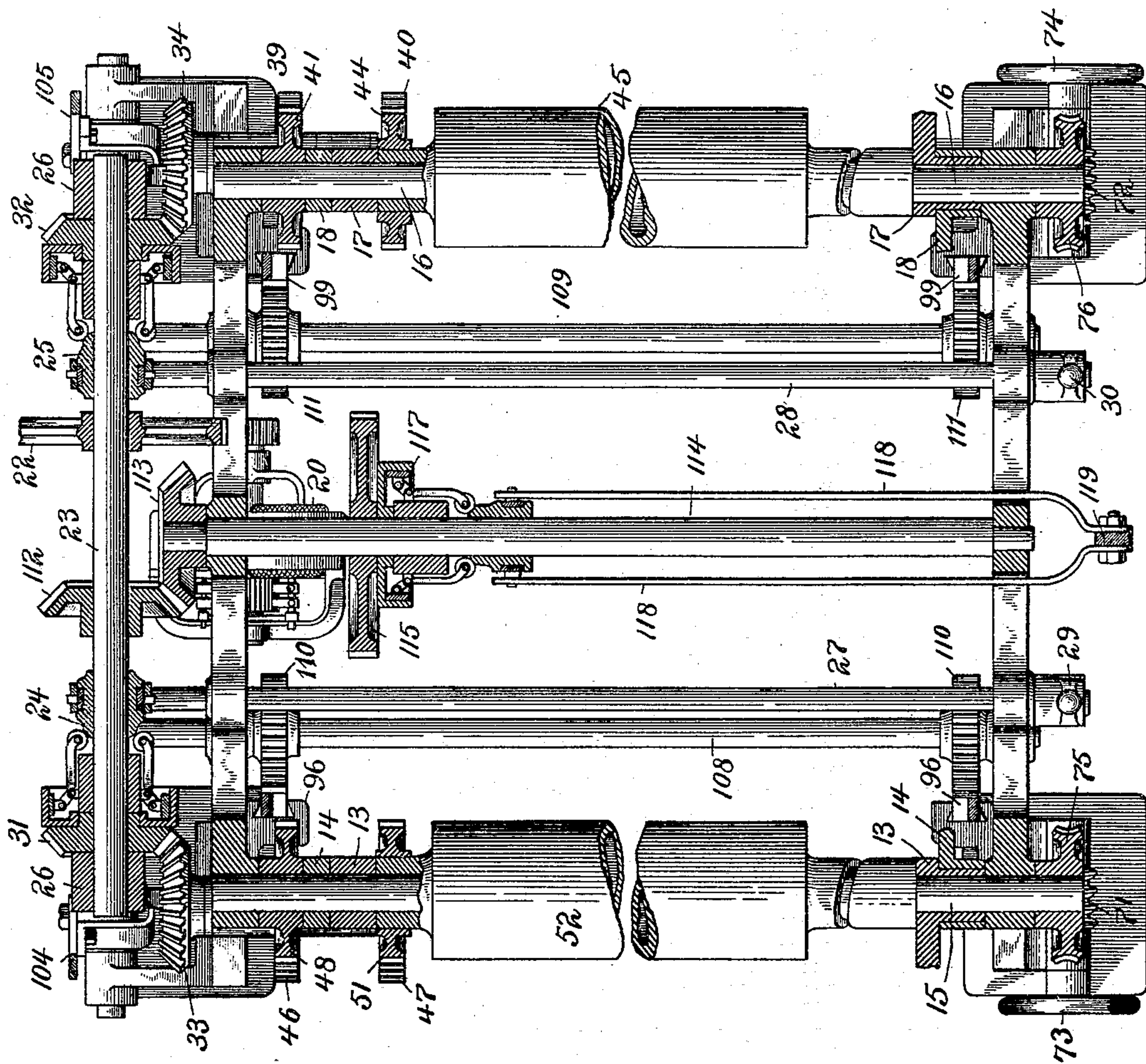


Fig. 5.

WITNESSES:

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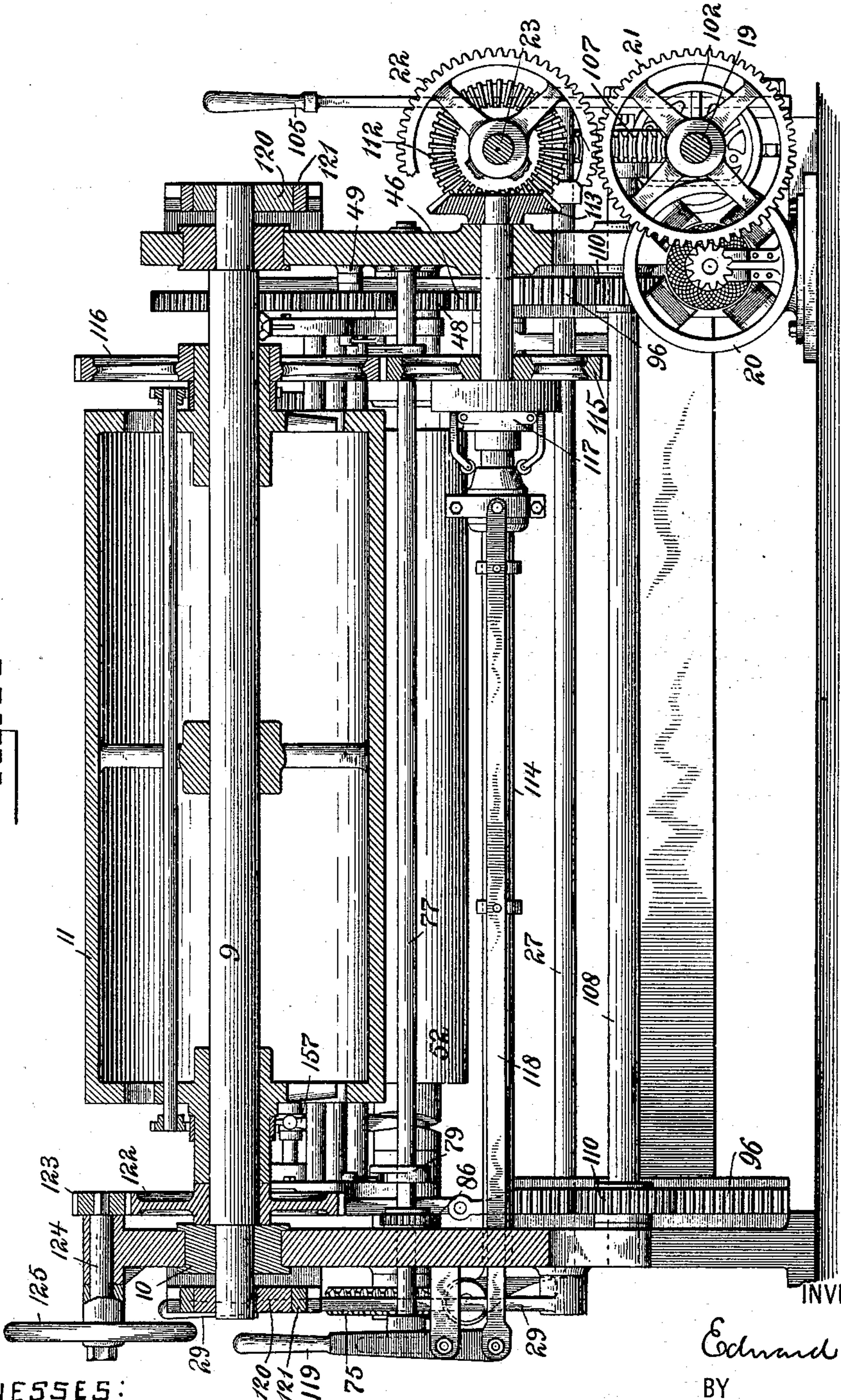


Fig. 6-

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WITNESSES:
F. N. Roehrich
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No. 637,596.

Patented Nov. 21, 1899.

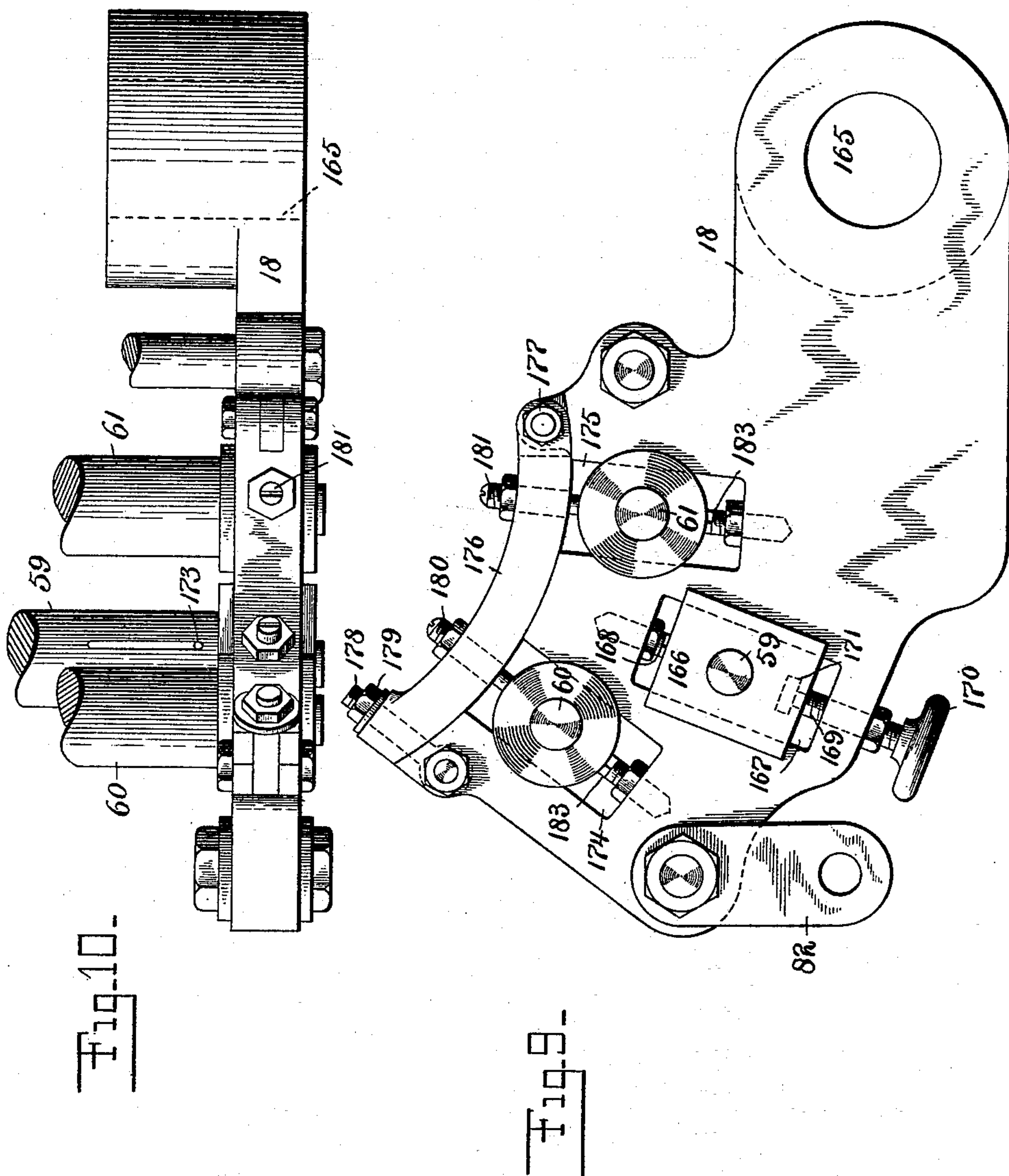
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MECHANISM FOR MAKING PRINTING SURFACES.

(Application filed Oct. 4, 1899.)

(No Model.)

16 Sheets—Sheet 9.



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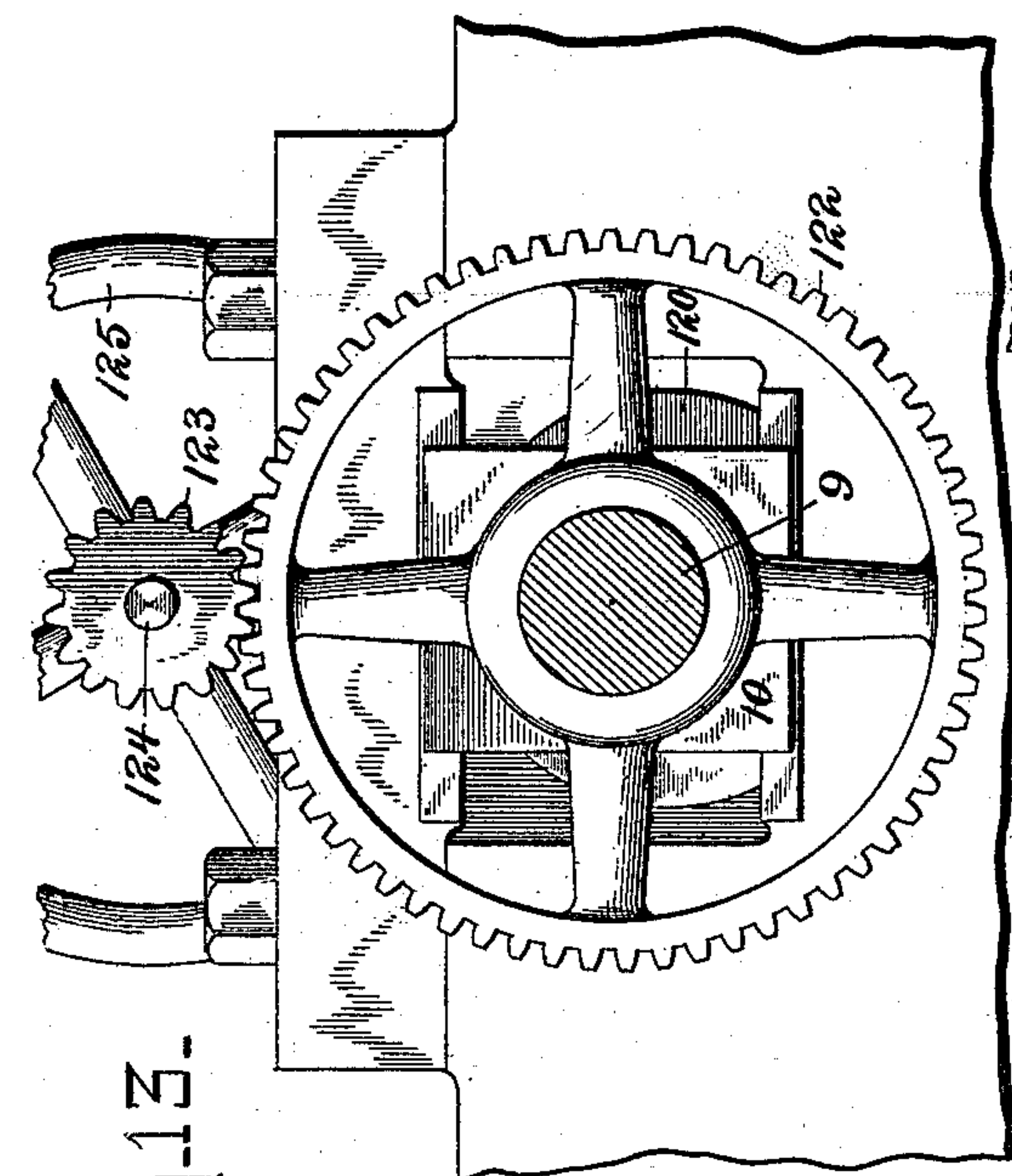
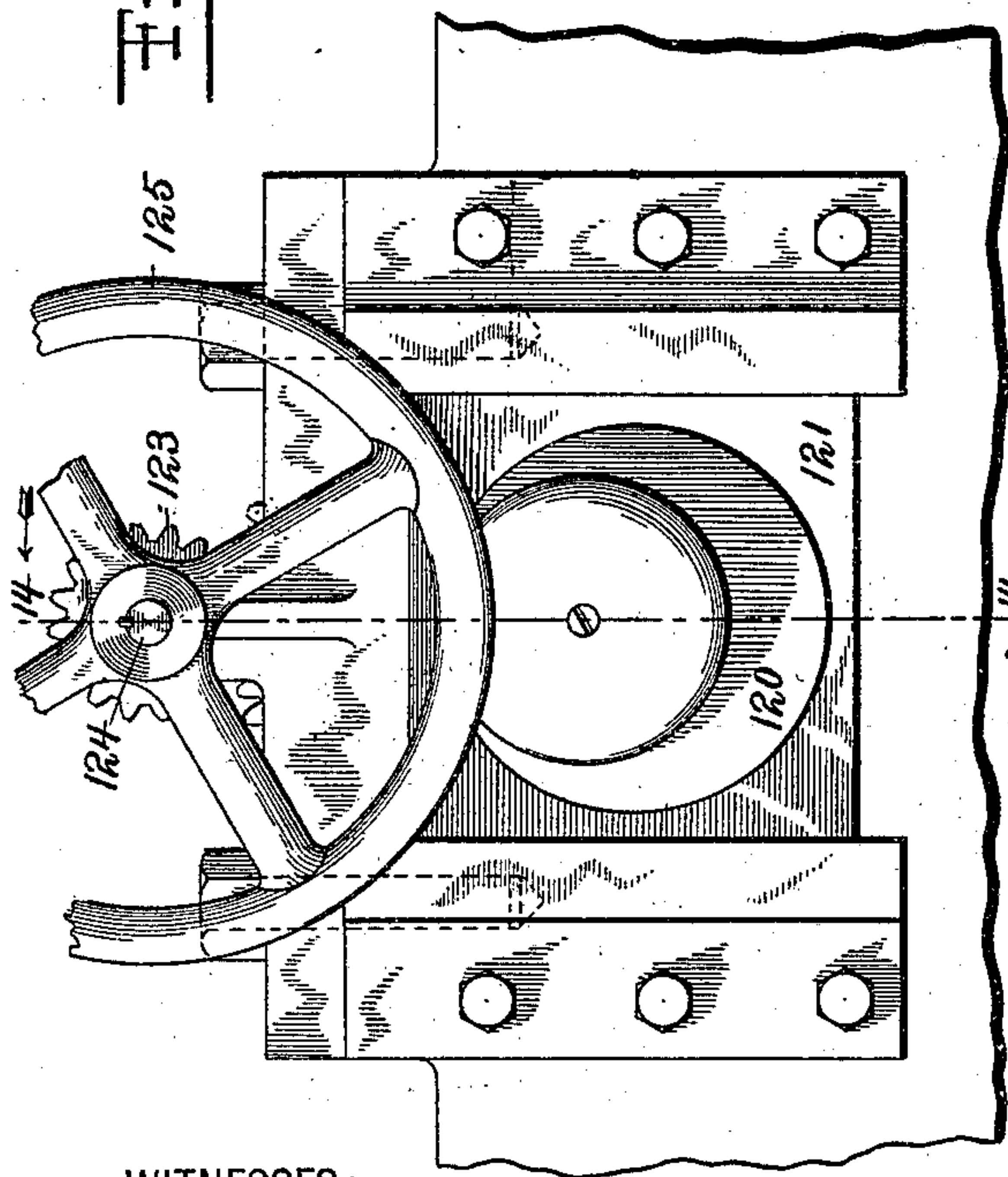


Fig. 13-



WITNESSES:

