(No Model.) 3 Sheets—Sheet 1.

C. BURROWS.

RULING MACHINE.

No. 568,235. Patented Sept. 22, 1896.

Fig. 1.

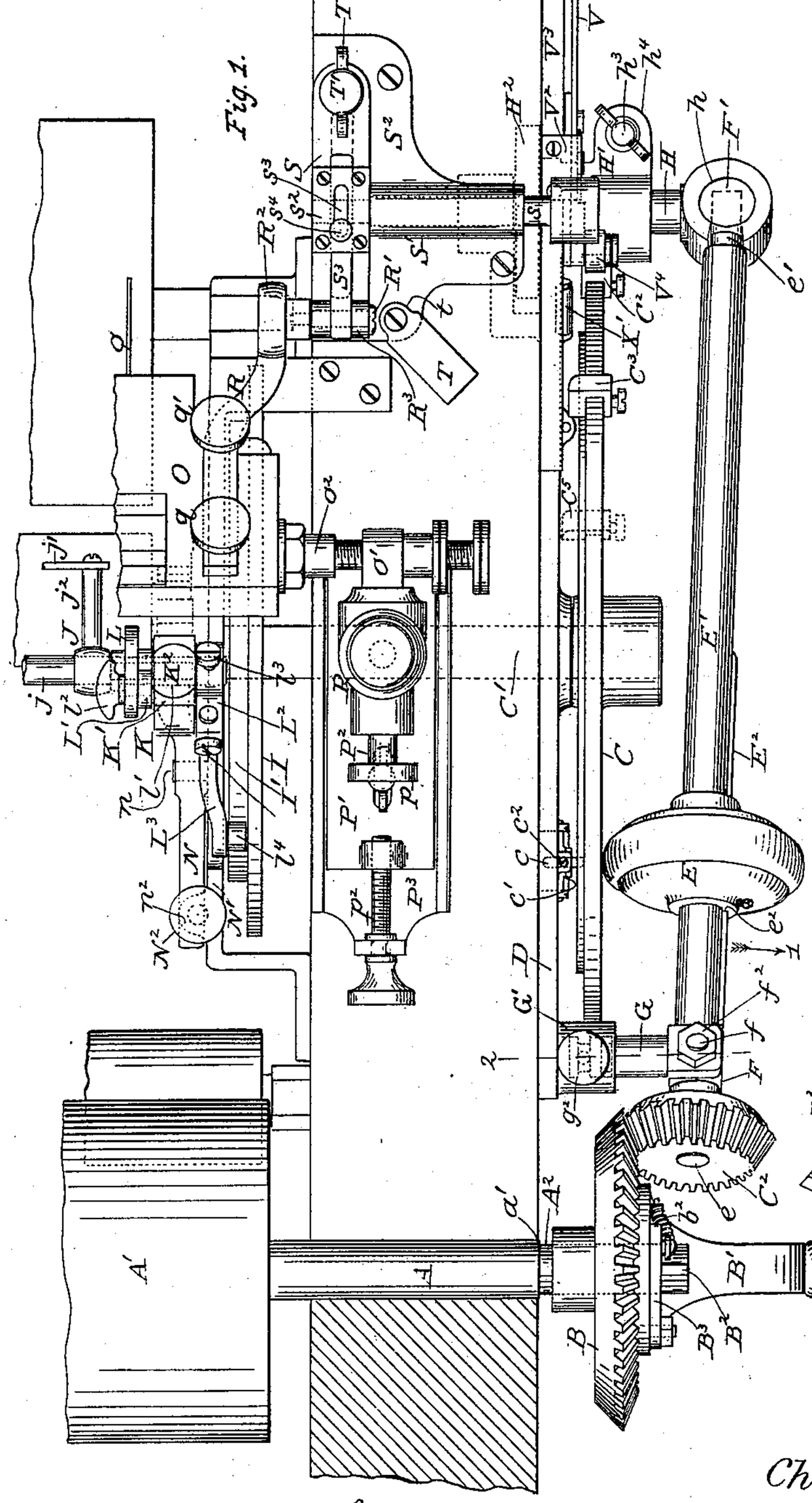


Fig. 6.