F. N. Roehrich
Sidney Mann

Fig. 11-

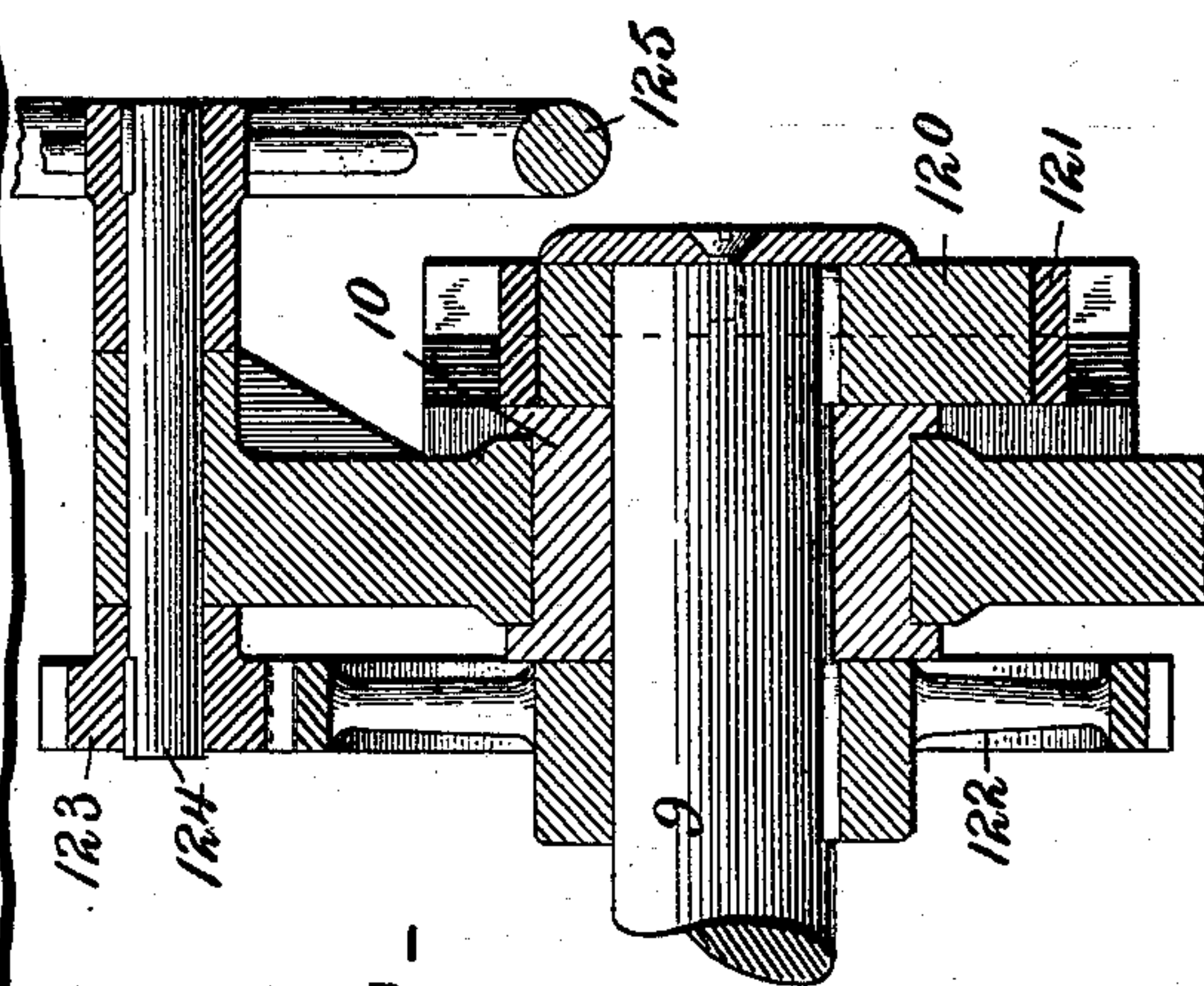


Fig. 14-

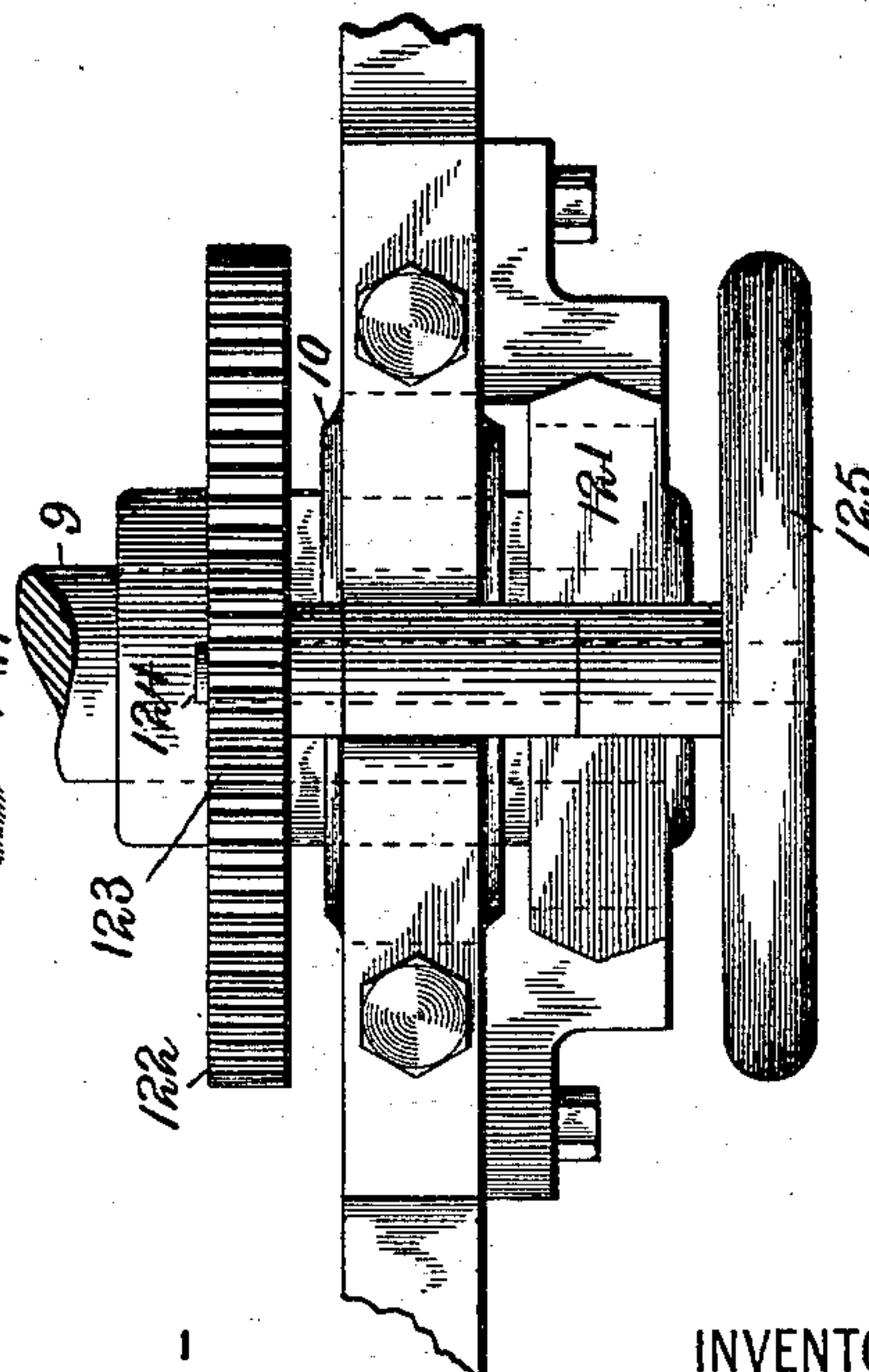


Fig. 12-

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Patented Nov. 21, 1899.

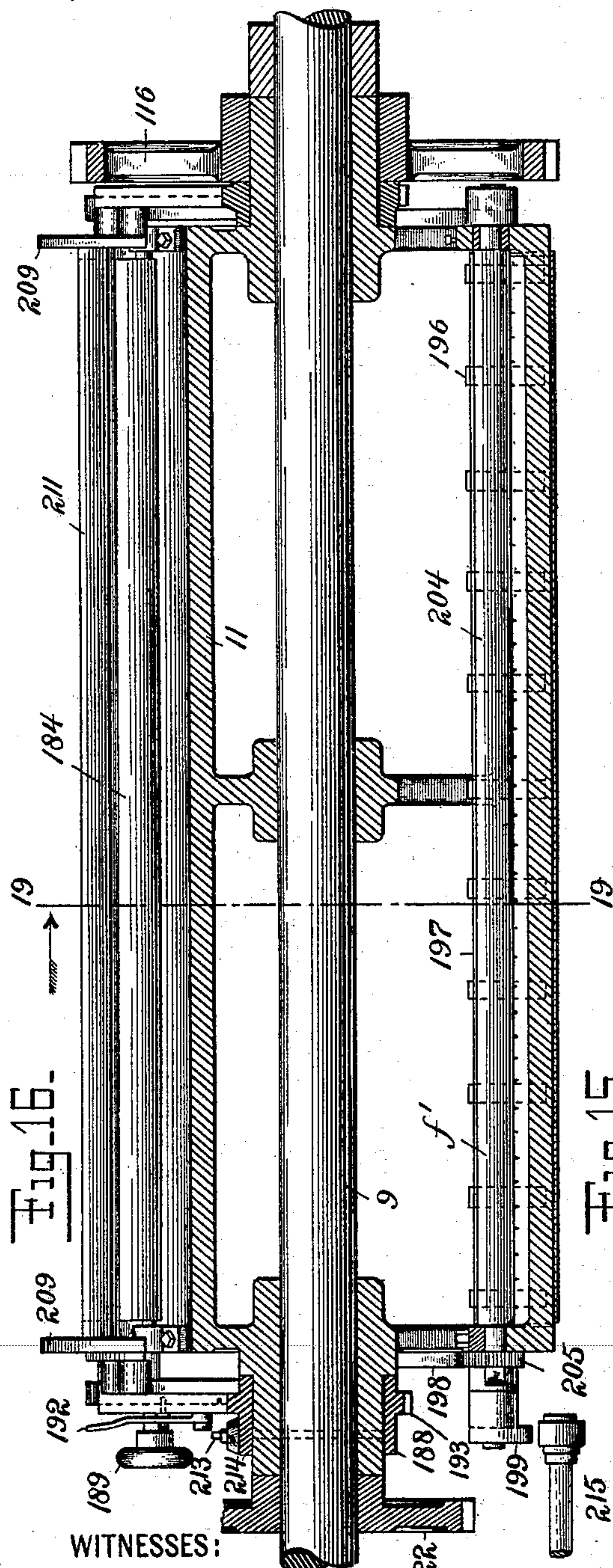
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MECHANISM FOR MAKING PRINTING SURFACES.

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Fig. 16-

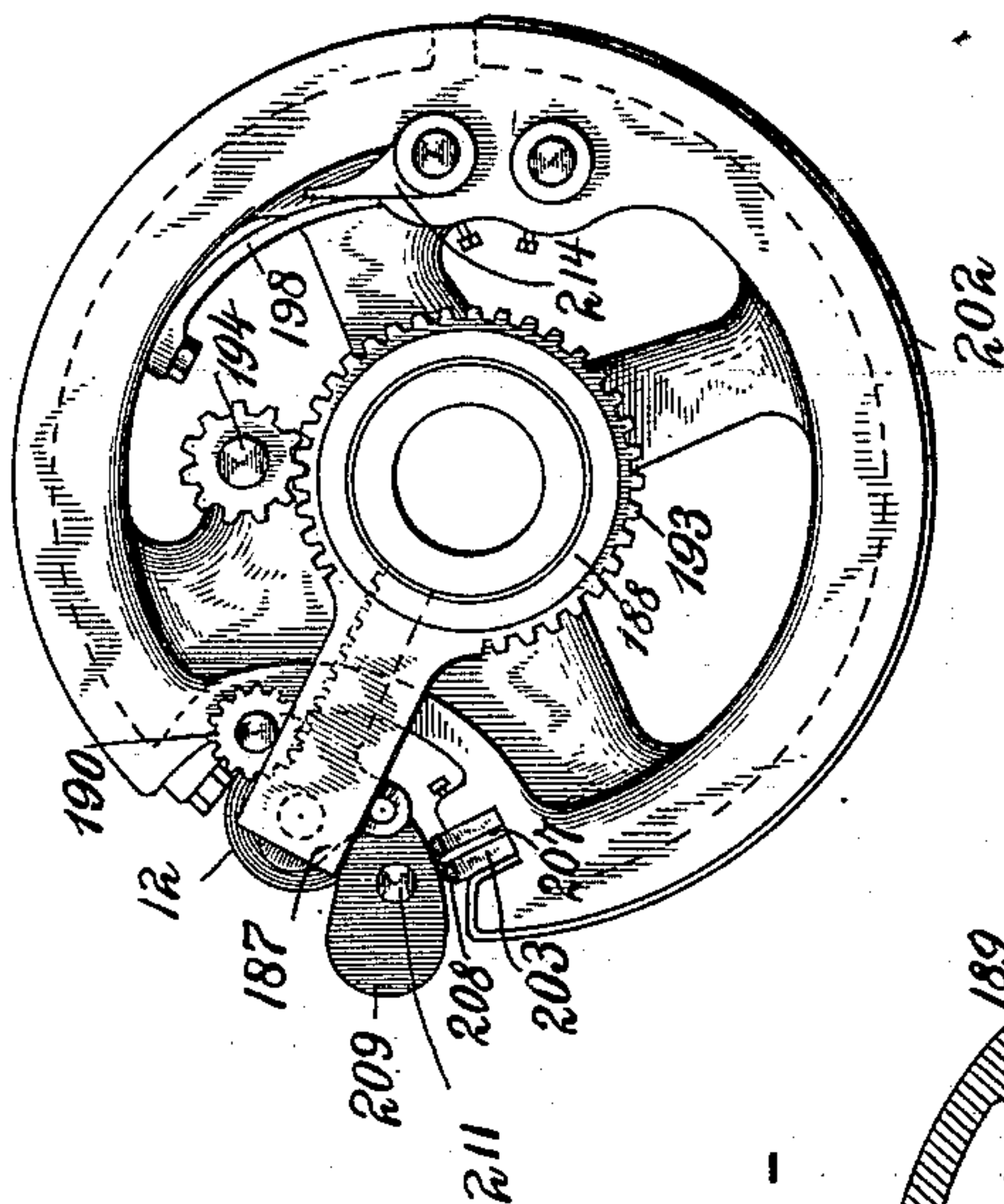


Fig. 19-

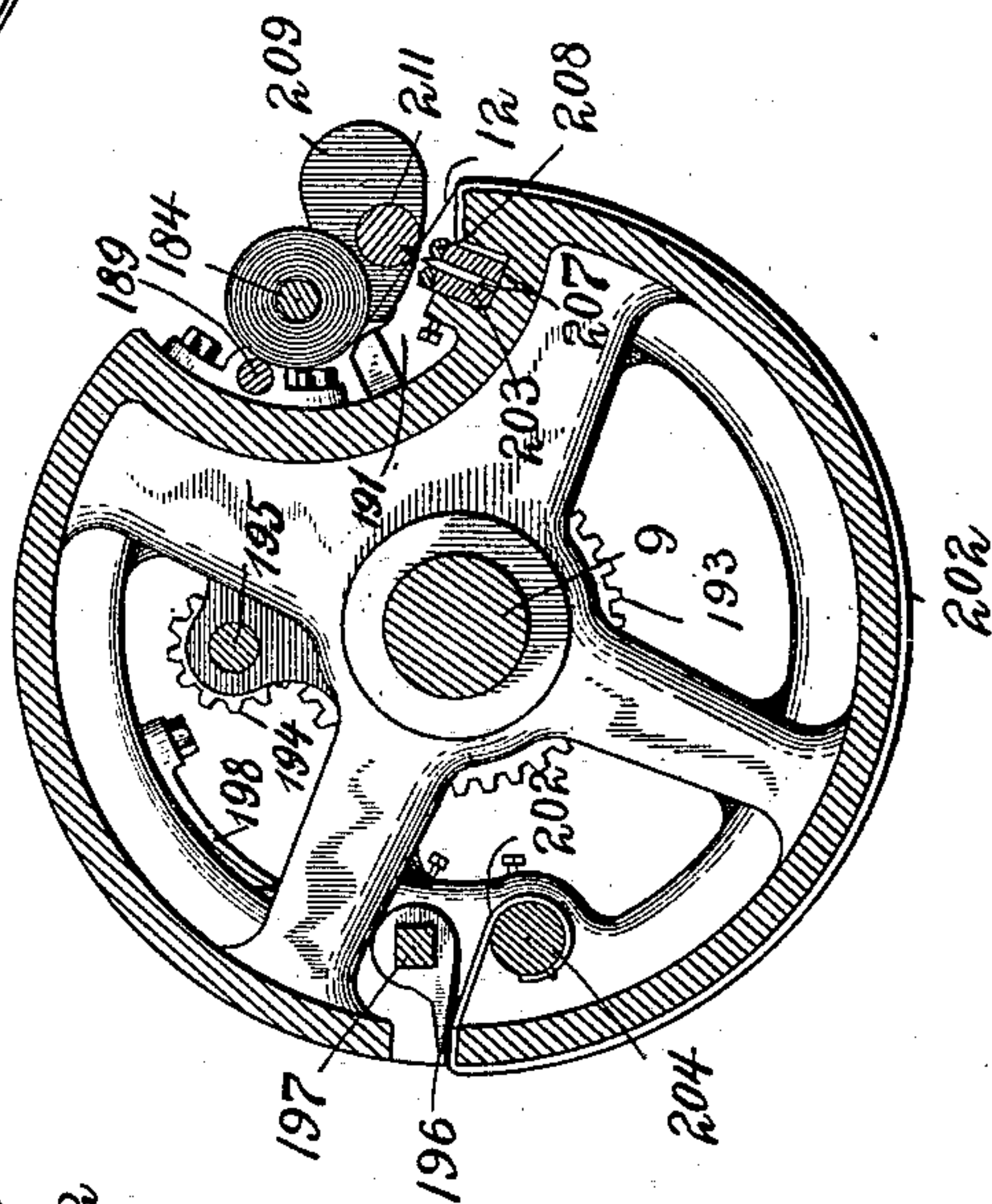
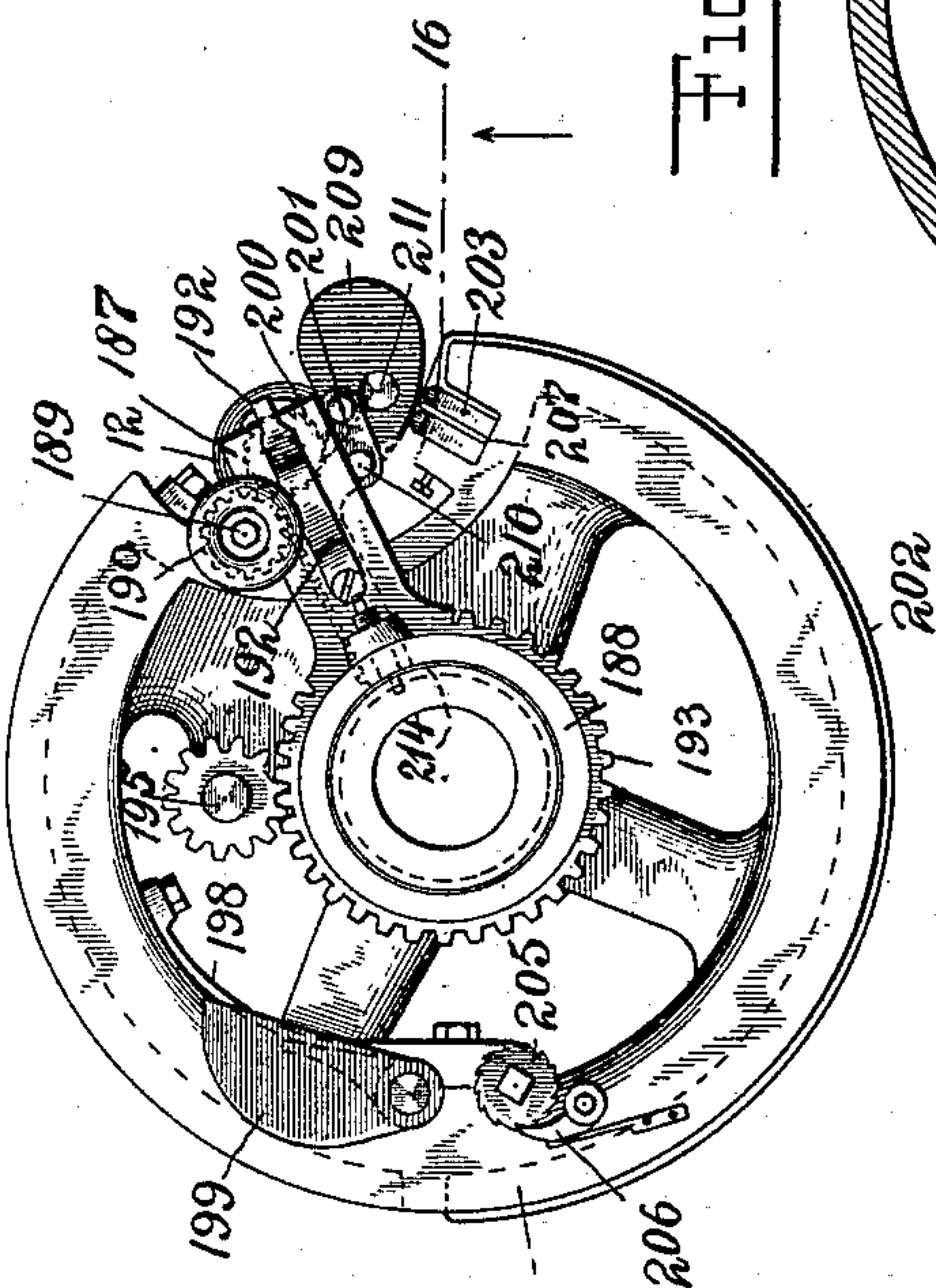


Fig. 17 -



WITNESSES:

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Patented Nov. 21, 1899.

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16 Sheets—Sheet 13.