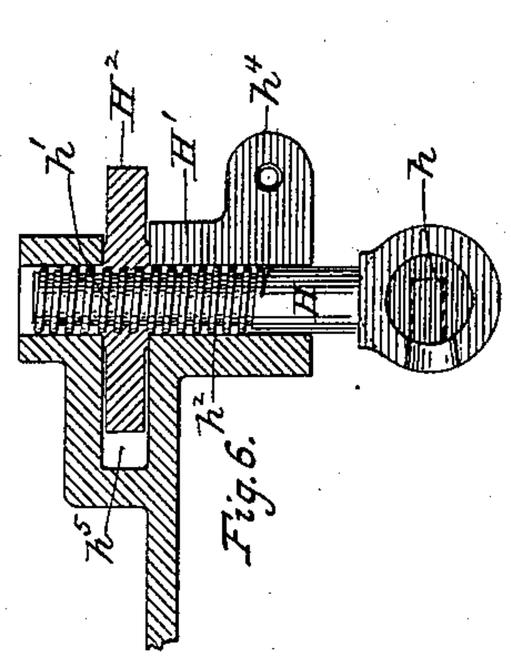


Fig. 4.

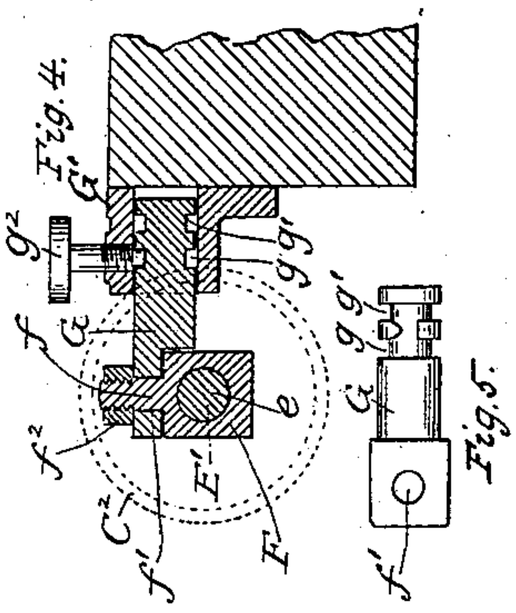
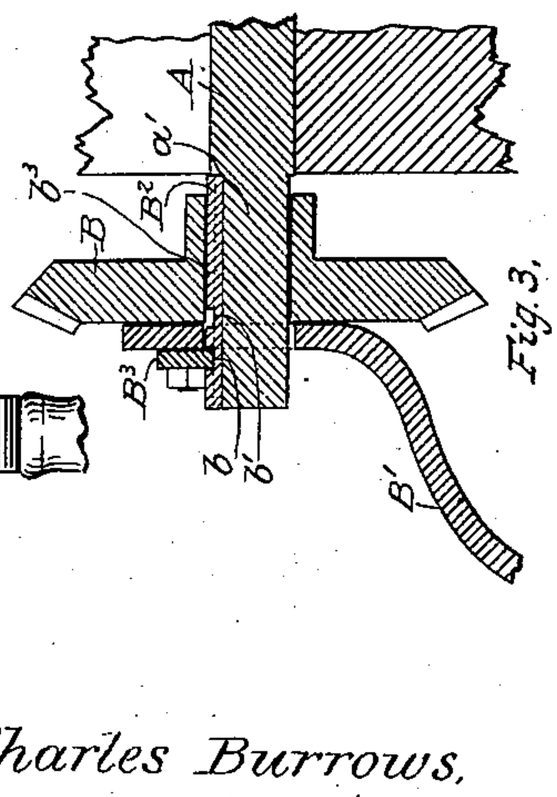


Fig. 5.

Fig. 3.



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(No Model.) 3 Sheets—Sheet 2.

C. BURROWS.

RULING MACHINE.

No. 568,235. Patented Sept. 22, 1896.