Fig. 20-

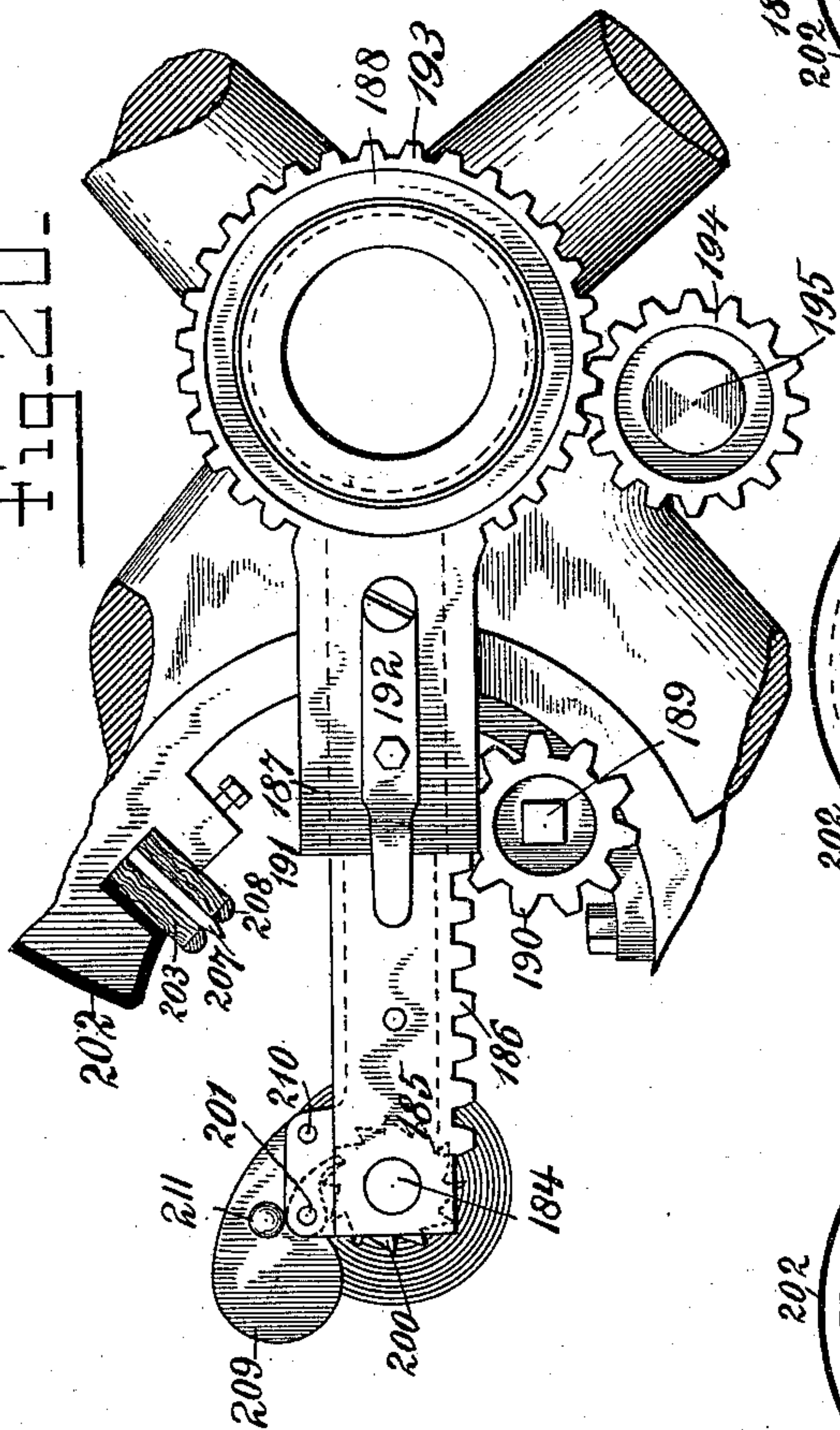


Fig. 21-

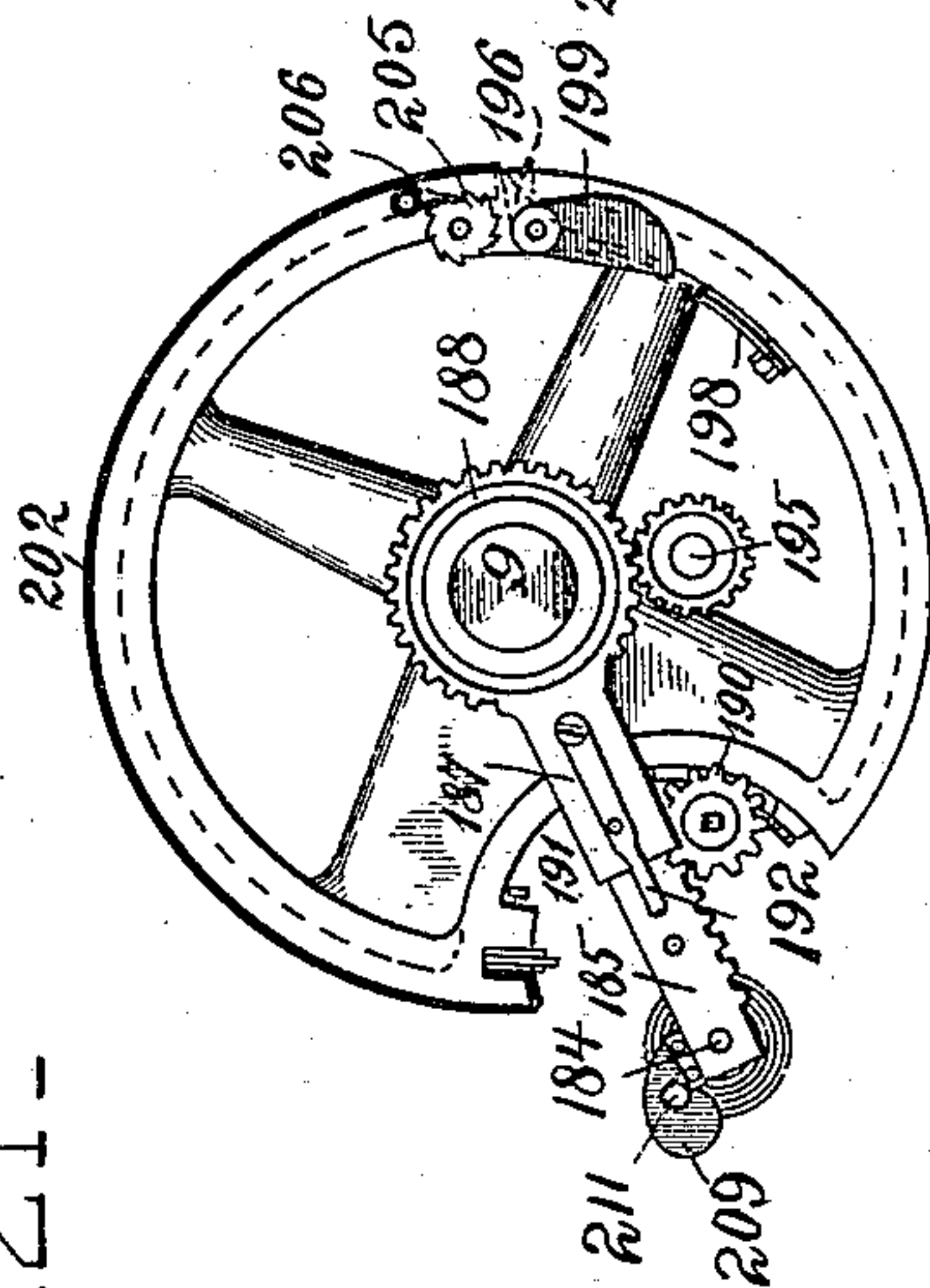


Fig. 22-

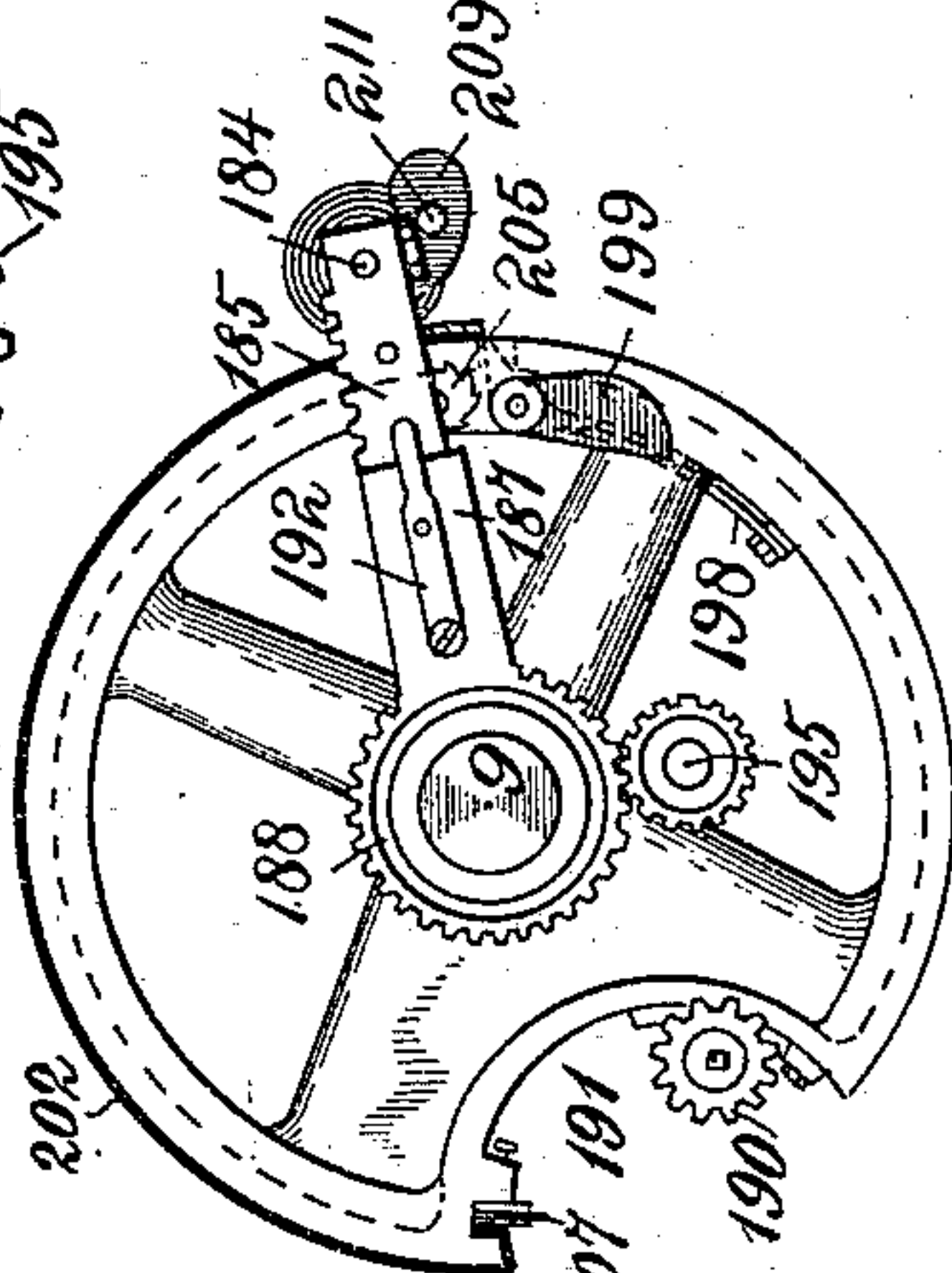
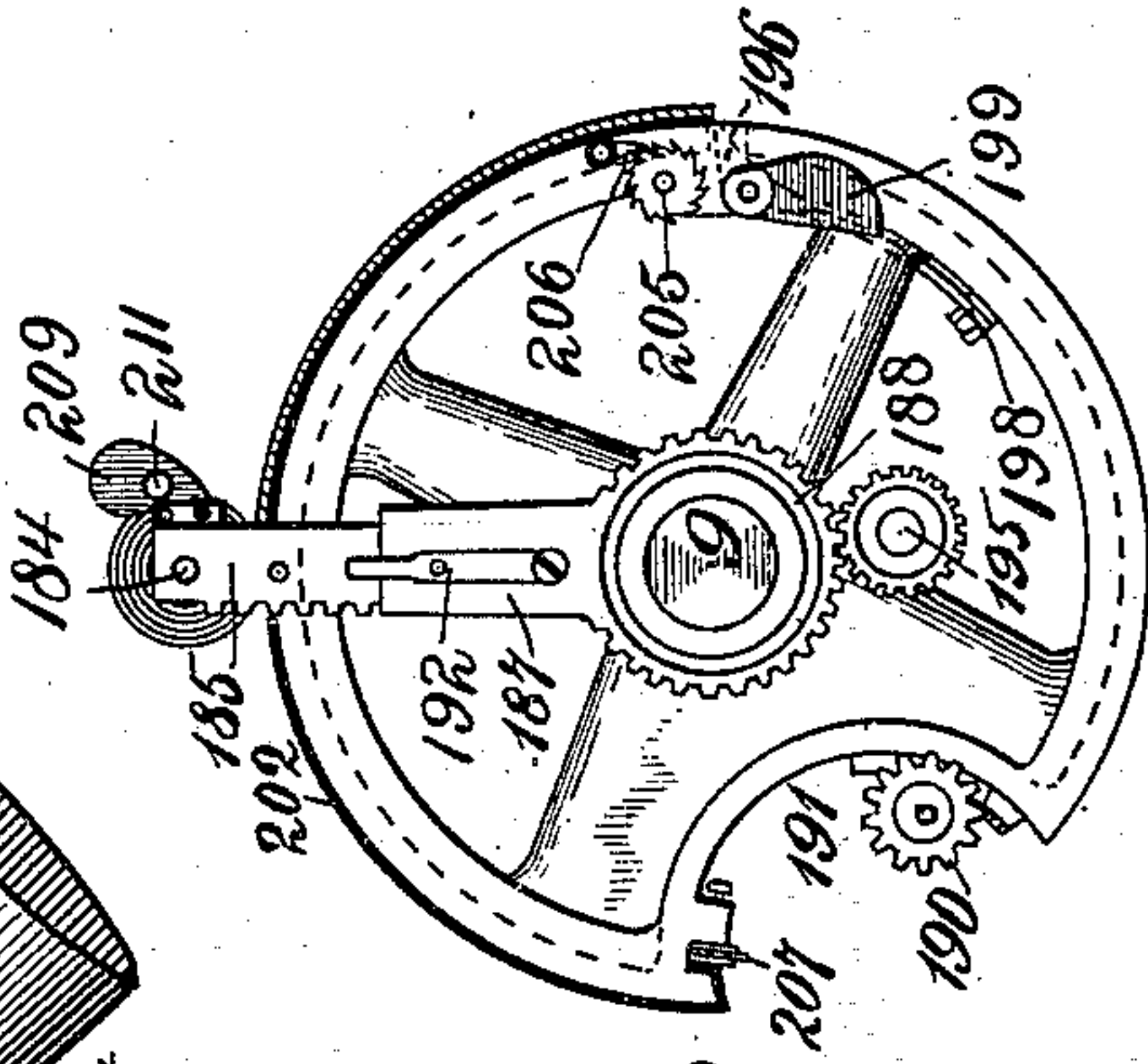


Fig. 23-



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No. 637,596.

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MECHANISM FOR MAKING PRINTING SURFACES.

(Application filed Oct. 4, 1899.)

(No Model.)

16 Sheets—Sheet 14.

Fig. 26-

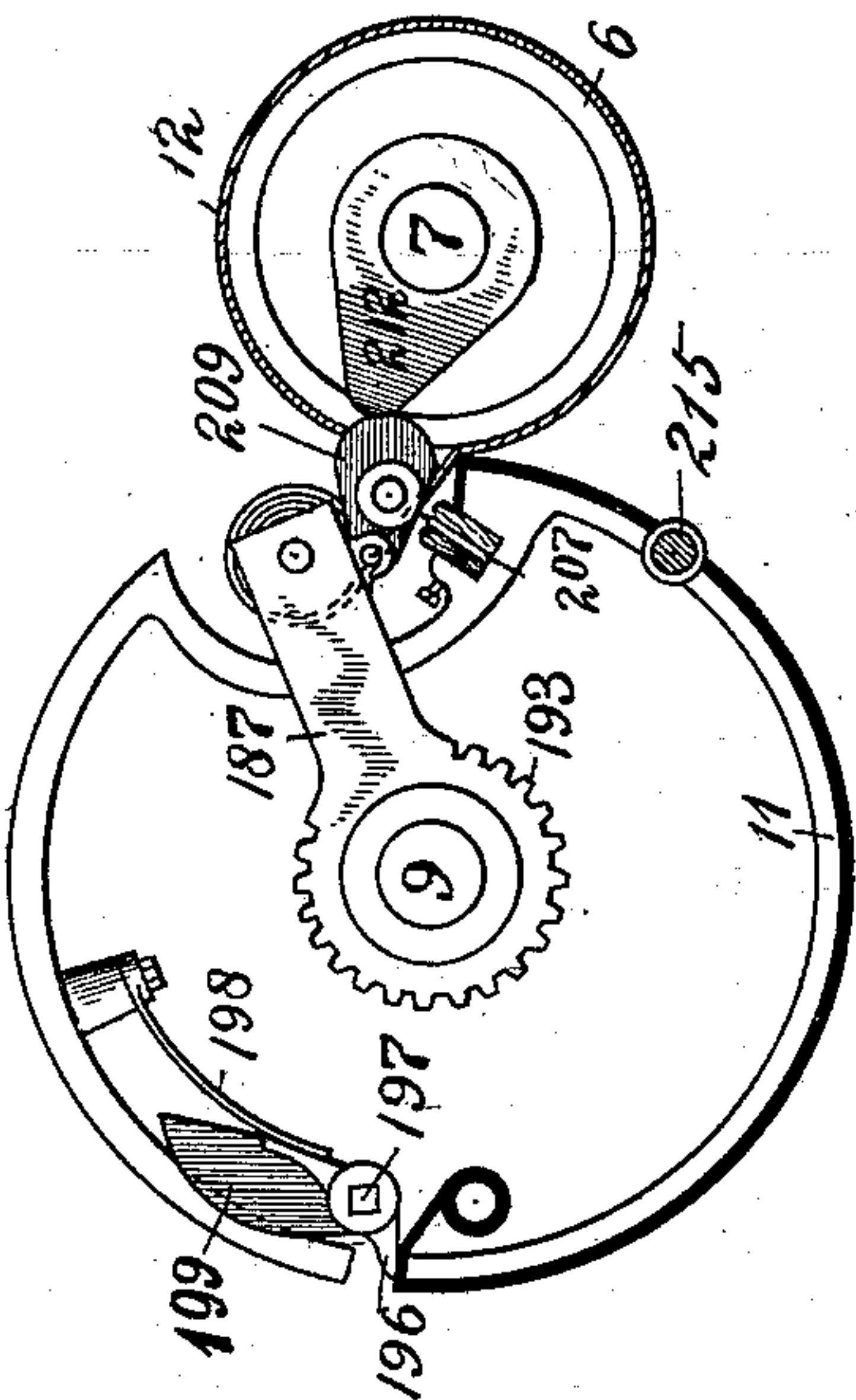


Fig. 27-

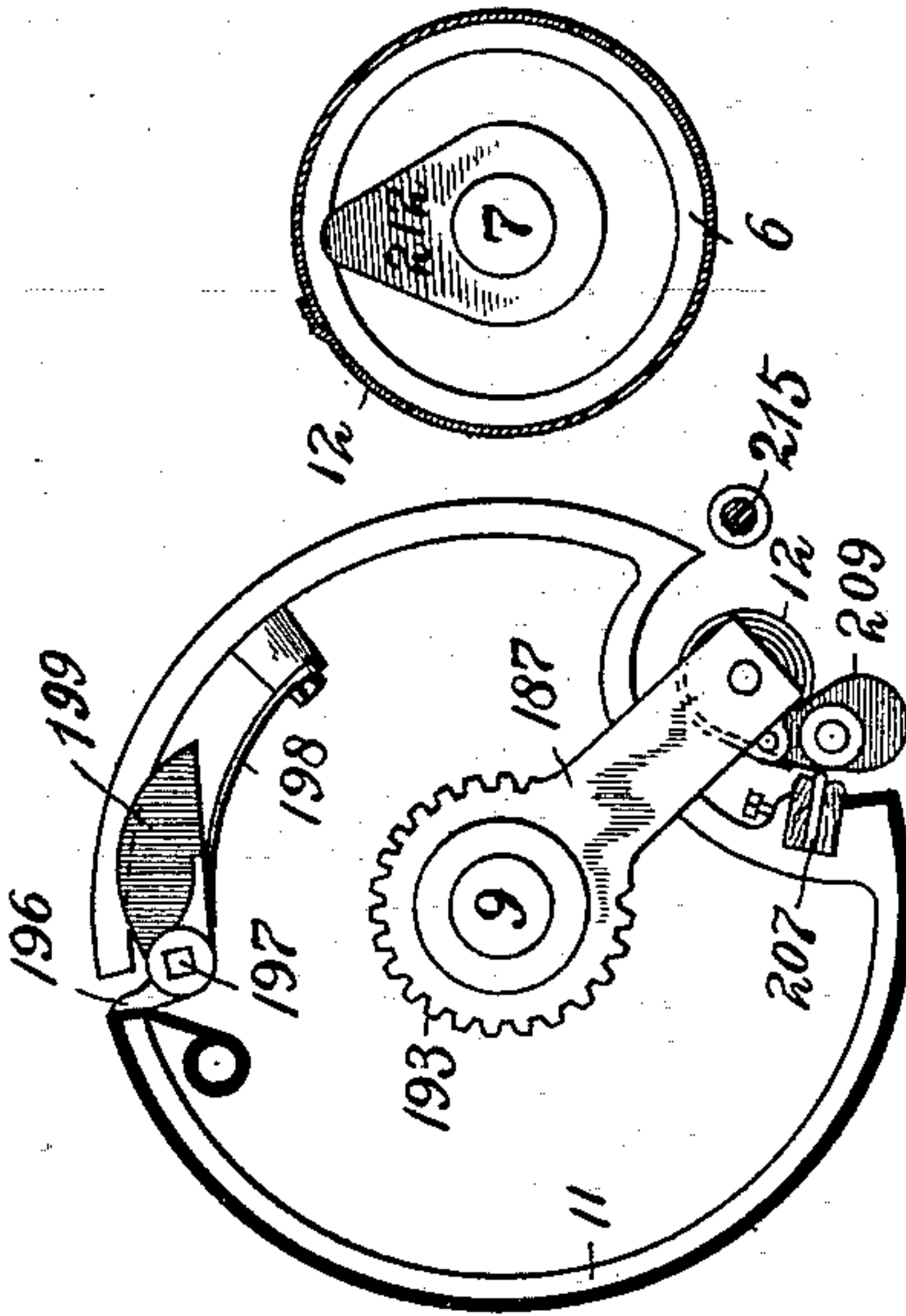


Fig. 24-

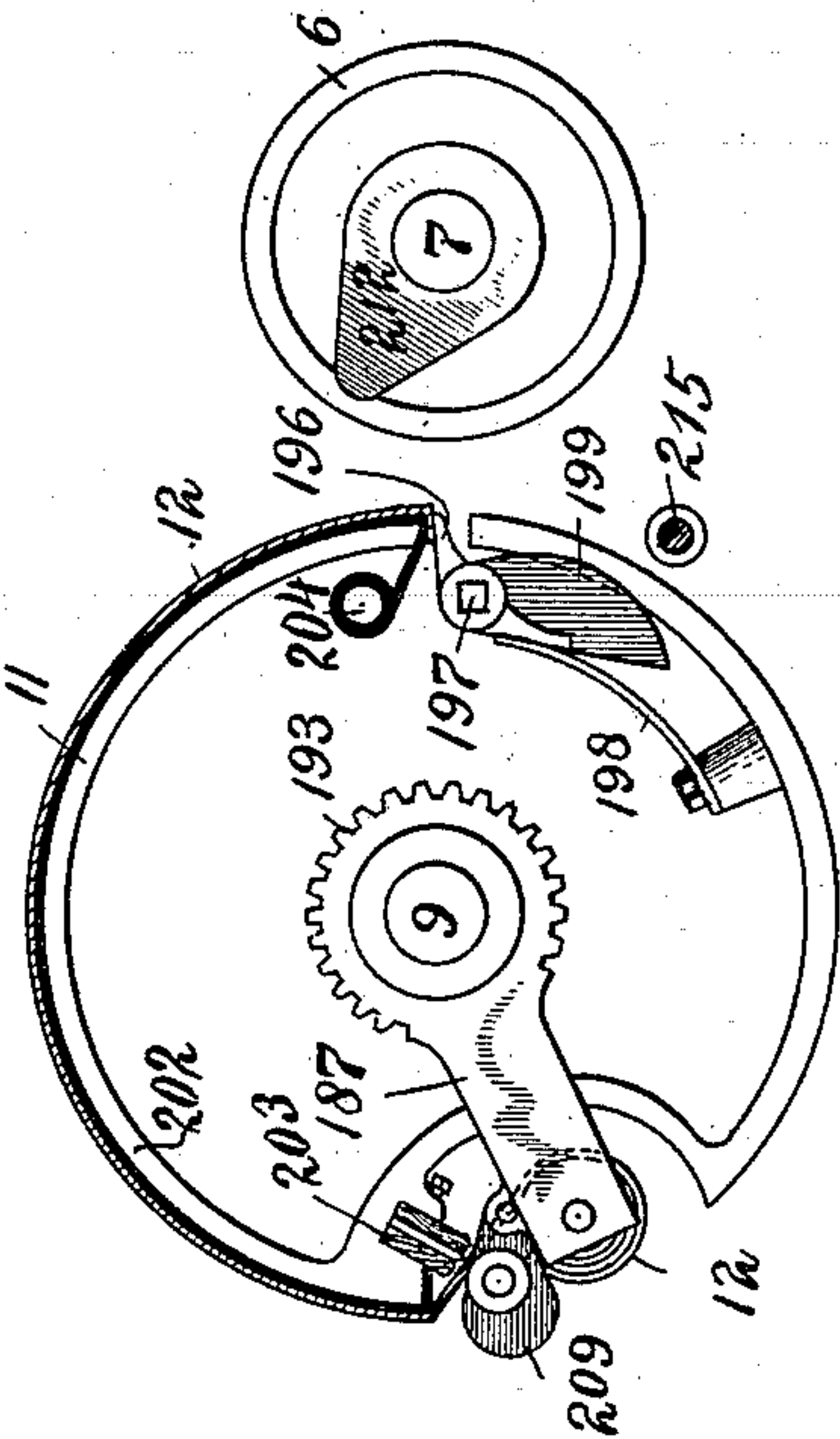
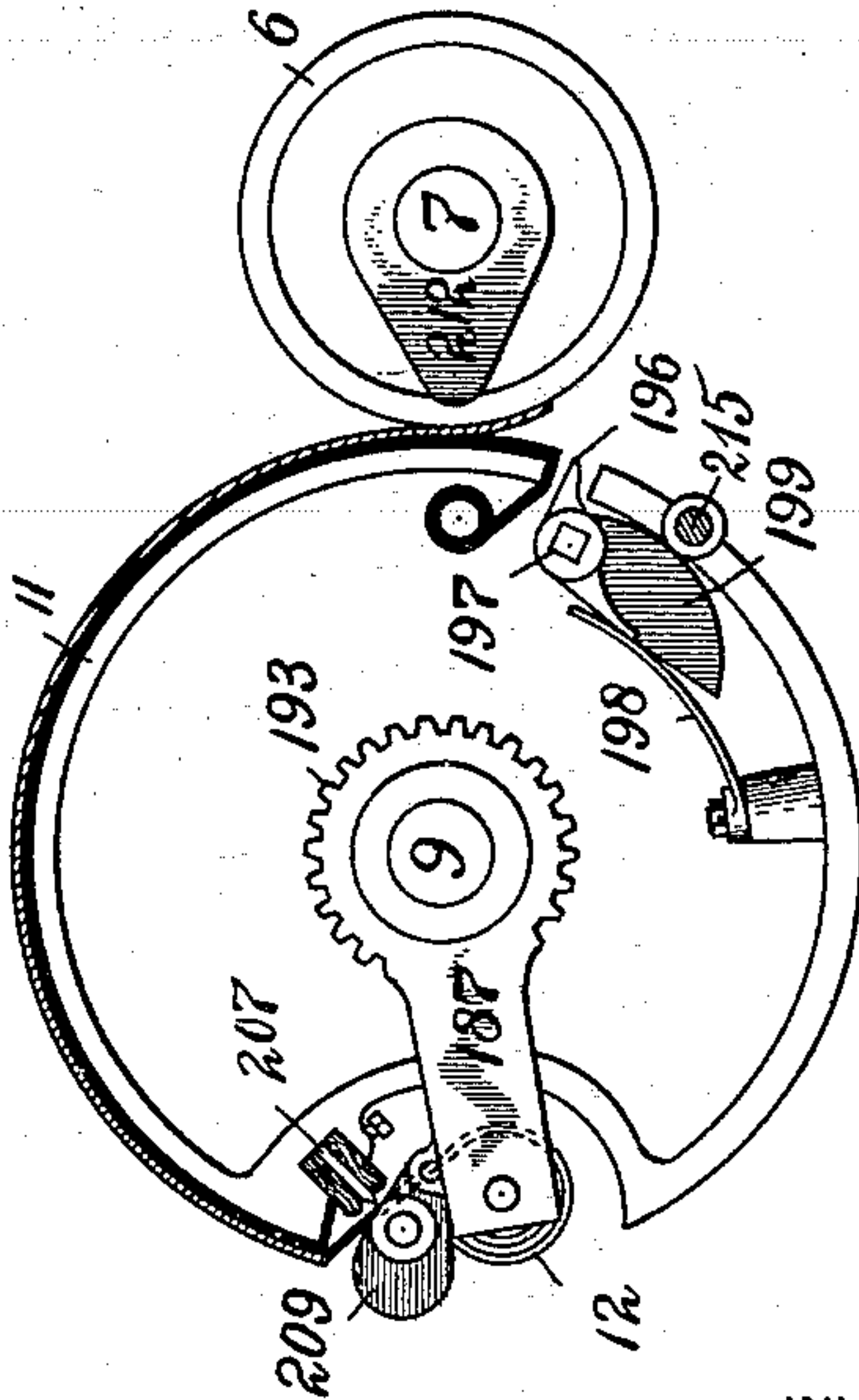


Fig. 25-



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No. 637,596.

Patented Nov. 21, 1899.

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MECHANISM FOR MAKING PRINTING SURFACES.

(Application filed Oct. 4, 1899.)

(No Model.)

16 Sheets—Sheet 15.

Fig. 30-

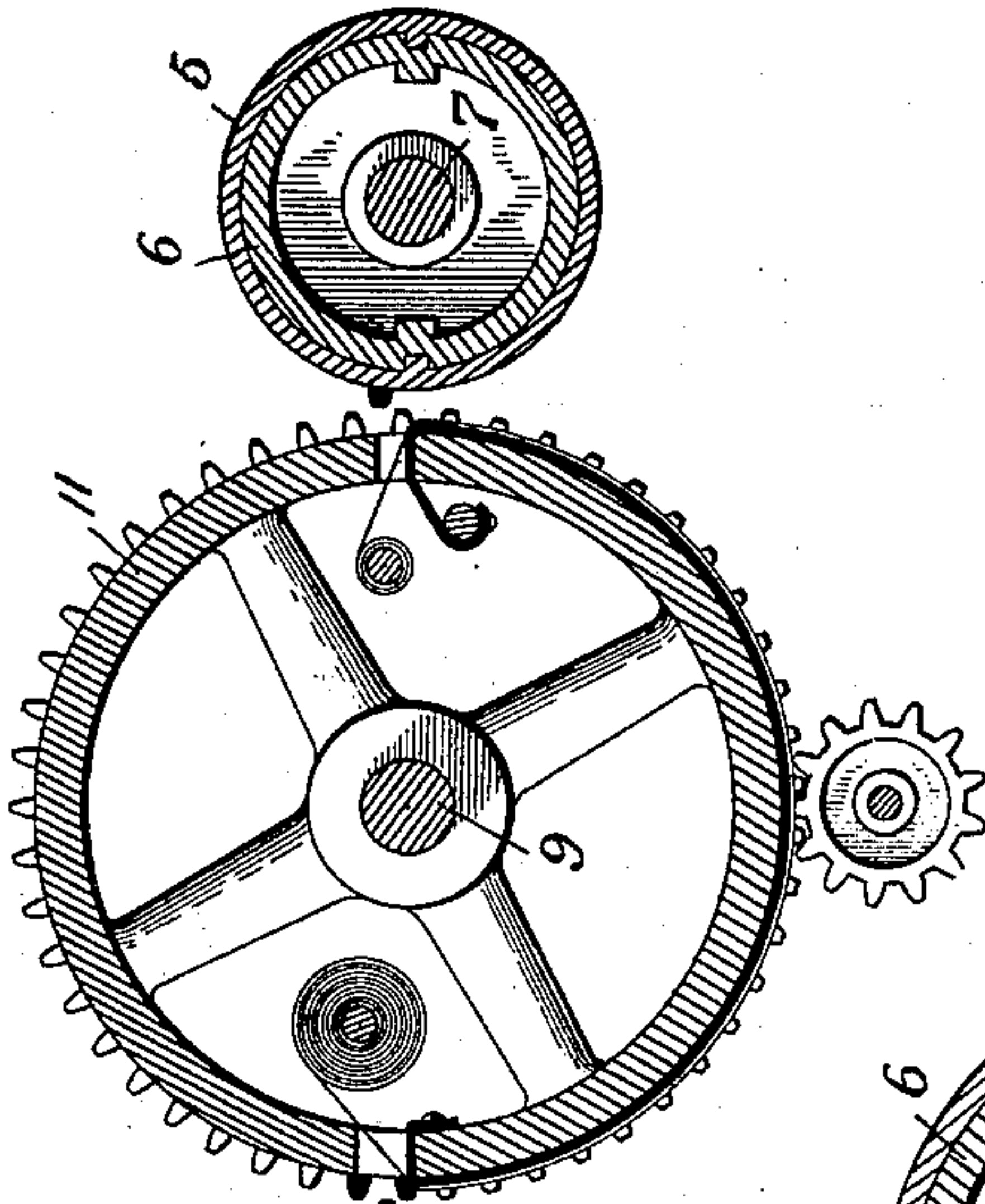


Fig. 28-

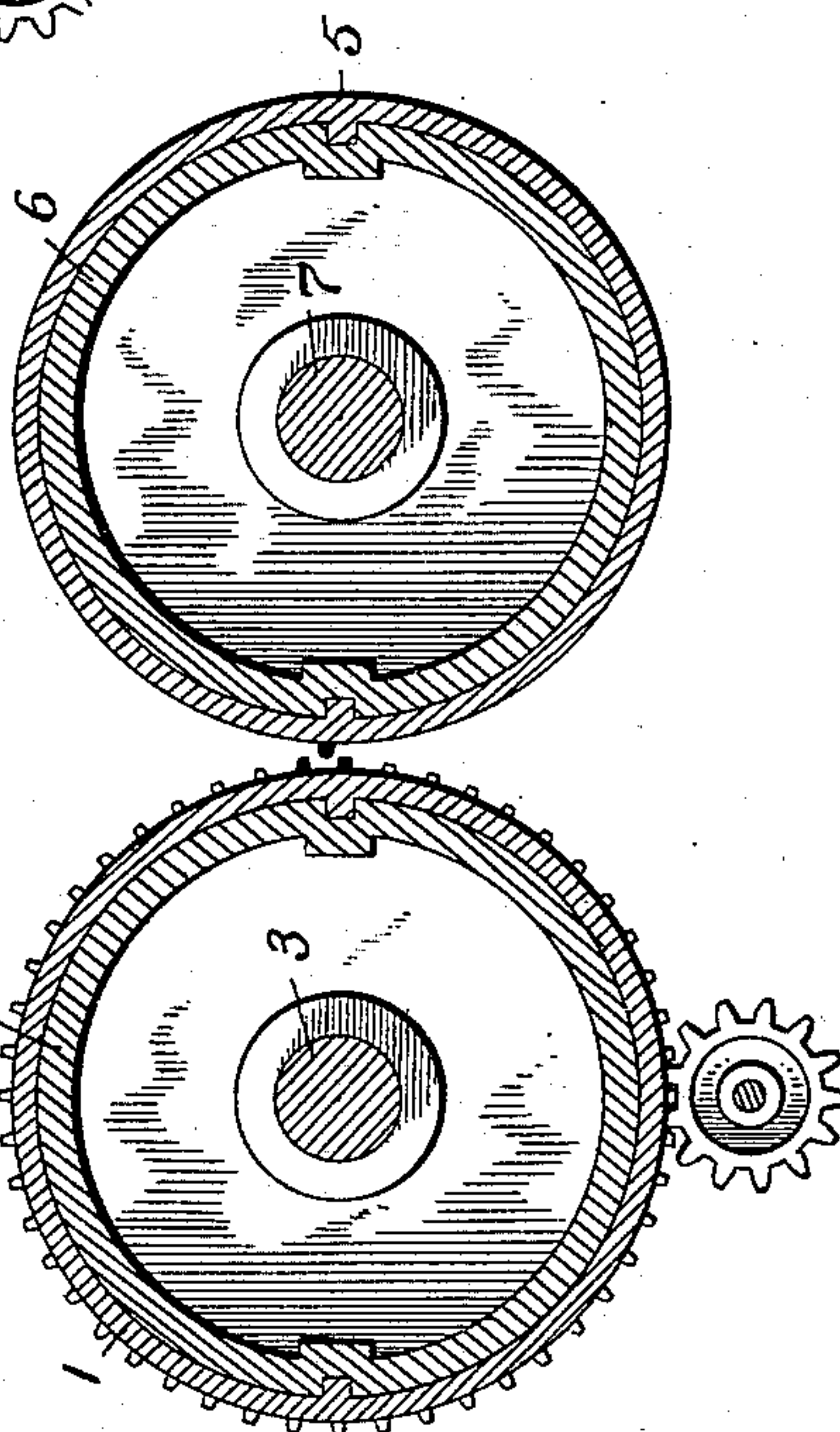
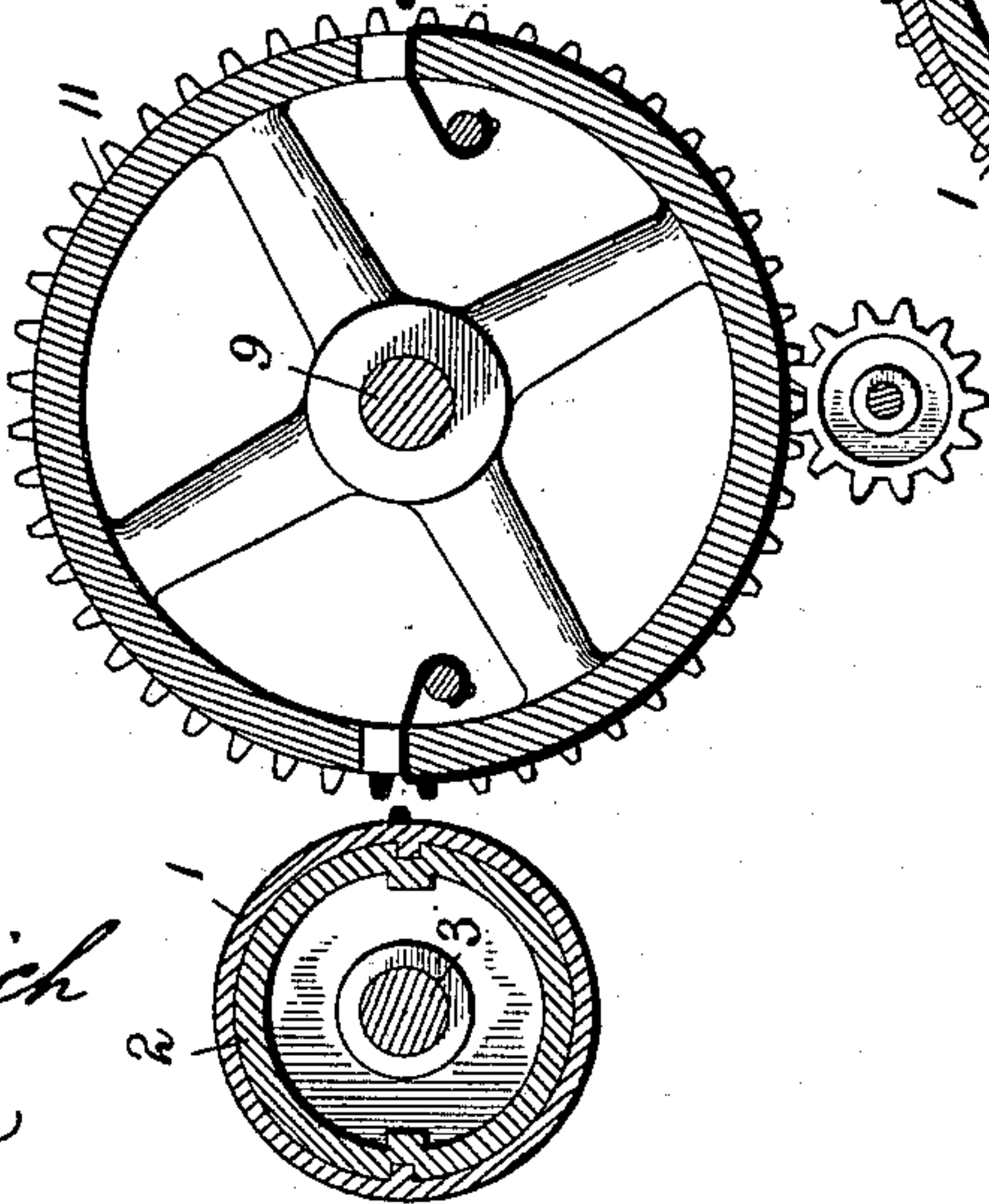


Fig. 29-



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Patented Nov. 21, 1899.

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(No Model.)

16 Sheets—Sheet 16.

Fig-31-

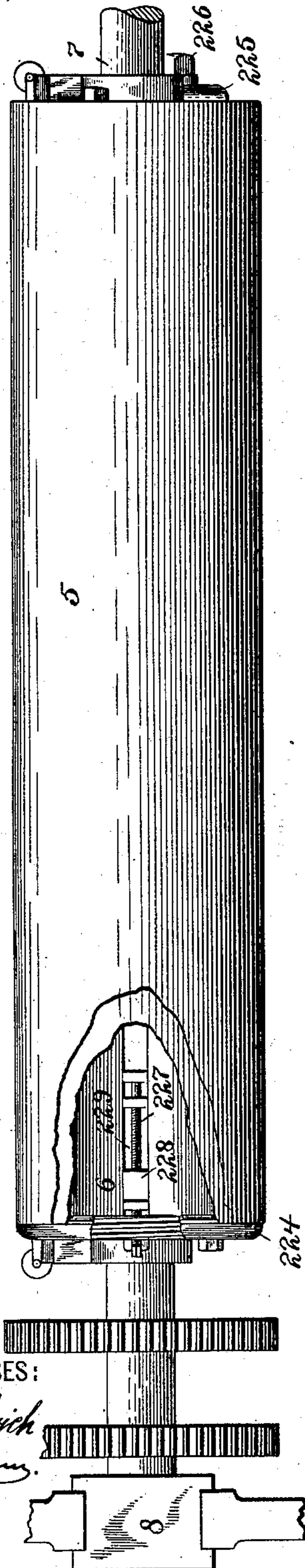
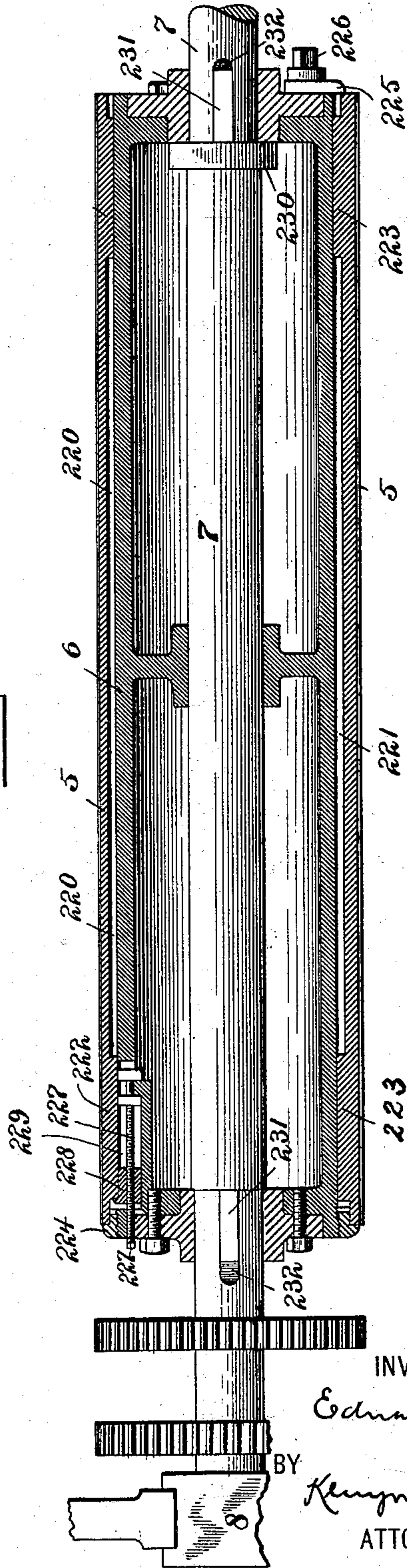


Fig-32-



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BY *Klingman & Klingman*
ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD HETT, OF NEW YORK, N. Y.

MECHANISM FOR MAKING PRINTING-SURFACES.

SPECIFICATION forming part of Letters Patent No. 637,596, dated November 21, 1899.

Application filed October 4, 1899. Serial No. 732,440. (No model.)

To all whom it may concern:

Be it known that I, EDWARD HETT, a citizen of the United States, and a resident of New York, (New Dorp,) in the county of Richmond and State of New York, have invented certain new and useful Improvements in Mechanism for Making Printing-Surfaces, of which the following is a specification.

This invention relates to mechanism designed and adapted to be employed in making printing-surfaces suitable for planographic, relief, intaglio, or other printing.

In that branch of the art to which my invention is most nearly related it has heretofore been the practice in making printing-surfaces to first make a basic surface by sticking up by hand and with great care a number of transfers upon a flat support, called a "setting-up plate." These transfers are usually thin pieces of paper bearing copies in black ink of the design or matter to be printed by a printing-surface. The designs on the transfer-paper are generally printed thereon and without any special reference to the absolute or relative location of the designs on the various transfer-papers. Where several printing-surfaces are to cooperate in printing, as in multicolor-work, it is essential that the transfers for each printing-surface be very carefully stuck up on the setting-up plate in accordance with certain matching guiding-marks previously located on each transfer when the transfer is made and on the setting-up plate with reference to the register of the printing-surfaces which when completed are to cooperate in printing. When a basic surface has been thus prepared, it has been the practice to lay it upon the surface, generally a flat stone, which is to become the printing-surface. Scrapers are then passed over the setting-up plate, so as to exert proper pressure, and the setting-up plate being removed the transfers are found turned over from the setting-up plate upon the stone. The transfer-paper is then soaked off, but the ink of the transfer remains on the printing-surface, and the surface is then developed, as by etching, and thus becomes a printing-surface. In cases where it is necessary to employ a plurality of printing-surfaces in printing a job it has been the practice according to this old process to make each of the printing-surfaces

in the same way, starting always with the setting-up plate and the transfers turned over thereon upon each surface to be made into a printing-surface. Whatever may be the number of printing-surfaces required for a job it was necessary to form each in the same way from its particular basic surface previously prepared and with the same painstaking care, especially in regard to accuracy of register. Again, where in some cases it was desired to duplicate the printing-surfaces, so that those worn out might be replaced or so that the printing might proceed on different presses at the same time with duplicate printing-surfaces, it was necessary to form these duplicate printing-surfaces each in the same way and always from a new and original basic surface previously prepared and each with the same expenditure of care, time, and labor. Thus the making of the printing-surfaces added greatly to the final cost of the job and this cost increased in proportion to the number of printing-surfaces required.