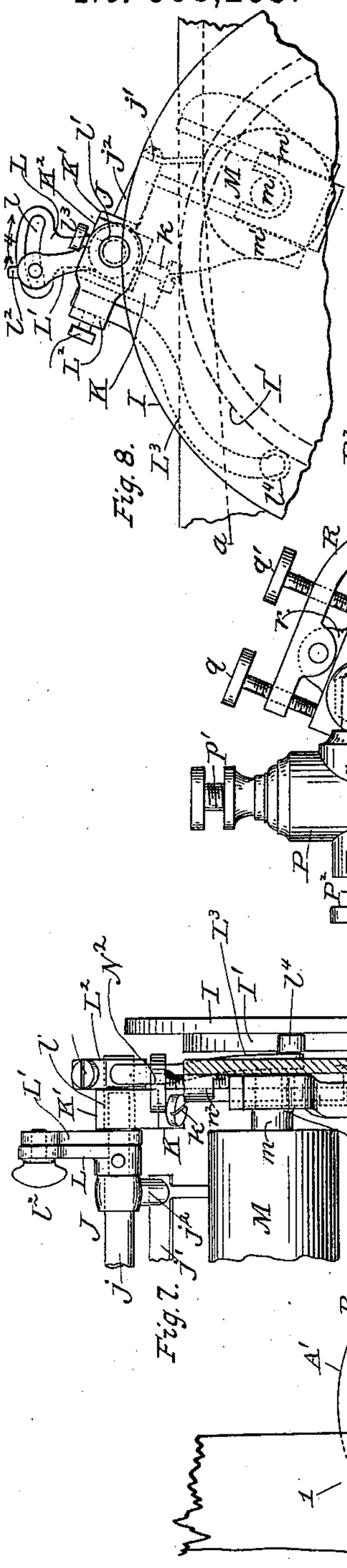

Fig. 8.

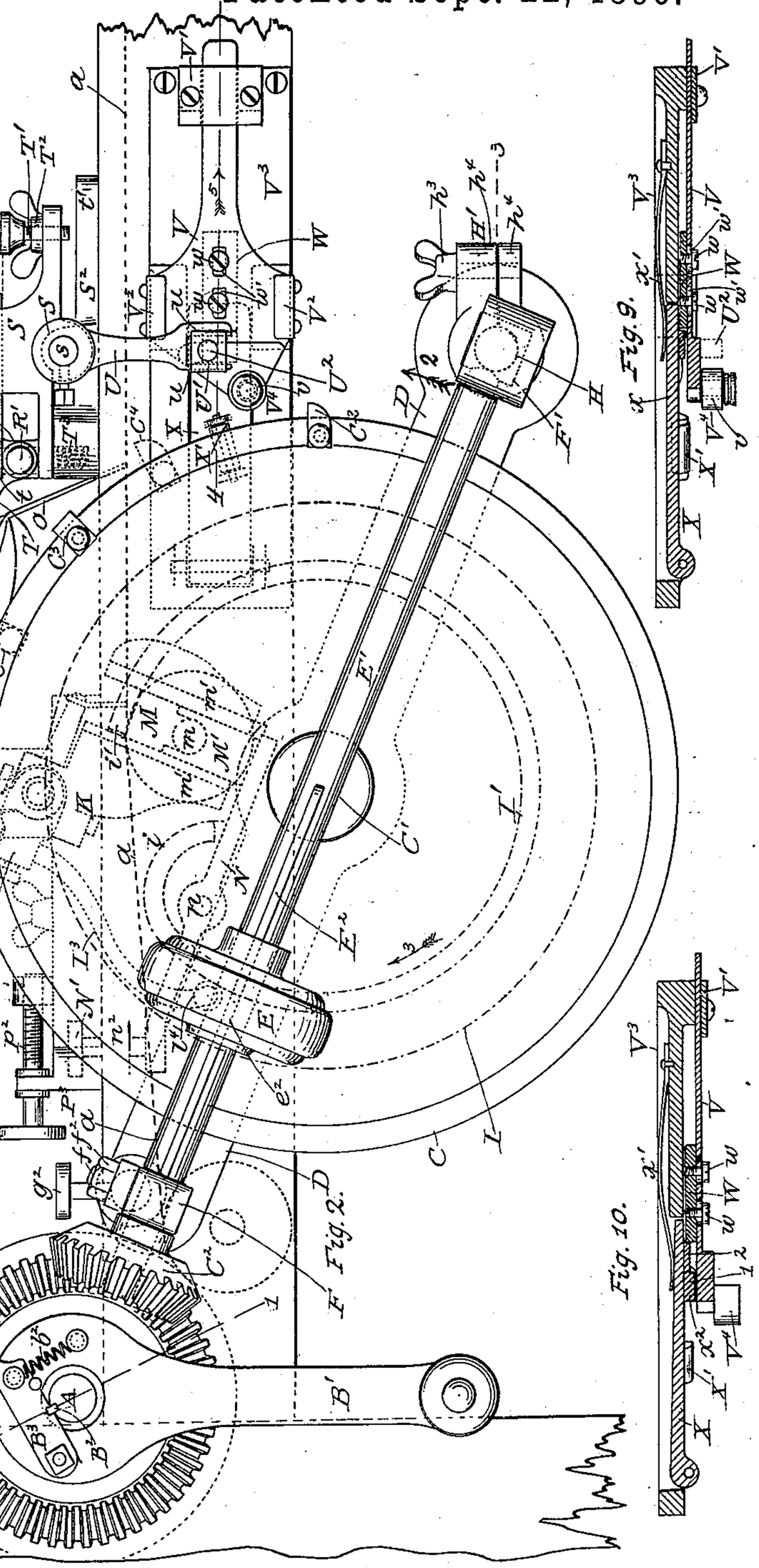

Fig. 2.

Fig. 9.

Fig. 7.

Fig. 10.

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(No Model.) 3 Sheets—Sheet 3.

C. BURROWS.

RULING MACHINE.

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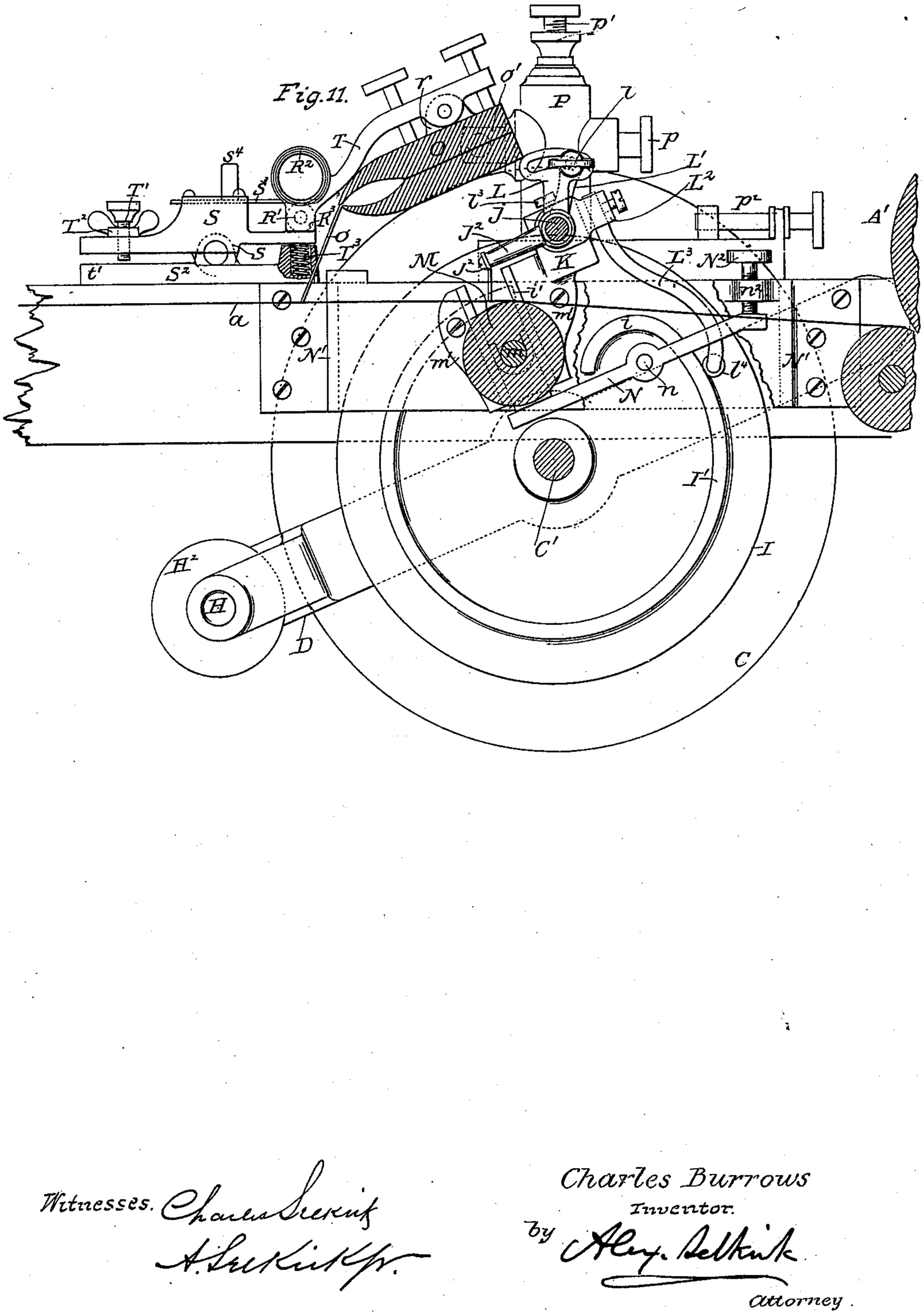
Fig. 11.