The mechanism which constitutes the subject-matter of the present application will be best understood by first referring to the process, the economical carrying out of which said mechanism is designed to facilitate. The process referred to is made the subject of a separate application concurrently filed herewith. That process results in the making of a printing-surface, whether planographic, relief, intaglio, or otherwise, from a previously-prepared printing-surface, which for convenience may be here called a "primary printing-surface" or a "primary surface," by printing from said primary surface—that is, suitably imparting an impression from said surface—directly or indirectly upon or to a surface adapted to be developed into a printing-surface, said bodies or couple being arranged in a definite and predetermined cooperating relation both longitudinally and transversely with reference to predetermined guides for the purpose hereinafter explained. The surface which thus receives the design from the primary surface I herein, for convenience, term the "secondary surface" and when developed the "secondary printing-surface." By the use of the preestablished guides or guiding means, which may vary widely in character and arrangement, the design of the

primary surface may be located on a secondary surface in an exact predetermined position both longitudinally and transversely and also with reference to register, and from a series of registering primary surfaces a series or a plurality of series of registering secondary printing-surfaces may be made. The secondary surfaces are made of a permanent size and shape to adapt them to fit in a pre-established seat in a printing-press, so that they may be mounted at once in place in the press and without any special adjustment for register be made to print in accurate register. By means of the mechanism of the present invention from a series of registering primary surfaces a series of registering secondary surfaces or a plurality of series of such secondary surfaces may be made.

In carrying out the process I may begin with a primary surface made by any suitable process or may, and generally do, begin, as a preliminary to the process, by first making the primary surface, preparing for this purpose a basic surface preferably by sticking up ordinary transfers bearing the design to be printed upon a setting-up plate and turning over these transfers in the usual way upon a printing-surface, which is then suitably developed and becomes the so-called "primary surface." This primary surface may be of stone, zinc, aluminium, or other suitable material and may be developed so as to be a planographic, relief, intaglio, or other printing-surface. The primary surface is generally graduated—that is, the design thereon is so made as to be capable of printing an impression in which the ink will be distributed on the impression-surface in graduated quantities for light and shade effects, depth of color, &c. The primary surface and secondary surface are then arranged in a definite and predetermined cooperating relation, so that the former works as required with reference to the latter and with reference to the position which it is desired the design of the primary surface shall occupy on the secondary surface when imparted thereto. For this purpose the primary surface and the secondary surface are arranged in preestablished seats on suitable supports prepared for them in a machine in which the process of imparting the design of the primary surface to the secondary surface is most conveniently carried out, the preestablished guides being employed for quickly and with absolute accuracy arranging the primary and secondary surfaces in the proper cooperating relation. The design of the primary surface is then carried over from the primary surface and imparted to or upon the secondary surface directly or indirectly, but without the intermediate employment of a setting-up plate. The secondary surface is then developed so as to become a printing-surface, and is then the so-called "secondary printing-surface." Like the primary surface, it may be of stone, zinc, aluminium, or other suitable material and may

be developed so as to be a planographic, relief, intaglio, or other printing-surface, and the development of the secondary surface may or may not be in accordance with the method employed in developing the primary surface. For example, the primary surface may be a relief or intaglio surface and the secondary surface may be so developed as to be a planographic surface, or vice versa. Neither the character nor material of one of these surfaces, whatever it may be, has any necessary dependence upon the character or material of the other. In completing the primary and secondary printing-surfaces either or both may be developed by light or deep etching or by any other suitable method and may be routed out.

There are various means by which the design of the primary surface may be printed upon or imparted to the secondary surface by the primary surface, all of which are within the scope of my invention. The design of the primary surface may be printed upon a conveying-surface, which is then brought into contact with the secondary surface, so as to impart thereto the design which it has previously taken from the primary surface, the conveying-surface being an intermediate between the primary surface and the secondary surface and being a basic surface for the secondary surface, or the primary surface may be made to print directly upon the secondary surface, in which case the latter surface when developed would print the same design as the primary surface, but in reverse. In cases where an intermediate conveying-surface is employed it may, as preferred, be in the form of a fabric, as transfer-paper, stretched over a suitable support and be brought into firm contact with the secondary surface and turned over thereupon, or the conveying-surface may be a sheet of paper, rubber, or other suitable material and held on a support from which the conveying-surface is not separated when such surface is brought into contact with the secondary surface, but which remains firmly secured on its support during this operation. When the conveying-surface is of paper and whether it is held on its support during the operation of imparting the design to the secondary surface or is turned over from its support upon the secondary surface, new or successive conveying-surfaces must take the place on the support of the one used, and preferably the identical place, in imparting the design to new or successive secondary surfaces. When the conveying-surface is of rubber or some other material admitting of repeated use, it is permanently held on its support, the ink residuum, if any, being washed off or otherwise removed before beginning its work for each new and different design to be imparted to a secondary surface.

I preferably employ a conveying-surface in carrying over and imparting the design to the secondary surface, the conveying-surface generally being of transfer-paper and after

receiving the design from the primary surface being turned over upon the secondary surface. The secondary surfaces are preferably identical and interchangeable, especially where they are to carry the same design, and where they are to carry different designs intended to cooperate in printing, as in multi-color-printing, they are designed and constructed for register when completed as printing-surfaces. In using the conveying-surface in practice it is mounted in a machine with the primary surface and the secondary surface, the primary surface and secondary surface being arranged in a definite and predetermined cooperating relation both longitudinally and transversely and preferably in the same or equivalent definite and predetermined cooperating relation both longitudinally and transversely with respect to the conveying-surface and with reference to preestablished guides. For this purpose I mount the conveying-surface and the coacting primary and secondary surfaces in the machine each in its own separate assigned place or pre-established seat. The secondary surface is made removable, so that successive secondary surfaces may be arranged in the same place, and thus be arranged in the same relation with respect to the conveying-surface or successive conveying-surfaces and receive identical designs from the same primary surface, and when the secondary surfaces are identical the identical designs imparted thereto will be identically placed, so that these secondary surfaces may be interchangeable in the subsequent printing. The same result may be attained, however, by imparting a design to a secondary surface mounted in the machine in the particular place assigned for it and then mounting the next secondary surface in the same place occupied by the primary surface, the primary surface having been previously removed after having printed its design on the conveying-surface. In this case the two successive secondary surfaces are arranged not in the same but in equivalent definite and predetermined cooperating relation with respect to the successive conveying-surfaces. In making a series of registering secondary printing-surfaces designed to cooperate in printing each secondary surface, being constructed and designed for register, and its corresponding primary surface are arranged in the same or equivalent definite and predetermined cooperating relation with respect to their conveying-surface. Moreover, in making a plurality of secondary surfaces from the same primary surface, whether through the intermediation of a conveying-surface or successive conveying-surfaces or not, the successive conveying-surfaces are arranged in the same or equivalent cooperating relation with respect to the primary surface. After the secondary surface has received its impression of the design from the primary surface and has been developed in suitable manner it may then be inked, mounted in a press,

and used as a printing-surface. Thus it will be seen that the printing-surface—viz., the secondary printing-surface—is made or derived from a previously-prepared printing-surface—viz., the primary surface—and without the intermediate employment of a setting-up plate, which after the primary surface has been made has no further utility. It will also be seen that two or more secondary printing-surfaces may be derived also from the primary surface and two or more secondary printing-surfaces, or one or more such surfaces with a primary surface constitute a plurality of printing-surfaces adapted to be used in printing the same design. This plurality of printing-surfaces for the same design is very useful in cases where it is desired to run two or more presses upon the same job or when one or more extra printing-surfaces are required to take the place of a printing surface or surfaces which have been worn out or become impaired by use in printing or otherwise. This plurality of printing-surfaces, capable of indefinite multiplication or increase, makes it possible, moreover, to print from such surfaces the same design indefinitely and beyond the limit of wear of an individual printing-surface. Again, from a series of registering primary surfaces a series or a plurality of series of secondary printing-surfaces adapted to cooperate in printing may be readily made, the designs being imparted from the series of primary surfaces to each series of secondary surfaces in accurate and predetermined position and with reference to register as printing-surfaces, and each secondary surface of a series may be identical and interchangeable with the corresponding members of the other series. Moreover, much time, labor, and painstaking care are saved by the new process in preparing a plurality of printing-surfaces as compared with the old process of preparing each printing-surface directly from a manually-prepared basic surface.

In the practical use of the invention a plurality of designs is imposed upon the primary printing-surface in accurate predetermined mutual relation with reference to the printing of those designs by the secondary printing-surface in accurate predetermined positions on the impression-surface and with reference to register. This plurality of designs is generally imposed upon the primary surface by sticking up a plurality of ordinary transfers upon a setting-up plate in the accurate predetermined mutual relation which they are to have upon the secondary surface. These transfers are then turned over upon the primary surface, which is thereupon developed, so as to be capable of printing. The secondary surface has imparted to it from the primary surface this plurality of designs in the same identical mutual relation. To accomplish this result, I may bring the primary printing-surface and the secondary surface into direct contact, or, as is preferred, I may impart the designs of the primary surface to

a conveying-surface, from which the designs are then imparted to the secondary surface. Thus it will be seen that the secondary surface has imparted to it a plurality of designs in accurate predetermined mutual relation and from a unitary surface bearing said designs in the same identical relation, the primary surface or the conveying-surface being a unitary basic surface with respect to the secondary surface.

The present invention, considered in its broader aspect, consists of a primary printing-surface developed, and therefore capable of printing, and a secondary surface adapted to be made into a printing-surface, said surfaces being mounted on suitable supports in a frame and arranged in a definite and predetermined cooperating relation both longitudinally and transversely with reference to pre-established guides or guiding means, whereby the design of the primary surface may be printed to or carried over and imparted directly or indirectly to or upon one or more secondary surfaces.

It also consists of a primary surface, a secondary surface, and a conveying-surface mounted in a suitable frame or on suitable supports and arranged in definite and predetermined cooperating relation both longitudinally and transversely with reference to pre-established guides or guiding means, whereby the primary surface may print its design on the conveying-surface and the conveying-surface may impart the design to or upon the secondary surface in the manner desired.

The invention also consists of the various mechanical features and combinations and subcombinations of features whereby the objects of the invention are attained, all as will hereinafter appear, and be set out more particularly in the claims.

In the drawings forming part of this specification I have illustrated a complete machine in which are embodied the various mechanisms of my invention, all in the best form now known to me, cooperating as parts of this one machine and capable of economically and readily attaining the desired result. It will be understood, however, that various features and combinations and subcombinations thereof may be used in other relations. I have also illustrated several modifications of mechanism diagrammatically for the purpose of indicating generally that the invention is not confined to any particular and specific form of machine or mechanism.

Referring now more particularly to the various views, in which like figures designate corresponding parts, Figure 1 is a side elevation of the machine referred to and looking in the direction of the arrow 1, Fig. 4. Fig. 2 is a side elevation looking in the direction of the arrow 2, Fig. 4. Fig. 3 is a vertical sectional elevation on the line 3 3, Fig. 4. Fig. 4 is an end elevation. Fig. 4^a is a central broken plan view. Fig. 5 is a sectional plan on the line 5 5 of Fig. 1. Fig. 6 is a sec-

tional elevation on line 6 6 of Fig. 1. Figs. 7 and 8 are respectively a side and fragmental front elevation of the inking-frame and inking-rollers. Figs. 9 and 10 are respectively a side and fragmental front elevation of the damping-frame and damping-rollers. Figs. 11 and 12 are respectively an outer side elevation and plan view of certain mechanism for shifting the supporting-cylinder for the conveying-surface. Fig. 13 is an inner side elevation of such mechanism. Fig. 14 is a sectional elevation on the line 14 14, Fig. 11. Fig. 15 is a broken plan view of the supporting-cylinder for the conveying-surface. Fig. 16 is a broken vertical section of the same on the line 16 16, Fig. 17. Figs. 17 and 18 are respectively opposite end elevations of said cylinder looking in the direction of the arrows 17 and 18, Fig. 15. Fig. 19 is a sectional elevation on the line 19 19, Fig. 16. Fig. 20 is an enlarged fragmental end view of said cylinder, showing more particularly the paper-carrier thereof. Figs. 21, 22, and 23 are end views of said cylinder, showing various positions of the paper-carrier in stretching the paper over the supporting-cylinder. Figs. 24, 25, 26, and 27 are diagrammatic end views of the said cylinder and the secondary surface and showing their relation in the operation of turning over a transfer from the former upon the latter. Fig. 28 is a diagrammatic view of a modification and showing a primary surface and a secondary surface cooperating together in the same machine, so that the former prints directly upon the latter. Fig. 29 is a diagrammatic view of a modification and showing primary and secondary surfaces and a conveying-surface cooperating together in the same machine, the conveying-surface being in the form of a permanent substance—rubber, for example—which carries over the design from the primary surface to the secondary surface. Fig. 30 is a diagrammatic view of a modification and showing primary and secondary surfaces and a conveying-surface cooperating together in the same machine, the conveying-surface being in the form of a temporary fabric—paper, for example—which remains on its support while carrying over the design from the primary surface to the secondary surface and is then torn off. Figs. 31 and 32 are respectively a broken plan and a longitudinal section of a secondary printing-surface mounted on its support.

Of the various types of machines in which my invention may be embodied in its broadest aspect I prefer to employ the complete organized machine shown in Figs. 1 to 27 and Figs. 31 and 32, inclusive. In this type there are primary and secondary surfaces and a conveying-surface. The machine is organized with special reference to securing the desired manipulation and cooperation of these three elements—that is to say, there is mechanism for bringing the primary surface and conveying-surface into cooperating contact,

such mechanism being arranged with a view to securing the required register when the secondary surface comes to be used as a printing-surface. Inasmuch as a primary surface and a secondary surface, with or without a conveying-surface, have never heretofore, so far as I am aware, been associated in a definite and predetermined coöperating relationship both longitudinally and transversely with reference to preëstablished guides, so as to coöperate for the purpose of making a secondary printing-surface and locating the design thereon in a definite predetermined position and with reference to register, it will be seen that the mechanism for effecting the coöperation of these elements of whatever specific character are all within the purview of my invention. Moreover, in the type of machine recommended I prefer to employ curved or cylindrical primary and secondary surfaces, and the complete machine shown in the drawings is organized with special reference to the manipulation and coöperation of such surfaces and for their ready removal. For the purpose of more readily completing the secondary surface as a printing-surface the machine is also provided with inking and damping rollers for both the primary and secondary surfaces. In the best form of the invention the secondary surfaces are cylindrical and preferably are shell-like and tubular and made removable from rotary supports, so that after the secondary surfaces have been made into secondary printing-surfaces they may be seated on appropriate supports and in the required accurate positions in a printing-press. The primary printing-surfaces may be and for convenience preferably are constructed in the same manner. When the primary and secondary surfaces are thus made removable and replaceable on their supports, it will be seen that guiding means or preëstablished guides will be advantageous to insure that they are made to occupy their preëstablished seats on their supports. This the invention provides for. I have thus adverted to these principal features of the present machine for the specific purpose of making it clearly understood that I consider the various mechanisms and combinations thereof broadly new, whatever may be the type of machine or the specific details thereof employed for the purpose of effecting the results desired and the various steps of my process, and that it is my present purpose and attempt to claim the same broadly.

I will now specifically describe the particular machine shown in the drawings, omitting generally from such description for the sake of clearness further statements designed to indicate what are and what are not the essentials of the invention in its more or less generic aspect.

1 is the primary surface, cylindrical in form and preferably shell-like and continuous and removable from its supporting-cylinder 2, which is secured on the shaft 3, turning in boxes 4. This primary surface is suitably

developed and when inked is ready to print the design which it is desired to carry over and impart to the cylindrical secondary surface 5 on the support 6, secured on the shaft 7, which turns in the boxes 8. The secondary surface 5 is also preferably continuous and removable from its support.

In Figs. 31 and 32 is shown the preferred arrangement for the secondary surface. The secondary surface is there shown as a continuous cylindrical shell-like tube with a seamless exterior. The secondary surface has a cylindrical support 6, the former having a slight interior taper and the latter a corresponding exterior taper, so that the secondary surface may be easily removed from its support, which contacts with and firmly supports every point of the internal periphery of the secondary surface. In order that the secondary surface 5 may be readily mounted always exactly in its predetermined seat on its support 6, suitable guiding means for this purpose are provided, which insure absolute identity and accuracy of position at all times both longitudinally and circumferentially. The guiding means for circumferential location shown in the drawings consists of two opposite longitudinal grooves 220 and 221, accurately cut on the exterior surface of the supporting-cylinder 6, and corresponding ribs 232 and 223, formed on the interior of the secondary surface and adapted to slide and accurately fit in these grooves—a marked rib of the secondary surface in a marked groove of the support. For the purpose of insuring identity and accuracy in the longitudinal position of the secondary surface on its support the support is provided with a collar 224, screwed on one end of the support to form a fixed abutment against which one end of the secondary surface accurately fits when in place on its support. The secondary form is locked in place against any accidental movement by the clamps 225 and screws 226 on the opposite end of the support. The support 6 is generally provided at one end—the one on which the collar 224 is fixed—with a screw 227, extending through a nut 228, adapted to travel to and fro on the screw in the slot 229 in the support 6 and arranged to start the secondary surface from its seat by the rotation of the screw. If desired, the support 6 may be so constructed as to be removable from its shaft 7, the support being seated on the shaft against the collar 230 by keys 231 entering slots 232 in the shaft, and if required the secondary surface may be fixed permanently on its support, the collar 230 and the keys 231 serving as guiding means whereby the removable support may be accurately located both longitudinally and transversely in a predetermined position on the shaft. It is preferred, however, to make the secondary surface removable from the support 6. The primary surface is preferably arranged and constructed in the same way.

9 is a shaft turning in boxes 10 and carry-

ing the drum or support 11 for the conveying-surface 12, adapted to receive an imprint from the primary surface 1 and carry it over or impart it to the secondary surface 5. The inking-frame 13, carrying the inking-rollers for the primary surface 1, is fixed on the shaft 15, so as to be swung thereby to and from the primary surface. On the opposite side of the machine and fixed on the shaft 16 is the inking-frame 17, carrying the inking-rollers for the secondary surface 5. The frames 14 and 18 for the damping-rollers for the respective printing-surfaces are loosely mounted on the shafts 15 and 16, respectively, so as to turn thereon when moved to and from their printing-surfaces, as will hereinafter more fully appear. The inking and damping frames and rollers for the primary and secondary surfaces 1 and 5 are similar and similarly mounted and actuated. Their details will be described later on.

The main driving-shaft 19 of the machine is actuated from any suitable source of power, as the electric motor 20, and carries the fixed gear 21, which meshes with the gear 22, fixed on the shaft 23, which may be called the "power - distributing" shaft because the power for driving the primary and secondary and conveying surfaces and inking and damping rollers is derived from this shaft 23. For the purpose of this distribution of power the shaft 23 is provided with suitable clutches 24 and 25. The clutches 24 and 25 are operated, respectively, by the clutch-shafts 27 and 28, provided with hand-levers 29 and 30. The clutches 24 and 25 make fixed and loose the gears 31 and 32, respectively, on the shaft 23. The shaft 23 is carried in brackets 26, fixed on the main frame. (See Fig. 2.) The gears 31 and 32 mesh, respectively, with the gears 33 and 34, fixed on the short shafts 35 and 36, supported by the main frame and the brackets 37 and 38, respectively. The shaft 36 has fixed thereon gears 39 and 40, the former meshing with gear 41, which is loose on the shaft 16 and meshes with idle gear 42, meshing with gear 43, fixed on the shaft 7, which carries the secondary surface 5. The gear 40 meshes with gear 44, secured to the main ink-distributing cylinder 45, which is sleeved to rotate on the shaft 16. The short shaft 35 on the opposite side of the machine from shaft 36 has fixed thereon the gears 46 and 47. The gear 46 meshes with the gear 48, which is loose on the shaft 15 and meshes with the idle gear 49, which meshes with the gear 50, fixed on the shaft 3, which carries the primary surface 1. The gear 47 meshes with the gear 51, which is secured to the main inking-cylinder 52, sleeved to rotate on the shaft 15. It will thus be seen that by operating the clutch 25 to lock the gear 32 on the shaft 23 the secondary surface is driven through the train of gears 32, 34, 39, 41, 42, and 43 and that the inking-cylinder 45 is likewise driven through the train of gears 32, 34, 40, and 44. It will likewise be seen that by operating the clutch 24 to lock the gear

29 on the shaft 23 the primary surface is driven through the train of gearing 31, 33, 46, 48, 49, and 50 and that the inking-cylinder 52 is driven through the train of gears 31, 33, 47, and 51. The inking-roller 53 carries a gear 54, which meshes with the gear 44 and with a gear on the reciprocating inking-roller 55, which supplies the form-inking rollers 56 and 57. An idle gear 58 on the frame 18 meshes with the gear 44 and with a gear on the damping-roller 59, which supplies the form-damping rollers 60 and 61. Thus it will appear that these inking and damping rollers are driven with the secondary surface 5 to supply that surface with ink and water as may be required in developing said surface into a printing-surface. On the opposite side of the machine the inking and dampening rollers are similarly arranged and geared. The ink-distributing roller 62 carries a gear 63, which meshes with the gear 51 and with a gear on the reciprocating inking-roller 64, which supplies the rollers 65 and 66. An idle gear 67 on the frame 14 meshes with the gear 51 and with a gear on the water-roller 68, which supplies water to the rollers 69 and 70. The inking and dampening rollers for the primary surface are for the purpose of supplying that surface with ink and water, so that it may print the design thereof as required. When the inking and dampening rollers are not required, they are swung back from their printing-surfaces, but these surfaces may still be driven by the idle gears 42 and 49. The inking-frames 13 and 17 are swung back by the worm-shafts 71 and 72, respectively, having the hand-wheels 73 and 74. These worm-shafts actuate the worm-wheels 75 and 76, fixed on the shafts 15 and 16, on which the inking-frames are respectively fixed. The dampening-frames 14 and 18, carrying their water-rollers, are swung back from their printing-surfaces when not required by the crank-shafts 77 and 78, carrying, respectively, the cranks 79 and 80, connected with their frames by links 81 and 82. The crank-shafts are driven by the gears 83 and 84, fixed thereon and actuated, respectively, by gears 85 and 86, operated by the hand-wheels 87 and 88. The boxes 4 for the shaft 3 are adjusted vertically in their recesses in the main frame by the lower screws 89 and the upper screws 90, the latter working through arms 91, pivoted on the main frame, so that they may be swung aside when the boxes are to be lifted from place. For the purpose of lateral adjustment I provide eccentrics 92 in the boxes 4, in which the shaft 3 rotates. By turning the eccentrics the shaft, with its printing-surface, is moved laterally. Vertical adjustment may also be obtained by these eccentrics. They have slots 93 and bolts 94 to lock the eccentrics in their adjusted positions. The boxes 8 of the shaft 7 are similarly provided with adjusting means.

In order that the supports or cylinders 2 and 6 may be lifted from place in the machine or lowered into position, I provide pairs of lift-

ing-arms for each cylinder 2 and 6. The lifting-arms 96 for the cylinder 2 are provided with forks 97 at their upper end to engage and support the shaft 3 and at their lower ends are provided with racks 98. The lifting-arms 99 for the cylinder 6 are similarly constructed and arranged. The shaft 19 is provided with the loose worms 100 and 101, adapted to be locked thereon by means of the clutches 102 and 103, operated by the levers 104 and 105, respectively. These worms 100 and 101 engage worm-gears 106 and 107 on the shafts 108 and 109, respectively, which carry two gears 110 and two gears 111. The gears 110 mesh with the racks of the arms 96, and the gears 111 mesh with the racks of the arms 99. By these means the lifting-arms are hoisted and lowered to facilitate the lowering of the cylinders 2 and 6 to place or to facilitate the removal of these cylinders from place.

I will now describe the mechanism for operating the support or cylinder 11.

Fixed on the shaft 23 is a gear 112, meshing with the gear 113, fixed on the shaft 114, on which is mounted the loose gear 115, meshing with the gear 116, fixed to the cylinder 11. A clutch 117, operated by the rods 118, which are actuated by the lever 119, serves to lock the loose wheel 115 on its shaft when the cylinder 11 is to be rotated.

I will now describe the mechanism whereby the cylinder 11 is moved to and from the cylinders 2 and 6 for the purpose of receiving an impression on its conveying-surface 12 from the primary surface 1 and carrying it over to the secondary surface 5.

The boxes 10, (see Figs. 11, 12, and 14,) which support the shaft 9 of the cylinder 11, are capable of lateral movement in their recesses. Keyed on the ends of the shaft 9 and outside the frame are the eccentrics 120, working in the vertically-moving boxes 121. Fast on the shaft 9 near one end is the gear-wheel 122, in mesh with which is the gear 123 on the shaft 124, turned by the hand-wheel 125. By turning the hand-wheel 125 the shaft 9 is rotated and with it the eccentrics 120, which as they turn force the boxes 10 in a lateral direction. The eccentric-boxes 121 move slightly vertically in correspondence with the movement of the eccentrics. This mechanism is capable not only of moving the conveying-surface into contact with the primary and secondary surfaces, but also of applying to such contact all the pressure required.

I will now describe the details of the inking and damping frames. (See Figs. 7, 8, 9, and 10.)

The inking-frame 17 is provided with the bosses 126 to receive the shaft 16, which carries the main ink-distributing roller 45 and on which the frame is fixed, as already described. The rider-roller 53 is carried in boxes 127, supported in recesses 128. The reciprocating rider 55 is also supported in recess 129. These recesses 128 and 129 are open at their outer sides and are closed by the arms

130, pivoted on the main part of the inking-frame by the bolts 131 and locked in place by the nuts 132 on the bolts 133, which pass through apertures in the lower ends of these arms. When it is desired to take the rollers 53 and 55 out of the frame for the purpose of cleaning them or otherwise, the arms 130 are unfastened and swung back and the rollers may then be removed. The boxes 127 are adjusted by the inner screws 134, having lock-nuts, and outer screws 135. The screws 135 pass through threaded apertures in the arms 130, are provided with lock-nuts 136 and hand-wheels 137, and have heads 163, which rest in slots 164 in the inner sides of the boxes 127. Pivoted on the bolts 138 and preferably on the upper ends of the arms 130 are arms 139, having forks 140 at their lower ends engaging grooves 141 on the hand-wheels 137. The outer adjusting-screws 142 pass through threaded apertures in the arms 139 and loosely through apertures in the arms 130. These screws have also lock-nuts 143. 144 are the inner adjusting-screws for the roller 55 and have lock-nuts, as shown. The rollers 53 and 55 are first set by their adjusting-screws, but when it becomes necessary to temporarily separate these rollers from the forming rollers 56 and 57, as when the machine is stopped for an hour or so, the hand-wheels 137 are turned, and the rollers 53 and 55 thereupon separate from the inking-rollers 56 and 57. These rollers 56 and 57 are supported in the recesses 147 and 148, respectively, open at their outer ends. These recesses are closed by the arms 149, pivoted by the bolts 150 on the main part of the frame 17 and locked in place by the bolts 151 and nuts 152. The outer adjusting-screws 153 and 154 for these rollers pass through threaded apertures in the arms 149 and have lock-nuts, as shown. 155 and 156 are the inner adjusting-screws for the rollers 56 and 57 and also have lock-nuts. When the rollers 56 and 57 are to be removed, as for the purpose of washing them or otherwise, the arms 149 are unlocked and swung back, when the rollers may be withdrawn. 157 is a lever pivoted on a bracket 158 and operating to reciprocate the roller 55. This lever has a lug 159 engaging an actuating-cam 160, rotating with the roller 45 on the shaft 16, (see Fig. 4,) and also has a lug 161 engaging a groove 162 in the roller 55. The inking-frame 13 and its rollers is a duplicate of the frame 17 and its rollers.

The damping-frame 18 (see Figs. 9 and 10) is provided with bearings 165 to receive the shaft 16, on which, as already described, the frame is pivoted. The damping-roller 59 is carried in boxes 166, which fit in recesses 167, in which they are adjustable by the inner screws 168, having lock-nuts, and by the outer screws 169, having lock-nuts and hand-wheels 170. The screws 169 have heads 171, which work in recesses on the inner sides of the boxes 166. The roller 59 has a gear 172, meshing with the idle-gear 58, carried by the frame

18, whereby the dampening-rollers are driven. The roller 59 may be withdrawn from its boxes by retracting the journal at one end, which may be slid into a recess in the roller by moving the pin 173 backward in its slot. The form-dampening rollers 60 and 61 are carried in recesses 174 and 175, respectively, open on their outer sides, which are closed by the arms 176, pivoted to the frame 18 by bolts 177. Bolts 178, passing through apertures in the free ends of these arms, serve, with their nuts 179, to lock the arms in place. These rollers are adjustable and held in place by the outer screws 180 and 181, respectively, having lock-nuts, and passing through threaded apertures in the arms 176, and by the inner screws 182 and 183, having lock-nuts. When it is desired to remove the rollers 60 and 61, as for cleaning, the arms 176 are swung back, when the rollers may be withdrawn from the frame.

I will now describe the specific construction of the support which carries the conveying-surface 12. This support is shown in the drawings as a cylinder 11 and provided with various accessories adopted for convenience. It will be understood that this support or cylinder and its accessories may be variously modified and still carry out the main purpose of carrying over an imprint or impression from the primary surface to the secondary surface. Such modifications are all within the purview of my invention. The cylinder is loosely mounted on the shaft 9, carried by the boxes 10, which are supported by the main frame between the primary and secondary surfaces, as already described. On the shaft 184 is carried a roll of a suitable fabric, constituting the conveying-surface 12, and preferably transfer-paper. The shaft 184 is journaled in two extensible arms 185, provided with racks 186, telescoping with the arms 187 on the bosses 188, loose on the shaft 9. A shaft 189, having gears 190 at both ends, which mesh with the racks 186, serves when rotated by its hand-wheel to move the arms 185, so as to carry the roll in and out of the recess 191, formed in the cylinder, the arms 185 being locked either in or out by the spring-latch 192. The bosses 188 have gear-teeth 193, meshing with the gears 194, fixed on the shaft 195, whereby the arms 185 and 187 may, when the roll is drawn out of its recess 191, be moved around the periphery of the cylinder 11, so that the end of the paper may be caught by the grippers 196, carried by the rod 197, against an arm 214, on which the springs 198 press. This rod carries on one end the cam 199. Fig. 21 shows the position of the arms constituting the roll-carrier just after the roll has been moved out of the recess 191 and when it is ready to be moved back to the grippers. Fig. 22 shows the position of the carrier just after the grippers have been made to engage the paper, and Fig. 23 shows the position of the carrier on its way back again to the recess 191 and as the carrier is spreading the paper over the periphery

of the cylinder. Fig. 17 shows the position of the carrier when the paper 12 has been stretched in place and the carrier has been retracted into the recess. The roll-shaft 184 has a ratchet-wheel and ratchet 200 and 201, whereby the paper may be held tight on the roll and therefore taut over the cylinder. The paper generally rests on a blanket 202, held in place by the cutter-bar 203 and one rod 204, which is provided with a ratchet-wheel and pawl 205 and 206. The cutter-bar 203 carries a knife 207, which extends between two rubber lips 208. 209 are two cams pivoted at 210 on the arms 185 and carrying the cutter-bar 211, having a recess to receive the knife when the two bars come together. The paper 12 extends between the two cutter-bars, (see Fig. 19,) and when they come together the paper is cut. The cams are actuated to move the bar 211 against the bar 203 by the cams 212, (see Fig. 3,) fixed on the shaft 7. One of the bosses 188 is provided with a bolt 213, which engages the circular groove 214 on a hub of the cylinder 11, (see Fig. 16,) whereby the boss and its arm are removably held in place on the shaft.

In the operation of the cylinder the paper 12 is first stretched over the cylinder, as described, and the cylinder is then moved laterally by operating the hand-wheel 125 so as to bring the gears 50 and 116 into mesh and the end of the paper next the grippers in contact with the primary surface 1, which has been already fully prepared or developed, so as to bear the design which it is desired shall be made upon the secondary surface. The primary surface having been properly inked by the operation of its inking and dampening rollers, actuated from the power-distributing shaft 23 and controlled by the clutch 24, as already described, and the inking and dampening frames having been swung out of the way by operating the hand-wheels 73 and 87, the primary surface is now ready to print an impression upon the paper 12—i. e., the conveying-surface. In bringing the gears 50 and 116 into mesh a marked tooth of one is always entered into a marked recess of the other, so that the impression will be printed upon the conveying-surface always in identically the same place—this for the purpose of securing accurate register in the process of making the secondary printing-surface and with reference to the subsequent printing. The cylinders 2 and 11, having the required pressure applied to the paper 12 and secondary surface, are now rotated from the power-distributing shaft through the shaft 113 and the gear 115, controlled by the clutch 117, the clutch 24 having been previously reversed. Thus the primary surface prints its impression upon the paper 12 and by rolling contact. When the rotation of the cylinders 11 and 2 ceases, the cylinder 11 is brought into the position shown in Fig. 24, having made a half-turn, and in this position, the starting end of the paper being opposite the cyl-

5 inder 6, it is now moved over to the cylinder 6 by reversing the hand-wheel 25, and a marked tooth and recess of the gears of these cylinders are intermeshed, so that the
 10 cylinders may always begin their coaction in precisely the same mutual relation. The cylinders 11 and 6, having the required pressure applied to the paper 12 and secondary surface, are now rotated from the power-
 15 distributing shaft through the shaft 113 and gear 115, as before. As the cylinder 11 begins to rotate the gripper-cam 199 strikes the stud 215, projecting from the inner side of the main frame, and releases the paper 12
 20 from the grippers, which adheres to the secondary surface and is turned over thereon. The progress of this operation is shown at several stages in Figs. 21 to 24. Just before the latter end of the paper is reached in this
 25 operation the cutter-cams 209 are struck by the cams 212, and the cutter-bar 211 is driven against the cutter-bar 203, the lips 208 of which yield to the pressure of the bar 211, thereby stretching the paper over the bar 211
 30 as the knife 207 enters the recess therein and severs the paper. The cylinder 11 is now moved back to its initial position. The paper-transfer, turned already over on the secondary surface, is dampened and removed in
 35 the usual manner. The secondary surface is now developed and rolled up in the usual manner, the inking and dampening rollers in the frames 17 and 18 being used in this operation, the two sets of rollers being operated
 40 and driven by the mechanism already described. The secondary surface has now become the secondary printing-surface and is ready to be employed for printing. Of course the secondary surface need not necessarily be
 45 developed before removing it from the machine. It may be wholly or partly developed afterward. In removing the secondary surface from the machine the clutch 103 is operated to lock the worm 101 on the shaft 19,
 50 which then by its rotation hoists the lifting-arms 99, thereby lifting the shaft 7, with its boxes, the locking-arms of which have previously been thrown back. The entire cylinder 6, with its shaft and the printing-surface 5, may then be removed by any convenient means and mounted in a printing-press,
 55 or, if desired, the tubular printing-surface 5 may be slipped from its supporting-cylinder 1, preferably onto a transporting apparatus such as is described in my pending application filed July 12, 1898, Serial No. 685,764, and subsequently slipped onto a supporting-cylinder of a printing-press adapted to receive it. I prefer to remove the printing-surface 5 from its cylinder 6, as last referred to.
 60 Both the primary and secondary surfaces and their cylinders are constructed with this end in view, the printing-surfaces having ribs adapted to slide in corresponding recesses on their cylinders, as shown in Figs. 3 and 32.
 65 The tubular or shell-like printing-surfaces are preferably made continuous and seamless

and may consist of a suitable base, as copper, with an electrolytically-deposited zinc coating, or of a shell or tube cast, bent, or otherwise formed, and may be made of zinc or other suitable material.

It will be evident from the above description that a printing-surface may be removed and another substituted for it in the same place, so that if it is desired the primary printing-surface may be removed after it has printed on the conveying-surface and a secondary surface may be substituted for it in the same place and receive the impression or design on the conveying-surface by being brought into contact with it just as the primary surface was brought in contact with it and then rolled up and developed, or successive secondary surfaces may be substituted one for the other and so as to receive the same or different impressions or designs from the conveying-surface, according as the conveying-surface has successively printed upon it the same or different impressions or designs, or successive primary surfaces may be substituted one for the other, so as to print successively different designs or impressions upon the conveying-surface, which may convey each such design or impression to successive secondary surfaces.

The intermeshing gears of the primary and secondary surfaces and the conveying-surface are not necessary in securing the rolling contact of one of these bodies with the other. Any one of these rolling bodies may be driven from the other by frictional contact, the intermeshing gears being dispensed with, as shown in Figs. 25, 26, and 27. Again, various forms of guiding means or preestablished guides may take the place of the marked teeth and recesses of these intermeshing gears and whether or not these gears are used. All that is necessary in this connection is that the co-acting bodies, whatever their form may be, shall be brought into exact predetermined co-operating relation with reference to some sufficient guiding means or preestablished guides, whereby the design of the primary surface may be imposed upon the secondary surface in exact predetermined position.

In alluding to the positions of the printing-surfaces on their respective supports and to their coöperating relation and to the coöperating relation of the conveying-surface I use the terms "longitudinally" and "transversely" as referring to the two directions at right angles over said bodies whether either or both of these bodies is flat or curved. If the body is curved, "longitudinal" would refer to the axial direction and "transverse" to the circumferential direction.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a machine designed to be used in making printing-surfaces, the combination of a primary printing-surface adapted to print a design; with a secondary surface adapted and arranged to receive a design and to be devel-

oped into a printing-surface; predetermined guides with reference to which said surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely, and means for imparting the design from the primary surface to the secondary surface in accurate predetermined position.

2. In a machine designed to be used in making curved or cylindrical printing-surfaces, the combination of a primary printing-surface adapted to print a design; with a curved or cylindrical secondary surface adapted and arranged to receive a design and to be developed into a printing-surface; predetermined guides with reference to which said surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; and means for imparting the design from the primary surface to the secondary surface in accurate predetermined position.

3. In a machine designed to be used in making lithographic-printing surfaces, the combination of a primary printing-surface adapted to print a design; with a lithographic secondary surface adapted and arranged to receive a design and to be developed into a printing-surface; predetermined guides with reference to which said surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; and means for imparting the design from the primary surface to the secondary surface in accurate predetermined position.

4. In a machine designed to be used in making curved or cylindrical lithographic-printing surfaces, the combination of a primary printing-surface adapted to print a design; with a curved or cylindrical lithographic secondary surface adapted and arranged to receive a design and to be developed into a printing-surface; predetermined guides with reference to which said surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; and means for imparting the design from the primary surface to the secondary surface in accurate predetermined position.

5. In a machine designed to be used in making curved or cylindrical shell-like printing-surfaces, the combination of a primary printing-surface adapted to print a design; with a curved or cylindrical shell-like secondary surface adapted and arranged to receive a design and to be developed into a printing-surface; predetermined guides with reference to which said surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; and means for imparting the design from the primary surface to the secondary surface in accurate predetermined position.

6. In a machine designed to be used in making continuous cylindrical shell-like lithographic-printing surfaces, the combination of a primary printing-surface adapted to print

a design; with a continuous cylindrical shell-like lithographic secondary surface adapted and arranged to receive a design and to be developed into a printing-surface; predetermined guides with reference to which said surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; and means for imparting the design from the primary surface to the secondary surface in accurate predetermined position.

7. In a machine designed to be used in making printing-surfaces, the combination of a primary printing-surface adapted to print a design; with a secondary surface adapted and arranged to receive a design and to be developed into a printing-surface; predetermined guides with reference to which said surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; devices for inking the primary printing-surface; and means for imparting the design from the primary surface to the secondary surface in accurate predetermined position.

8. In a machine designed to be used in making lithographic-printing surfaces, the combination of a primary printing-surface adapted to print a design; with a lithographic secondary surface adapted and arranged to receive a design and to be developed into a printing-surface; predetermined guides with reference to which said surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; devices for inking the primary printing-surface; and means for imparting the design from the primary surface to the secondary surface in accurate predetermined position.

9. In a machine designed to be used in making printing-surfaces, the combination of a primary printing-surface adapted to print a design; with a removable and replaceable secondary surface adapted and arranged to receive a design; a support for the secondary surface having an accurate preestablished seat thereon so that the secondary surface and successive secondary surfaces may be seated on said support in the same predetermined position both longitudinally and transversely; preestablished guides with reference to which the primary and secondary surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; and means for imparting the design from the primary surface to the successive secondary surfaces in accurate predetermined position.

10. In a machine designed to be used in making printing-surfaces the combination of a removable and replaceable primary printing-surface adapted to print a design; a support for the primary surface having an accurate preestablished seat thereon so that said primary surface and successive primary surfaces may be seated on their support in the same predetermined position both longitudi-

nally and transversely; with a removable and replaceable secondary surface adapted and arranged to receive a design; a support for the secondary surface having an accurate
 5 preestablished seat thereon so that the secondary surface and successive secondary surfaces may be seated on said support in the same predetermined position both longitudinally and transversely; preestablished
 10 guides with reference to which the successive pairs of primary and secondary surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; and means for imparting the designs
 15 from the successive primary surfaces to the successive secondary surfaces in accurate predetermined position.

11. The combination of a series of primary printing-surfaces having registering designs; a series of removable and replaceable secondary surfaces; a machine having a support for the primary surfaces, and a support for the secondary surfaces, each support having a
 20 preestablished seat in which the surfaces therefor may be seated in accurate predetermined position both longitudinally and transversely; preestablished guides with reference to which the primary and secondary
 25 surfaces may be arranged in pairs in accurate predetermined cooperating relation both longitudinally and transversely; and means for imparting the designs of the primary surfaces seated successively on their support to the
 30 secondary surfaces seated successively on their support.

12. In a machine designed to be used in making printing-surfaces, the combination of a primary printing-surface adapted to print a design; with a curved shell-like removable
 40 and replaceable secondary surface adapted and arranged to receive a design; a rotary support for the secondary surface having an accurate preestablished seat thereon so that the secondary surface and successive secondary
 45 surfaces may be seated on said support in the same predetermined position both longitudinally and transversely; preestablished guides with reference to which the primary and secondary surfaces may be arranged in accurate predetermined cooperating
 50 relation both longitudinally and transversely; and means for imparting the design from the primary surface to the successive secondary surfaces in accurate predetermined position.

13. The combination of a series of primary printing-surfaces having registering designs; a series of curved shell-like removable and replaceable secondary surfaces; a machine
 60 having a support for the primary surfaces, and a rotary support for the secondary surfaces, each support having a preestablished seat in which the surfaces therefor may be seated in accurate predetermined position
 65 both longitudinally and transversely; preestablished guides with reference to which the primary and secondary surfaces may be ar-

ranged in pairs in accurate predetermined cooperating relation both longitudinally and transversely; and means for imparting the
 70 designs of the primary surfaces seated successively on their support to the secondary surfaces seated successively on their support.

14. The combination of a series of curved shell-like primary printing-surfaces having
 75 registering designs; a series of curved shell-like removable and replaceable secondary surfaces; a machine having a rotary support for the primary surfaces, and a rotary support for the secondary surfaces, each support hav-
 80 ing a preestablished seat in which the surfaces therefor may be seated in accurate predetermined position both longitudinally and transversely; preestablished guides with reference to which the primary and secondary
 85 surfaces may be arranged in pairs in accurate predetermined cooperating relation both longitudinally and transversely; and means for imparting the designs of the primary surfaces seated successively on their support to
 90 the secondary surfaces seated successively on their support.