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UNITED STATES PATENT OFFICE.

CHARLES BURROWS, OF SCHENECTADY, NEW YORK.

RULING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 568,235, dated September 22, 1896.

Application filed September 12, 1895. Serial No. 562,295. (No model.)

To all whom it may concern:

Be it known that I, CHARLES BURROWS, a citizen of the United States, and a resident of the city and county of Schenectady, in the State of New York, have invented certain new and useful Improvements in Ruling-Machines, of which the following is a specification.

My invention relates to improvements in machines for ruling flat papers; and it consists in the combinations of devices and elements hereinafter described, and particularly set forth in the claims.

The objects of my invention are, first, to provide a combination of devices by which the driving bevel-gear on the feed-roller shaft may at will be thrown into or out of engagement with the gear it drives, whereby the machine may be operated for faint lining as may be preferred or required, and also to admit the employment, on the shaft of the driven gear, of friction-wheels of different diameters for use for increasing or lessening the speed of the cam-disk; second, to provide a combination of devices whereby either one of several friction-wheels of varying diameters may, at will, be made to replace any other one of said wheels and also be variously adjusted on its shaft for increasing or lessening the speed of the shaft of the cam-disk in relation to that of the feed-roller for nicely adjusting the movements of various parts in relation to each other; third, to provide a combination of devices whereby the gate may be released or fixed as required for changing the machine from that for faint lining to that for striking or the reverse; fourth, to provide combinations of devices by which may be effected an accurate adjustment of the number of times of raising and dropping the pens in relation to the speed of the travel of the paper, and also to provide combinations of elements by means of which the pens may be quickly, automatically, and positively carried to the paper without jars, vibrations, or liability to rebound or stagger and without regard to any variation in the initial speed of the machine itself and the pens be raised from contact with the paper at predetermined points on the same.

Other objects and advantages of this invention will appear in the following description, and the novel features thereof will be pointed out in the claims.

This invention is illustrated in the accompanying drawings, which, with the letters of reference marked thereon, form a part of this specification, and in which—

Figure 1 is a plan view of that portion of a ruling-machine which embodies the improvements in this invention. Fig. 2 is a side elevation of the same. Fig. 3 is a section taken at line 1 in Fig. 2. Fig. 4 is a section taken at line 2 in Fig. 1, illustrating means for holding and releasing the bracket sustaining one of the bearings of the counter-shaft of the machine. Fig. 5 is a view of the said bracket from its upper side. Fig. 6 is a section taken at line 3 in Fig. 2. Fig. 7 is a side elevation of the disk, a section thereof, for actuating mechanism for operating the gate passing the paper to the pens. Fig. 8 is a front view of the same. Fig. 9 is a section taken at line 4 in Fig. 2 and illustrating a mechanism for vibrating in one direction the oscillating devices between said mechanism and the pen-beam. Fig. 10 is a section taken at line 4 4 in Fig. 2 and illustrating a modification of a part thereof, in which a step-form stop x^2 is shown in lieu of the plain stop x shown in Fig. 9; and Fig. 11 is a sectional elevation of the machine on the inside of the frame-rail of the same in Fig. 1 and looking toward the inside of said frame-rail.

The same letters of reference refer to similar parts throughout the several views.

In the drawings, A is the drive-shaft of the machine, which shaft is mounted in suitable bearings and actuated by a suitable band or gear mechanism (not shown) driven by any suitable power. A′ is the feed-roller, mounted on said shaft, and a is the usual endless cloth carried by suitable rollers and employed for carrying paper to be ruled.

B is the drive bevel-gear, suitably secured to shaft A, and B′ is a hand-crank, also secured to said shaft or to said bevel-gear for revolving said shaft A by hand when parts of the machine are being adjusted or when it may be advantageous. In my preferred means for securing said drive bevel-gear on said shaft the reduced portion A^2 of the same is made with a length from shoulder a' sufficient to allow an endwise movement of said

gear to a distance of one-half inch, or more or less, as may be preferred. B^2 is a spline set in the portion A^2 of said shaft, and *b b'* are notches made in said spline, as shown in Fig. 3, for receiving latch B^3, pivoted to the said bevel-gear and its attached crank, and b^2 is a spring for holding said latch in said notches it is intended it should engage with. A groove b^3, formed at a side of the central perforation of the gear B, holds with the spline B^2, fixed with portion A^2 of shaft A. When latch B^3 is raised out of the notches *b b'*, the gear B may be freely moved in either direction and may be thrown out of engagement with the bevel-gear it actuates, so that shaft A and its feed-roller A' may be revolved by hand or otherwise when faint ruling is to be done by hand, or be shifted in either direction for engaging with the same coacting bevel-gear, as its shaft may be moved laterally in direction relatively toward or from the shoulder *a'* of shaft A accordingly as larger or smaller friction-wheels are to be actuated.

C is revolving disk secured on shaft C', supported in suitable bearings secured to the framework of the machine. E is a friction-roller actuating said revolving disk, which friction-roller is mounted on shaft E', to one end of which bevel-gear C^2, actuated by gear B, is secured. Although this shaft E' of said friction-roller E may be mounted in bearings supported by rigidly-fixed brackets from the framework of the machine, yet I preferably provide for it bearings which are themselves movable and are each supported from brackets which are adjustable in respect to their extension from the frame, so that friction-rollers of different diameters may be carried by said shaft E', as may be preferred for actuating the disk C faster or slower, as may be advantageous or preferred. F, Figs. 1, 2, and 4, is the bearing for the journal *e* of said friction-roller shaft E', and F', Figs. 1, 2, and 6, is the bearing for the journal *e'* of the same shaft.

Bearing F is preferably made with a block form and with a perforation corresponding with the diameter of the journal *e* of shaft E, and is provided with the swivel-stem *f*, by which it is supported from the outer end portion of the bracket G by passing through perforation *f'* therein and secured by the nut f^2. The rearward end portion of this bracket G is cylindrical in form and provided with a series of annular grooves *g g'*. A sleeve G', secured to the frame, or a stationary piece fixed thereto, receives this grooved cylindrical end portion of said bracket, which may be adjusted longitudinally in either direction within the same and be secured therein by the set-screw g^2, screwed through a side wall of said sleeve with its lower end working in either one of the said grooves, as may be necessary by reason of the diameter of the friction-roller E, as, say, in groove *g*, when the friction-roller is of small diameter, or in groove *g'*, when the roller is of larger diameter. This bearing F, being supported and secured by bracket G, as described, is calculated to allow the friction-roller shaft E' to be swung outwardly in direction indicated by arrow 1 in Fig. 1, and the reverse.