15. The combination of a series of curved lithographic shell-like primary printing-surfaces having registering designs; a series of
 95 curved lithographic shell-like removable and replaceable secondary surfaces; a machine having a rotary support for the primary surfaces, and a rotary support for the secondary surfaces, each support having a preestab-
 100 lished seat in which the surfaces therefor may be seated in accurate predetermined position both longitudinally and transversely; preestablished guides with reference to which the primary and secondary surfaces may be
 105 arranged in pairs in accurate predetermined cooperating relation both longitudinally and transversely; and means for imparting the designs of the primary surfaces seated successively on their support to the secondary
 110 surfaces seated successively on their support.

16. In a machine designed to be used in making printing-surfaces, the combination of a primary printing-surface; and a curved or
 115 cylindrical secondary surface arranged to receive an impression from the primary surface and carried on a support and removable therefrom so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place
 120 in the machine, preestablished guides with reference to which the successive secondary surfaces may be supported in the same or equivalent definite and predetermined cooperating relation both longitudinally and
 125 transversely whereby a plurality of identical and interchangeable curved or cylindrical secondary printing-surfaces may be made having identical designs identically placed thereon.

17. In a machine designed to be used in making printing-surfaces, the combination of a primary surface; and a curved or cylindrical
 130 secondary surface arranged to have imparted

thereto an impression from the primary surface and carried on a support and removable therefrom so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in the machine, preestablished guides with reference to which the successive secondary surfaces may be supported in the same or equivalent definite and predetermined cooperating relation both longitudinally and transversely, whereby a plurality of identical and interchangeable curved or cylindrical secondary printing-surfaces may be made having identical designs identically placed thereon, and devices for inking said primary surfaces.

18. In a machine designed to be used in making printing-surfaces, the combination of a primary surface carried on a support and removable therefrom, so that successive primary surfaces may be substituted therefor and work in the same place in the machine; and a secondary surface carried on a support and removable therefrom, so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in the machine, the successive secondary surfaces being arranged to have imparted thereto impressions from the successive primary surfaces respectively, the successive pairs of coacting primary and secondary surfaces being supported in the same or equivalent definite and predetermined cooperating relation with reference to register in the subsequent printing, whereby from a series of registering primary surfaces a plurality of series of registering secondary printing-surfaces may be made, the members of each series of secondary printing-surfaces being identical and interchangeable with the corresponding members of the other series of such secondary printing-surfaces.

19. In a machine designed to be used in making printing-surfaces, the combination of a primary surface carried on a support and removable therefrom, so that successive primary surfaces may be substituted therefor and work in the same place in the machine; and a curved or cylindrical secondary surface carried on a support and removable therefrom, so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in the machine, the successive secondary surfaces being arranged to have imparted thereto impressions from the successive primary surfaces respectively, the successive pairs of coacting primary and secondary surfaces being supported in the same or equivalent definite and predetermined cooperating relation with reference to register in the subsequent printing, whereby from a series of registering primary surfaces a plurality of series of curved or cylindrical registering secondary printing-surfaces may be made, the members of each series of secondary printing-surfaces being identical and

interchangeable with the corresponding members of the other series of such secondary printing-surfaces.

20. In a machine designed to be used in making printing-surfaces, the combination of a curved or cylindrical primary surface carried on a support and removable therefrom, so that successive primary surfaces may be substituted therefor and work in the same place in the machine; and a curved or cylindrical secondary surface carried on a support and removable therefrom, so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in the machine, the successive secondary surfaces being arranged to have imparted thereto impressions from the successive primary surfaces respectively, the successive pairs of coacting primary and secondary surfaces being supported in the same or equivalent definite and predetermined cooperating relation with reference to register in the subsequent printing, whereby from a series of registering primary surfaces a plurality of curved or cylindrical registering secondary printing-surfaces may be made, the members of each series of secondary printing-surfaces being identical and interchangeable with the corresponding members of the other series of such secondary printing-surfaces.

21. In a machine designed to be used in making printing-surfaces, the combination of a primary surface carried on a support and removable therefrom, so that successive primary surfaces may be substituted therefor and work in the same place in the machine; and a curved or cylindrical lithographic secondary surface carried on a support and removable therefrom, so that identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in the machine, the successive secondary surfaces being arranged to have imparted thereto impressions from the successive primary surfaces respectively, the successive pairs of coacting primary and secondary surfaces being supported in the same or equivalent definite and predetermined cooperating relation with reference to register in the subsequent printing, whereby from a series of registering primary surfaces a plurality of series of registering secondary printing-surfaces may be made, the members of each series of secondary printing-surfaces being identical and interchangeable with the corresponding members of the other series of such secondary printing-surfaces.

22. In a machine designed to be used in making printing-surfaces, the combination of a primary surface carried on a support and removable therefrom, so that successive primary surfaces may be substituted therefor and work in the same place in the machine; and a curved or cylindrical secondary surface carried on a support and removable therefrom, so that successive identical and inter-

changeable secondary surfaces may be substituted therefor and work in the same place in the machine, the successive secondary surfaces being arranged to have imparted thereto impressions from the successive primary surfaces respectively, the successive pairs of co-acting primary and secondary surfaces being supported in the same or equivalent definite and predetermined coöperating relation with reference to register in the subsequent printing, whereby from a series of registering primary surfaces a plurality of series of curved or cylindrical registering secondary surfaces may be made, the members of each series of secondary printing-surfaces being identical and interchangeable with the corresponding members of the other series of such secondary printing-surfaces.

23. In a machine designed to be used in making printing-surfaces, the combination of a curved or cylindrical primary surface carried on a support and removable therefrom, so that successive primary surfaces may be substituted therefor and work in the same place in the machine; and a curved or cylindrical secondary surface carried on a support and removable therefrom, so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in the machine, the successive secondary surfaces being arranged to have imparted thereto impressions from the successive primary surfaces respectively, the successive pairs of coacting primary and secondary surfaces being supported in the same or equivalent definite and predetermined coöperating relation with reference to register in the subsequent printing, whereby from a series of registering primary surfaces a plurality of series of curved or cylindrical registering secondary printing-surfaces may be made, the members of each series of secondary printing-surfaces being identical and interchangeable with the corresponding members of the other series of such secondary printing-surfaces, and devices for inking said primary surfaces.

24. A basic surface designed and adapted for use in making a printing-surface, comprising a unitary conveying-surface having printed thereon a plurality of designs or impressions in accurate and predetermined relation with respect to each other and with reference to register in the subsequent printing of said designs, a secondary surface and preëstablished guides with reference to which said basic surface and said secondary surface may be brought into accurate predetermined coöperating relation both longitudinally and transversely whereby the said designs or impressions of the basic surface may be imparted to said secondary surface and said secondary surface may be made into a printing-surface for printing said designs or impressions in the same predetermined relation as said designs or impressions had on the basic surface.

25. A basic surface designed and adapted for use in making a printing-surface, comprising a unitary conveying-surface having printed thereon a plurality of designs or impressions in accurate and predetermined relation with respect to each other and with reference to register in the subsequent printing of said designs, said basic surface being adapted to be brought into positive contact with a secondary surface and turned over thereon, whereby the said designs or impressions of the basic surface may be imparted to said secondary surface and said secondary surface may be made into a printing-surface for printing said designs or impressions in the same predetermined relation as said designs or impressions had on the basic surface.

26. A curved basic surface designed and adapted for use in making a printing-surface, comprising a unitary conveying-surface having printed thereon a plurality of designs or impressions in accurate and predetermined relation with respect to each other and with reference to register in the subsequent printing of said designs, a secondary surface and preëstablished guides with reference to which said basic surface and said secondary surface may be brought into accurate predetermined coöperating relation both longitudinally and transversely whereby the said designs or impressions of the basic surface may be imparted to said secondary surface and said secondary surface may be made into a printing-surface for printing said designs or impressions in the same predetermined relation as said designs or impressions had on the basic surface.

27. A curved basic surface designed and adapted for use in making a printing-surface, comprising a unitary conveying-surface having printed thereon a plurality of designs or impressions in accurate and predetermined relation with respect to each other and with reference to register in the subsequent printing of said designs, said basic surface being adapted to be brought into positive rolling contact with a secondary surface and turned over thereon, whereby the said designs or impressions of the basic surface may be imparted to said secondary surface and said secondary surface may be made into a printing-surface for printing said designs or impressions in the same predetermined relation as said designs or impressions had on the basic surface.

28. In a machine for making printing-surfaces, the combination of a primary printing-surface having thereon a plurality of designs in accurate predetermined relation with respect to each other and with reference to register in the subsequent printing of said designs; with a secondary surface adapted and arranged to receive an impression of said designs and to be developed into a printing-surface for said designs; preëstablished guides with reference to which said surfaces may be arranged in accurate predetermined relation

both longitudinally and transversely; and means for imparting said designs from the primary surface to the secondary surface in accurate predetermined position and in the identical mutual relation as on the primary surface.

29. In a machine for making printing-surfaces, the combination of a primary printing-surface having thereon a plurality of designs in accurate predetermined relation with respect to each other and with reference to register in the subsequent printing of said designs; with a lithographic secondary surface adapted and arranged to receive an impression of said designs and to be developed into a printing-surface for said designs; preestablished guides with reference to which said surfaces may be arranged in accurate predetermined relation both longitudinally and transversely; and means for imparting said designs from the primary surface to the secondary surface in accurate predetermined position and in the identical mutual relation as on the primary surface.

30. In a machine for making printing-surfaces, the combination of a primary printing-surface having thereon a plurality of designs in accurate predetermined relation with respect to each other and with reference to register in the subsequent printing of said designs; with a curved or cylindrical secondary surface adapted and arranged to receive an impression of said designs and to be developed into a printing-surface for said designs; preestablished guides with reference to which said surfaces may be arranged in accurate predetermined relation both longitudinally and transversely; and means for imparting said designs from the primary surface to the secondary surface in accurate predetermined position and in the identical mutual relation as on the primary surface.

31. In a machine for making printing-surfaces, the combination of a primary printing-surface having thereon a plurality of designs in accurate predetermined relation with respect to each other and with reference to register in the subsequent printing of said designs; with a continuous cylindrical lithographic secondary surface adapted and arranged to receive an impression of said designs and to be developed into a printing-surface for said designs; preestablished guides with reference to which said surfaces may be arranged in accurate predetermined relation both longitudinally and transversely; and means for imparting said designs from the primary surface to the secondary surface in accurate predetermined position and in the identical mutual relation as on the primary surface.

32. In a machine designed to be used in making a printing-surface, the combination of a primary surface, a secondary surface; and a conveying-surface adapted and arranged to receive an impression from said primary surface and impart it to said secondary sur-

face; preestablished guides with reference to which said bodies mounted in the machine may be arranged both longitudinally and transversely in accurate predetermined cooperating relation; and means for bringing said bodies together in cooperating contact in pairs.

33. In a machine designed to be used in making printing-surfaces, the combination of a primary surface, a lithographic secondary surface; and a conveying-surface adapted and arranged to receive an impression from said primary surface and impart it to said secondary surface, said secondary surface being removable so that other secondary surfaces may be substituted therefor and work in the same place in the machine; preestablished guides with reference to which said bodies mounted in the machine may be arranged both longitudinally and transversely in accurate predetermined cooperating relation; and means for bringing said bodies together in cooperating contact in pairs.

34. In a machine designed to be used in making printing-surfaces, the combination of a primary surface, a curved or cylindrical secondary surface, and a conveying-surface adapted and arranged to receive an impression from said primary surface and impart it to said secondary surface, said secondary surface being removable so that other secondary surfaces may be substituted therefor and work in the same place in the machine; preestablished guides with reference to which said bodies mounted in the machine may be arranged both longitudinally and transversely in accurate predetermined cooperating relation; and means for bringing said bodies together in cooperating contact in pairs.

35. In a machine designed to be used in making printing-surfaces, the combination of a primary surface, a secondary surface, and a conveying-surface adapted and arranged to receive an impression from said primary surface and impart it to said secondary surface, said primary surface and said secondary surface being removable so that other primary surfaces and other secondary surfaces may be substituted therefor and work in the same place in the machine; preestablished guides with reference to which said bodies mounted in the machine may be arranged both longitudinally and transversely in accurate predetermined cooperating relation; and means for bringing said bodies together in cooperating contact in pairs.

36. In a machine designed to be used in making printing-surfaces, the combination of a curved or cylindrical primary surface, a curved or cylindrical secondary surface, and a conveying-surface adapted and arranged to receive an impression from said primary surface and impart it to said secondary surface, said primary surface and said secondary surface being removable so that other primary surfaces and other secondary surfaces may be substituted therefor and work in the same

place in the machine; preestablished guides with reference to which said bodies mounted in the machine may be arranged both longitudinally and transversely in accurate predetermined cooperating relation; and means for bringing said bodies together in cooperating contact in pairs.

37. In a machine designed to be used in making printing-surfaces, the combination of a primary surface, a secondary surface, and a conveying-surface adapted and arranged to receive an impression from said primary surface and impart it to said secondary surface, said secondary surface being removable so that other secondary surfaces may be substituted therefor and work in the same place in the machine, and said primary and secondary surfaces being supported in the machine in the same or equivalent definite and predetermined cooperating relation with respect to the conveying-surface and with reference to register in the subsequent printing, whereby accuracy of register may be attained in the operation of making the secondary printing-surfaces; preestablished guides with reference to which said bodies mounted in the machine may be arranged both longitudinally and transversely in accurate predetermined cooperating relation; and means for bringing said bodies together in cooperating contact in pairs.

38. In a machine designed to be used in making printing-surfaces, the combination of a primary surface, a curved or cylindrical secondary surface, and a conveying-surface adapted and arranged to receive an impression from said primary surface and impart it to said secondary surface, said secondary surface being removable so that other secondary surfaces may be substituted therefor and work in the same place in the machine, and said primary and secondary surfaces being supported in the machine in the same or equivalent definite and predetermined cooperating relation with respect to the conveying-surface and with reference to register in the subsequent printing, whereby accuracy of register may be attained in the operation of making the secondary printing-surfaces; preestablished guides with reference to which said bodies mounted in the machine may be arranged both longitudinally and transversely in accurate predetermined cooperating relation; and means for bringing said bodies together in cooperating contact in pairs.

39. In a machine designed to be used in making printing-surfaces, the combination of a primary surface, a secondary surface and a conveying-surface adapted and arranged to receive an impression from said primary surface and impart it to said secondary surface, said primary surface and said secondary surfaces being removable so that other primary surfaces and other secondary surfaces may be substituted therefor and work in the same place in the machine, and said primary and secondary surfaces being supported in the

machine in the same or equivalent definite and predetermined cooperating relation with respect to the conveying-surface and with reference to register in the subsequent printing, whereby accuracy of register may be attained in the operation of making the secondary printing-surfaces; preestablished guides with reference to which said bodies mounted in the machine may be arranged both longitudinally and transversely in accurate predetermined cooperating relation; and means for bringing said bodies together in cooperating contact in pairs.

40. In a machine designed to be used in making printing-surfaces, the combination of a primary surface, a curved or cylindrical lithographic secondary surface, and a conveying-surface adapted and arranged to receive an impression from said primary surface and impart it to said secondary surface, and said primary and secondary surface being supported in the machine in the same or equivalent definite and predetermined cooperating relation with respect to the conveying-surface and with reference to register in the subsequent printing, whereby accuracy of register may be attained in the operation of making the secondary printing-surfaces; preestablished guides with reference to which said bodies mounted in the machine may be arranged both longitudinally and transversely in accurate predetermined cooperating relation; and means for bringing said bodies together in cooperating contact in pairs.

41. In a machine designed to be used in making printing-surfaces, the combination of a curved or cylindrical primary surface, a curved or cylindrical secondary surface, and a conveying-surface adapted and arranged to receive an impression from said primary surface and impart it to said secondary surface, said primary surface and said secondary surface being removable so that other primary surfaces and other secondary surfaces may be substituted therefor and work in the same place in the machine, and said primary and secondary surfaces being supported in the machine in the same or equivalent definite and predetermined cooperating relation with respect to the conveying-surface and with reference to register in the subsequent printing, whereby accuracy of register may be attained in the operation of making the secondary printing-surfaces; preestablished guides with reference to which said bodies mounted in the machine may be arranged both longitudinally and transversely in accurate predetermined cooperating relation; and means for bringing said bodies together in cooperating contact in pairs.

42. In a machine designed to be used in making printing-surfaces, the combination of a primary surface, a secondary surface carried on a support and removable therefrom so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in the machine,

a conveying-surface carried on a support and means for bringing the primary surface and the conveying-surface or successive conveying-surfaces into positive contact and the successive secondary surfaces and said conveying-surface or successive conveying-surfaces into positive contact, whereby the conveying-surface or successive conveying-surfaces may receive impressions from the primary surface and thereafter impart them to the successive secondary surfaces, the primary surface and each successive secondary surface being supported in the same or equivalent definite and predetermined cooperating relation with respect to their coacting conveying-surface, whereby from a primary surface a plurality of identical and interchangeable secondary printing-surfaces may be made having identical impressions identically placed thereon.

43. In a machine designed to be used in making printing-surfaces, the combination of a primary surface carried on a support and removable therefrom so that other primary surfaces may be substituted therefor and work in the same place in the machine, a secondary surface carried on a support and removable therefrom so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in a machine, a conveying-surface carried on a support; and means for bringing the successive primary surfaces and the conveying-surface or successive conveying-surfaces into positive contact and the successive secondary surfaces and said conveying-surface or successive conveying-surfaces into positive contact, whereby the conveying-surface or successive conveying-surfaces may receive impressions from the successive primary surfaces and thereafter impart them to the successive secondary surfaces, the successive primary surfaces and the successive secondary surfaces being supported in the same or equivalent definite and predetermined cooperating relation with respect to their coacting conveying-surface and with reference to register in the subsequent printing, whereby from a series of registering primary surfaces a plurality of series of registering secondary printing-surfaces may be made, the members of each series of secondary printing-surfaces being identical and interchangeable with the corresponding members of the other series of such secondary printing-surfaces.

44. In a machine designed to be used in making printing-surfaces, the combination of a curved or cylindrical primary surface carried on a support and removable therefrom so that other primary surfaces may be substituted therefor and work in the same place in the machine, a curved or cylindrical secondary surface carried on a support and removable therefrom so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in the machine, a curved or cylindrical con-

veying-surface carried on a support; and means for bringing the successive primary surfaces and the conveying-surface or successive conveying-surfaces into positive rolling contact, and the successive secondary surfaces and said conveying-surface or successive conveying-surfaces into positive rolling contact, whereby the conveying-surface or successive conveying-surfaces may receive impressions from the successive primary surfaces and thereafter impart them to the successive secondary surfaces, the successive primary surfaces and the successive secondary surface being supported in the same or equivalent definite and predetermined cooperating relation with respect to their coacting conveying-surface and with reference to register in the subsequent printing, whereby from a series of registering curved or cylindrical primary surfaces a plurality of series of curved or cylindrical registering secondary printing-surfaces may be made, the members of each series of secondary printing-surfaces being identical and interchangeable with the corresponding members of the other series of such secondary printing-surfaces.

45. In a machine designed to be used in making printing-surfaces, the combination of a primary surface, a secondary surface carried on a support and removable therefrom so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in the machine, a conveying-surface carried on a support and means for bringing the primary surface and the conveying-surface or successive conveying-surfaces into positive contact and the successive secondary surfaces and said conveying-surface or successive conveying-surfaces into positive contact, whereby the conveying-surface or successive conveying-surfaces may receive impressions from the primary surface and thereafter impart them to the successive secondary surfaces, the primary surface and the successive secondary surface being supported in the same or equivalent definite and predetermined cooperating relation with respect to their coacting conveying-surface, devices for inking the primary surface whereby from a primary surface a plurality of identical and interchangeable secondary printing-surfaces may be made having identical impressions identically placed thereon.

46. In a machine designed to be used in making printing-surfaces, the combination of a primary surface carried on a support and removable therefrom so that other primary surfaces may be substituted therefor and work in the same place in the machine, a secondary surface carried on a support and removable therefrom so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in the machine, a conveying-surface carried on a support; and means for bringing the successive primary surfaces and the conveying-surface or successive conveying-sur-

faces into positive contact and the successive secondary surfaces and said conveying-surface or successive conveying-surfaces into positive contact, whereby the conveying-surface or successive conveying-surfaces may receive impressions from the successive primary surfaces and thereafter impart them to the successive secondary surfaces, the successive primary surfaces and the successive secondary surface being supported in the same or equivalent definite and predetermined cooperating relation with respect to their coacting conveying-surface and with reference to register in the subsequent printing, and devices for inking the primary surfaces, whereby from a series of registering primary surfaces a plurality of series of registering secondary printing-surfaces may be made, the members of each series of secondary printing-surfaces being identical and interchangeable with the corresponding members of the other series of such secondary printing-surfaces.

47. In a machine designed to be used in making printing-surfaces, the combination of a curved or cylindrical primary surface carried on a support and removable therefrom so that other primary surfaces may be substituted therefor and work in the same place in the machine, a curved or cylindrical secondary surface carried on a support and removable therefrom so that successive identical and interchangeable secondary surfaces may be substituted therefor and work in the same place in the machine, a curved or cylindrical conveying-surface carried on a support; and means for bringing the successive primary surfaces and the conveying-surface or successive conveying-surfaces into positive rolling contact, and the successive secondary surfaces and said conveying-surface or successive conveying surfaces into positive rolling contact, whereby the conveying-surface or successive conveying-surfaces may receive impressions from the successive primary surfaces and be thereafter turned over upon the successive secondary surfaces, the successive primary surfaces and the successive secondary surface being supported in the same or equivalent definite and predetermined cooperating relation with respect to their coacting conveying-surface and with reference to register in the subsequent printing, whereby from a series of registering curved or cylindrical primary surfaces a plurality of series of curved or cylindrical registering secondary printing-surfaces may be made, the members of each series of secondary printing-surfaces being identical and interchangeable with the corresponding members of the other series of such secondary printing-surfaces.

48. In a machine designed to be used in making printing-surfaces, the combination of a support for a primary surface, a primary surface carried on said support and removable therefrom so that another primary surface may be substituted therefor, a conveying-sur-

face carried on a suitable support and removable therefrom so that another conveying-surface may be substituted therefor in the same place, each primary surface being supported in the machine in the same predetermined cooperating relation with respect to its conveying-surface as every other primary surface with respect to its conveying-surface, and means for bringing a primary surface and a conveying-surface into positive contact whereby successive primary surfaces may print their designs or impressions upon successive conveying-surfaces in the same identical relation, said conveying-surfaces being adapted to be turned over from their support on successive secondary surfaces.