Bearing F' is made in the form of a cylindrical block provided with a perforation for receiving the journal *e'* of shaft E', as indicated by dotted lines in Figs. 1 and 2.

H is a bracket having its outer end portion made with a sleeve form and calculated to receive the cylindrical block-form bearing F' within its central perforation *h*. The body of this bracket is also made with a cylindrical form and is provided with a screw-thread *h'*.

H' is a clamping-sleeve secured to the frame and having its bore h^2 of diameter corresponding with that of the screw-threaded body of said bracket, so as to receive the latter, and clamping-screw h^3, when turned in a proper direction, causes the split sides h^4 h^4 of this sleeve to clamp tightly on the body of said bracket and hold it from turning in either direction. This sleeve H' is divided in its length by opening h^5 of sufficient width for receiving a finger-wheel H^2 between the front and rear portion of said sleeve, which finger-wheel is provided with a central screw-thread working on the screw-thread *h'* of the body of said bracket H, as shown by full lines in Fig. 6 and indicated by dotted lines in Fig. 1. With these forms of construction and arrangements of the respective parts of the said bearing F', bracket H, sleeve H', and finger-wheel H^2, the said bearing F' and the rear end portion of the friction-roller shaft E' may be swung upwardly in direction of arrow 2 in Fig. 2 for removal of the bearing F' from its seat in said bracket H and the reverse for its return thereon, while the bracket itself is free to turn in its sleeve or holder H' in either direction, as may be required, for removal or replacement of bearing F' and be extended outwardly or drawn inwardly by the revolving of the finger-wheel H^2 in proper direction when it is desired to increase the pressure of the friction-roller E on the face of the disk C or reduce the same.

Secured longitudinally in a side of the shaft E' of the friction-roller E is the spline E^2, and in the hub of the said roller is provided the groove e^2, (indicated by dotted lines in Fig. 2 and shown by full lines in Fig. 1,) receiving said spline for holding said friction-roller from turning on said shaft E', and a set-screw screwing into a screw-threaded perforation in the hub of said friction-roller and against the shaft E' is provided, holding the roller E in position set to on the said shaft. When said friction roller or wheel E is moved toward the center of the disk C, it causes the latter to revolve faster, while when moved toward its circumference the speed of the disk will be slower. By the adjustability of the respective brackets G and H in direction toward or from the frame of the machine friction rollers or wheels E of varying diameters

may be readily employed and may be readily placed on the shaft E′ or removed from the same by simply loosening the clamping-screw h^3 and raising the rear end of the shaft upwardly, when the bearing F′ will be raised out from the bracket H, so as to allow it to be removed from the journal e' of said shaft, when the friction wheel or roller may be slipped on or off the same, as desired. The swivel-joint between the bearing E and its bracket G allows the shaft E′ to be swung outwardly in direction of arrow 1 or the reverse without materially affecting the engagement of the teeth of the respective gear-wheels B and C^2.

A reinforcing-roller c, suitably secured to an adjustable piece c', supported from the stationary piece D, may be employed against the rear side of disk C for reaction against the pressure of the friction roller or wheel E. The adjustable piece c' of this journal may be forced outwardly by means of the screw c^2, working between said piece c' and the fixed piece D.

I is a second disk. (Shown by full lines in Figs. 1, 7, and 8 and indicated by dotted lines in Fig. 2.) This disk I is secured on shaft C′ so as to revolve simultaneously with the disk C, actuated by the friction wheel or roller E. This disk I carries the gate-operating cam I′. (Shown by full lines in Figs. 1 and 8 and indicated by dotted lines in Figs. 2 and 7.)

J, Figs. 1, 2, 7, and 8, is a vertically-vibrating gate for regulating the passage of the sheets to be ruled from the feed-roller to beneath the pens. This gate comprises the shaft j, (a portion thereof shown,) straight-edge bar j', (a portion thereof shown,) and the connecting-arms j^2 in any suitable number, (but one shown,) connecting said straight-edge bar j' with said shaft j. This gate J thus comprised is extended across the machine and over the endless cloth from one side thereof to the other with the shaft j supported in suitable bearings in brackets secured to the sides of the frame of the machine, and with the lower edge of the straight-edge bar j' bearing on the upper surface of the endless cloth when this gate is operating to check the passage of the sheets to the pens and off from the said surface when allowing the passage of said sheets. The brackets K, (but one shown,) supporting the bearing of shaft j of this gate, are suitably secured one at each side of the frame of the machine. These brackets K (shown in Figs. 1, 2, 7, and 8) have with their upper ends the bearing-holder K′, which receive in their respective chambers a block-form bearing K^2, which is held from rising by the retaining-screw k.