49. In a machine designed to be used in making printing-surfaces, the combination of a support for a primary surface, a primary surface carried on said support and removable therefrom so that another primary surface may be substituted therefor, said primary surface having a plurality of designs or impressions arranged in accurate and predetermined relation with respect to each other and with reference to register in the subsequent printing of said designs, a conveying-surface carried on a suitable support and removable therefrom so that another conveying-surface may be substituted therefor in the same place, each primary surface being supported in the machine in the same predetermined cooperating relation with respect to its conveying-surface as every other primary surface with respect to its conveying-surface, and means for bringing a primary surface and a conveying-surface into positive contact whereby successive primary surfaces may print their designs or impressions upon successive conveying-surfaces in the same identical relation, said conveying-surfaces being adapted to be turned over from their support on successive secondary surfaces.

50. In a machine designed to be used in making printing-surfaces, the combination of a support for a primary surface, a primary surface carried on said support and removable therefrom so that another primary surface may be substituted therefor, a curved conveying-surface carried on a suitable support and removable therefrom so that another conveying-surface may be substituted therefor in the same place, each primary surface being supported in the machine in the same predetermined cooperating relation with respect to its conveying-surface as every other primary surface with respect to its conveying-surface, and means for bringing a primary surface and a conveying-surface into positive rolling contact whereby successive primary surfaces may print their designs or impressions upon successive conveying-surfaces in the same identical relation, said conveying-surfaces being adapted to be turned over from their support on successive secondary surfaces.

51. In a machine designed to be used in mak-

ing printing-surfaces, the combination of a support for a primary surface, a primary surface carried on said support and removable therefrom so that another primary surface
 5 may be substituted therefor, said primary surface having a plurality of designs or impressions arranged in accurate and predetermined relation with respect to each other and with reference to register in the subsequent
 10 printing of said designs, a curved conveying-surface carried on a suitable support and removable therefrom so that another conveying-surface may be substituted therefor in the same place, each primary surface being sup-
 15 ported in the machine in the same predetermined cooperating relation with respect to its conveying-surface as every other primary surface with respect to its conveying-surface, and means for bringing a primary surface
 20 and a conveying-surface into positive rolling contact whereby successive primary surfaces may print their designs or impressions upon successive conveying-surfaces in the same identical relation, said conveying-surfaces be-
 25 ing adapted to be turned over from their support on successive secondary surfaces.

52. In a machine designed to be used in making a printing-surface, the combination of a secondary surface and a conveying-surface
 30 comprising a unitary surface having a plurality of designs or impressions printed thereon in accurate and predetermined relation with respect to each other and with reference to register in the subsequent printing of said
 35 designs, said secondary surface and said conveying-surface being supported in the machine in predetermined cooperating relation with respect to each other, and means for bringing the conveying-surface and the sec-
 40 ondary surface into positive contact, the impressions or designs of the conveying-surface being imparted to the secondary surface in accurate predetermined relation, and said secondary surface may be made into a secondary
 45 printing-surface suitable for printing.

53. In a machine designed to be used in making a printing-surface, the combination of a secondary surface, and a curved conveying-surface comprising a unitary surface having
 50 a plurality of designs or impressions printed thereon in accurate and predetermined relation with respect to each other and with reference to register in the subsequent printing of said designs, said secondary surface and
 55 said conveying-surface being supported in the machine in predetermined cooperating relation with respect to each other, and means for bringing the conveying-surface and the secondary surface into positive rolling con-
 60 tact, the impressions or designs of the conveying-surface being imparted to the secondary surface in accurate predetermined relation, and said secondary surface may be made into a secondary printing-surface suitable for
 65 printing.

54. In a machine designed to be used in making a printing-surface, the combination of a

curved or cylindrical secondary surface, and a conveying-surface comprising a unitary surface having a plurality of designs or impres- 70
 sions printed thereon in accurate and prede-
 termined relation with respect to each other
 and with reference to register in the subse-
 quent printing of said designs, said second-
 ary surface and said conveying-surface being 75
 supported in the machine in predetermined co-
 operating relation with respect to each other,
 and means for bringing the conveying-sur-
 face and the secondary surface into positive
 rolling contact, the impressions or designs of 80
 the conveying-surface being imparted to the
 secondary surface in accurate predetermined
 relation and said secondary surface may be
 made into a secondary printing-surface suit-
 able for printing. 85

55. In a machine designed to be used in making a printing-surface, the combination of a curved or cylindrical secondary surface and a conveying-surface comprising a unitary sur- 90
 face having a plurality of designs or impres-
 sions printed thereon in accurate and prede-
 termined relation with respect to each other
 and with reference to register in the subse-
 quent printing of said designs, said secondary
 surface and said conveying-surface being sup- 95
 ported in the machine in predetermined co-
 operating relation with respect to each other,
 means for bringing the conveying-surface and
 the secondary surface into positive contact,
 the impressions or designs of the conveying- 100
 surface being imparted to the secondary sur-
 face in accurate predetermined relation and
 said secondary surface may be made into a sec-
 ondary printing-surface suitable for printing.

56. In a machine designed to be used in mak- 105
 ing a printing-surface, the combination of a
 lithographic surface and a conveying-surface
 comprising a unitary surface having a plural-
 ity of designs or impressions printed thereon
 in accurate and predetermined relation with 110
 respect to each other and with reference to
 register in the subsequent printing of said de-
 signs, said secondary surface and said con-
 veying-surface being supported in the ma-
 chine in predetermined cooperating relation 115
 with respect to each other, means for bring-
 ing the conveying-surface and the secondary
 surface into positive rolling contact, the im-
 pressions or designs of the conveying-surface
 being imparted to the secondary surface in 120
 accurate predetermined relation and said sec-
 ondary surface may be made into a secondary
 printing-surface suitable for printing.

57. In a machine designed to be used in mak- 125
 ing a printing-surface, the combination of a
 curved or cylindrical lithographic secondary
 surface, and a conveying-surface comprising
 a unitary surface having a plurality of de-
 signs or impressions printed thereon in accu-
 rate and predetermined relation with respect 130
 to each other and with reference to register
 in the subsequent printing of said designs,
 said secondary surface and said conveying-
 surface being supported in the machine in

predetermined cooperating relation with respect to each other, means for bringing the conveying-surface and the secondary surface into positive contact, the impressions or designs of the conveying-surface being imparted to the secondary surface in accurate predetermined relation and said secondary surface may be made into a secondary printing-surface suitable for printing.

58. In a machine designed to be used in making a printing-surface, the combination of a primary surface, a conveying-surface carried on a suitable support and removable therefrom, preestablished guides with reference to which said primary surface and said conveying-surface may be arranged in the machine in accurate predetermined cooperating relation both longitudinally and transversely with respect to each other, and means for bringing said primary surface and said conveying-surface into positive contact whereby said primary surface may print its design or impression on said conveying-surface, said conveying-surface being adapted to be subsequently turned over from its support upon a secondary surface.

59. In a machine designed to be used in making a printing-surface, the combination of a primary surface having a plurality of designs or impressions arranged in accurate and predetermined relation thereon with respect to each other and with reference to register in the subsequent printing of said designs, a conveying-surface carried on a suitable support and removable therefrom, said primary surface and said conveying-surface being supported in the machine in predetermined cooperating relation with respect to each other, and means for bringing said primary surface and said conveying-surfaces into positive contact whereby said primary surface may print its design or impressions on said conveying-surface, said conveying-surface being adapted to be subsequently turned over from its support upon a secondary surface.

60. In a machine designed to be used in making a printing-surface, the combination of a primary surface having a plurality of designs or impressions arranged in accurate and predetermined relation thereon with respect to each other and with reference to register in the subsequent printing of said designs, a curved conveying-surface carried on a suitable support and removable therefrom, said primary surface and said conveying-surface being supported in the machine in predetermined cooperating relation with respect to each other, and means for bringing said primary surface and said conveying surface into positive rolling contact whereby said primary surface may print its design or impression on said conveying-surface, said conveying-surface being adapted to be subsequently turned over from its support upon a secondary surface.

61. In a machine designed to be used in making printing-surfaces, the combination of a

primary printing-surface; a removable and replaceable secondary surface; a support for said secondary surface having an accurate predetermined seat for the secondary surface and successive secondary surfaces in which said secondary surfaces may be seated in the same accurate predetermined position both longitudinally and transversely; a support for a conveying-surface or successive conveying-surfaces; preestablished guides with reference to which the primary and secondary surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; and means for bringing a conveying-surface into contact with the primary surface and then with a secondary surface whereby the design of the primary surface may be imparted to the secondary surface in accurate predetermined position and with reference to register, the secondary surface and successive secondary surfaces being designed and constructed to fit in a predetermined seat in a printing-press.

62. In a machine designed to be used in making printing-surfaces, the combination of a primary printing-surface; a removable and replaceable curved shell-like secondary surface; a rotary support for said secondary surface having an accurate predetermined seat for the secondary surface and successive secondary surfaces in which said secondary surfaces may be seated in the same accurate predetermined position both longitudinally and transversely; a support for a conveying-surface or successive conveying-surfaces; preestablished guides with reference to which the primary and secondary surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; and means for bringing a conveying-surface into contact with the primary surface and then with a secondary surface whereby the design of the primary surface may be imparted to the secondary surface in accurate predetermined position and with reference to register, the secondary surface and successive secondary surfaces being designed and constructed to fit in a predetermined seat in a printing-press.

63. In a machine designed to be used in making printing-surfaces, the combination of a removable and replaceable primary printing-surface; a support for said primary surface and successive primary surfaces having an accurate preestablished seat for the primary surface and successive primary surfaces in which said primary surfaces may be seated in the same predetermined position both longitudinally and transversely; a removable and replaceable secondary surface; a support for said secondary surface having an accurate predetermined seat for the secondary surface and successive secondary surfaces in which said secondary surfaces may be seated in the same accurate predetermined position both longitudinally and transversely; a support for a conveying-surface or successive convey-

ing-surfaces; preestablished guides with reference to which the primary and secondary surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; and means for bringing a conveying-surface into contact with a primary surface and then with a secondary surface whereby the design of the primary surface may be imparted to the secondary surface in accurate predetermined position and with reference to register, the secondary surface and successive secondary surfaces being designed and constructed to fit in a predetermined seat in a printing-press.

64. In a machine designed to be used in making printing-surfaces, the combination of a curved shell-like removable and replaceable primary printing-surface; a rotary support for said primary surface and successive primary surfaces having an accurate preestablished seat for the primary surface and successive primary surfaces in which said primary surfaces may be seated in the same predetermined position both longitudinally and transversely; a removable and replaceable curved shell-like secondary surface; a rotary support for said secondary surface having an accurate predetermined seat for the secondary surface and successive secondary surfaces in which said secondary surfaces may be seated in the same accurate predetermined position both longitudinally and transversely; a support for a conveying-surface or successive conveying-surfaces; preestablished guides with reference to which the primary and secondary surfaces may be arranged in accurate predetermined cooperating relation both longitudinally and transversely; and means for bringing a conveying-surface into contact with a primary surface and then with a secondary surface whereby the design of the primary surface may be imparted to the secondary surface in accurate predetermined position and with reference to register, the secondary surface and successive secondary surfaces being designed and constructed to fit in a predetermined seat in a printing-press.

65. In a machine designed to be used in making a printing-surface, the combination of a support for a conveying-surface having devices for holding and releasing a removable conveying-surface, and a support for a secondary surface, said supports arranged to be brought together so as to effect positive contact between a conveying-surface and a secondary surface, and means for operating said holding and releasing devices whereby the conveying-surface may be released and turned over upon the secondary surface.

66. In a machine designed to be used in making a printing-surface, the combination of a support for a conveying-surface having devices for holding and releasing a removable conveying-surface, and a support for a secondary surface, said supports arranged to be brought together so as to effect positive contact between a conveying-surface and a sec-

ondary surface, and means for automatically operating said holding and releasing devices whereby the conveying-surface may be released and turned over upon the secondary surface.

67. The combination of a support for a conveying-surface having devices for holding successive conveying-surfaces in the same identical position on the support, a roll of transfer-paper carried in a fixed predetermined position with respect to the support, and means for severing the paper from the roll whereby successive transfers may be drawn out from the roll and held in identically the same position on the support and severed from the roll and turned over from the support.

68. The combination of a curved or cylindrical support for a conveying-surface having devices for holding successive conveying-surfaces in the same identical position on the support, a roll of transfer-paper carried in a fixed predetermined position with respect to the support, and means for severing the paper from the roll, whereby successive transfers may be drawn out from the roll and held in identically the same position on the support and severed from the roll and turned over from the support.

69. The combination of a curved or cylindrical rotating support for a conveying-surface designed to be turned over from said support upon a secondary surface, a pair of radially-extensible arms for said support, a roll of transfer-paper carried by said arms whereby successive conveying-surfaces may be spread from the roll over said support, means for holding a conveying-surface on the support drawn out over the support from said roll, and means for severing a conveying-surface from the roll.

70. The combination of a curved or cylindrical support for a conveying-surface designed to be turned over from said support upon a secondary surface, a roll of transfer-paper, and a carrier for said roll adapted to move over said support whereby the paper for the roll may be laid over the support to provide the conveying-surface.

71. The combination of a curved or cylindrical rotating support for a conveying-surface designed to be turned over from said support upon a secondary surface, said support being carried on a shaft, a roll of transfer-paper, a carrier for said roll adapted to move over said support whereby the paper from the roll may be laid over said support, said carrier comprising a pair of radial arms revolvably mounted on said shaft.

72. The combination of a curved or cylindrical rotating support for a conveying-surface designed to be turned over from said support upon a secondary surface, said support being carried on a shaft, a roll of transfer-paper, a carrier for said roll adapted to move over said support whereby the paper from the roll may be laid over said support, said car-

rier comprising a pair of radially-extensible arms revolubly mounted on said shaft, means for holding the paper in place on the support, and means for severing it from the roll.

5 73. In a machine designed to be used in making a printing-surface, the combination of a cylindrical primary surface, a cylindrical secondary surface, and a curved or cylindrical support for a conveying-surface located between the primary and secondary surfaces and movable to and from said primary and secondary surfaces.

74. In a machine designed to be used in making a printing-surface, the combination of a rotating cylindrical primary surface, a rotating cylindrical secondary surface, a rotating curved or cylindrical support for a conveying-surface located between said primary and secondary surfaces, means for moving said support to and from the primary and secondary surfaces without rotating said support, and means for effecting positive rolling contact between a conveying-surface carried on its support and the primary and secondary surfaces.

75. In a machine designed to be used in making a printing-surface, the combination of a rotating cylindrical primary surface, a rotating cylindrical secondary surface, a rotating curved or cylindrical support for a conveying-surface located between said primary and secondary surfaces, means for moving said support to and from the primary and secondary surfaces without rotating said support, devices for inking said primary and secondary surfaces, and means for effecting positive rolling contact between a conveying-surface carried on its support and the primary and secondary surfaces.

76. The combination of a frame adapted to carry inking-rollers with the arms 130, 139 and 149 arranged to removably confine the rollers in place in the frame.

77. In a machine the combination of a drum or cylinder loosely mounted on a shaft, eccentrics 120 fixed on the shaft and working in boxes movable in one direction, boxes supporting the shaft and movable at a right angle to the direction of movement of the boxes 120, and means for rotating the shaft, whereby the drum or cylinder may be moved without rotating it.

78. The combination of a shaft 23 carrying a gear 112; a shaft 114 carrying a gear 113, clutch 117 and gear 115; cylinder 11 carrying gear 116; a cylinder as 2 having gear 50 and means for operatively connecting and disconnecting the shaft 23 from the cylinder as 2 whereby the cylinder 11 and cylinder as 2 may be separately or conjointly driven.

79. The combination of the cylinder 2, cylinder 11 and cylinder 6 and mechanism for driving said cylinders provided with devices for connecting and disconnecting said mechanism from said cylinders whereby the cylinders may be separately driven or the cylinder 11 may be driven in conjunction with

either the cylinder 2 or the cylinder 6, and means for raising and lowering the cylinders 2 and 6.

80. In a machine adapted for use in making printing-surfaces, the combination of the cylinder 2, cylinder 11 and cylinder 6 having intermeshing gears and means for moving the cylinder 11 to and from the cylinders 2 and 6, and mechanism for driving said cylinders separately and the cylinder 11 in conjunction with the cylinder 2 or cylinder 6 as desired.

81. The combination of shaft 19 having worms 100 and 101, hoisting-arms 96 and 99 having racks, shafts 108 and 109 having gears connecting the worms with the racks and clutches for locking the worms on the shaft 19.

82. The combination of shaft 19 having worms 100 and 101, hoisting-arms 96 and 99 having racks, shafts 108 and 109 having gears connecting the worms with the racks and clutches for locking the worms on the shaft 19, shaft 23 geared to shaft 19, the cylinders 2, 6 and 11, and mechanism operatively connecting for separate operation said cylinders 2 and 6 with the shaft 23.

83. In a machine designed for use in making printing-surfaces, the combination of a primary printing-surface; a secondary surface and a conveying-surface, mechanism for bringing the primary surface and conveying-surface together and separating them, and the secondary surface and conveying-surface together and separating them; mechanism for driving the primary surface and conveying-surface together in operative contact, and for driving the secondary surface and conveying-surface together in operative contact and preestablished guides with reference to which said surfaces may be brought together in accurate predetermined cooperating relation both longitudinally and transversely.

84. In a machine designed for use in making printing-surfaces, the combination of a primary printing-surface; a secondary surface and a rotating conveying-surface; mechanism for bringing the primary surface and conveying-surface together and separating them, and the secondary surface and conveying-surface together and separating them; mechanism for driving the primary surface and conveying-surface together in operative contact, and for driving the secondary surface and conveying-surface together in operative contact and preestablished guides with reference to which said surfaces may be brought together in accurate predetermined cooperating relation both longitudinally and transversely.

85. In a machine designed for use in making printing-surfaces, the combination of a rotating primary printing-surface; a secondary surface and a conveying-surface, mechanism for bringing the primary surface and conveying-surface together and separating them, and the secondary surface and conveying-surface together and separating them;

mechanism for driving the primary surface and conveying-surface together in operative contact, and for driving the secondary surface and conveying-surface together in operative contact.

86. In a machine designed for use in making printing-surfaces, the combination of a primary printing-surface; a rotating secondary surface and a conveying-surface, mechanism for bringing the primary surface and a conveying-surface together and separating them, and the secondary surface and conveying-surface together and separating them; mechanism for driving the primary surface and conveying-surface together in operative contact, and for driving the secondary surface and conveying-surface together in operative contact and preestablished guides with reference to which said surfaces may be brought together in accurate predetermined cooperating relation both longitudinally and transversely.

87. In a machine designed for use in making printing-surfaces, the combination of a rotating primary printing-surface; a rotating secondary surface and a conveying-surface, mechanism for bringing the primary surface and conveying-surface together and separating them, and the secondary surface and conveying-surface together and separating them; mechanism for driving the primary surface and conveying-surface together in operative contact, and for driving the secondary surface and conveying-surface together in operative contact.

88. In a machine designed for use in making printing-surfaces, the combination of a rotating primary printing-surface; a rotating secondary surface and a rotating conveying-surface, mechanism for bringing the primary surface and conveying-surface together and separating them, and the secondary surface and conveying-surface together and separating them; mechanism for driving the primary surface and conveying-surface together in operative contact, and for driving the secondary surface and conveying-surface together in operative contact.

89. In a machine designed for use in making printing-surfaces, the combination of a primary printing-surface; a secondary surface and a conveying-surface, mechanism for bringing the primary surface and conveying-surface together and separating them, and the secondary surface and conveying-surface together and separating them; mechanism for driving the primary surface and conveying-surface together in operative contact, and for driving the secondary surface and conveying-surface together in operative contact, and devices for inking the primary surface and preestablished guides with reference to which said surfaces may be brought together in accurate predetermined cooperating relation both longitudinally and transversely.

90. In a machine designed for use in mak-

ing printing-surfaces, the combination of a primary printing-surface; a secondary surface and a rotating conveying-surface, mechanism for bringing the primary surface and conveying-surface together and separating them, and the secondary surface and conveying-surface together and separating them; mechanism for driving the primary surface and conveying-surface together in operative contact, and for driving the secondary surface and conveying-surface together in operative contact, and devices for inking the primary surface and preestablished guides with reference to which said surfaces may be brought together in accurate predetermined cooperating relation both longitudinally and transversely.

91. In a machine designed for use in making printing-surfaces, the combination of a rotating primary printing-surface; a rotating secondary surface and a conveying-surface, mechanism for bringing the primary surface and conveying-surface together and separating them, and the secondary surface and conveying-surface together and separating them; mechanism for driving the primary surface and conveying-surface together in operative contact, and for driving the secondary surface and conveying-surface together in operative contact, and devices for inking the primary surfaces.

92. In a machine designed for use in making printing-surfaces, the combination of a primary surface; a secondary surface, and a conveying-surface; mechanism for moving the conveying-surface into and out of contact with the primary and secondary surfaces; and mechanism for driving the conveying-surface and primary surface together, and the conveying-surface and secondary surface together and preestablished guides with reference to which said surfaces may be brought together in accurate predetermined cooperating relation both longitudinally and transversely.

93. In a machine designed for use in making printing-surfaces, the combination of a primary surface; a rotary secondary surface, and a conveying-surface; mechanism for moving the conveying-surface into and out of contact with the primary and secondary surfaces; and mechanism for driving the conveying-surface and primary surface together and the conveying-surface and secondary surface together and preestablished guides with reference to which said surfaces may be brought together in accurate predetermined cooperating relation both longitudinally and transversely.

94. In a mechanism designed for use in making printing-surfaces, the combination of a primary surface; a secondary surface, and a conveying-surface; devices for inking the primary surface; mechanism for moving the conveying-surface into and out of contact with the primary and secondary surfaces; and

mechanism for driving the conveying-surface
and primary surface together and the convey-
ing-surface and secondary surface together
and preestablished guides with reference to
5 which said surfaces may be brought together
in accurate predetermined cooperating rela-
tion both longitudinally and transversely.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

EDWARD HETT.

Witnesses:

NICHOLAS M. GOODLETT, Jr.,
SIDNEY MANN.