Between the shaft j of the gate J and the second disk I is arranged mechanisms by which the operator may at will connect said gate with the cam I′, provided on the said disk for vibrating the said gate, and also for increasing or lessening the pressure of the bar j' of the same on the endless cloth, as may be required by the thickness or thinness of the sheets to be passed to beneath the pens. The mechanism for vibrating said gate consists of arm L, provided above with the transverse slot l and fixed on shaft j of said gate, arm L′ adjoining arm L and provided with a hollow journal l', Figs. 1, 7, and 8, loosely receiving a journal end of said shaft, as indicated by dotted lines, and extended through bearing K^2 and past the same, clamping-screw l^2, working in slot l of arm L and screwing into the head end of arm L′, bracket L^2, secured on the outer end portion of the hollow journal l' of arm L′, preferably by a set-screw l^3, and the actuating-arm L^3, secured by one of its ends to bracket L^2 and having its opposite end provided with roller l^4 for bearing on the cam I′ of the revolving disk I. The said cam I′ is preferably projected from the inner side of said disk, as shown by full lines in Figs. 1 and 8, and it is in form substantially concentric to the shaft on which said disk is secured with a sharpened curved receiving end i, separated from the abrupt termination i' by an interval of opening between, all as illustrated by dotted lines in Fig. 2.

When the disk I is revolved in the proper direction and the clamping-screw l^2 is loosened, the cam I′ will, through arm L^3 and bracket L^2, cease to oscillate arm L′ and not effect a movement of the gate; but when the arms L and L′ are secured together by the clamping-screw l^2, as shown in Figs. 1 and 7, the cam I′, revolving in direction of arrow 3, Fig. 2, will oscillate the united arms L L′ in direction of arrow 4, when the lower edge of bar j' will be carried down to the endless cloth a, running beneath and there be held for stopping the movement of a sheet on said cloth until the roller on arm L^3 has run off the terminating end i' of the cam I, when, by gravity or a reacting spring, the united arms L L′ will be oscillated in an opposite direction and cause the bar j' to be raised out of contact with the running cloth a, when the latter will carry the sheet forward to beneath the pens. As soon as the brake of the cam I′ has passed the roller of arm L^3 the cam will again oscillate the united arms L L′ in direction of arrow 4 and operate the gate to check the forward movement of the next succeeding sheet until the said gate is moved reversely, as before, for permitting its forward passage to the pens.

M is an adjustable cloth-supporting roller (shown by full and dotted lines in Fig. 1 and indicated by dotted lines in Fig. 2) having its journal m running in the adjustable bearing M′, which is held in place between ways m' m', which are preferably integral with bracket K.

N is a lever pivoted to piece N′ by pivot n and having one of its limbs bearing against the lower end of bearing M′.

N^2, Figs. 1 and 2, is a depressing-screw screw-

ing through the screw-threaded lug n^2, integral with piece N′ and against the opposite limb of said lever for depressing the same when the opposite end of the lever is to be raised for moving the bearing M′ and roller mounted thereon upwardly against the endless cloth *a*, slightly raising the latter against the lower edge of the bar *j′* of gate J to the distance required or preferred. A reverse movement of the depressing-screw N^2 will release pressure on lever N and allow the bearing M′ and roller M to move downwardly and allow the cloth to move out of contact with bar *j′*; while in connection with a similar adjusting mechanism at the far side of the machine an even pressure of the roller against the cloth may be had.

O, Figs. 1 and 2, is a pen-beam (a section shown) of any suitable construction calculated to hold with any desired number of ruling-pens *o*. This pen-beam is so journaled at its ends with suitable bearings projected from the frame of the machine that it may be supported across the endless cloth *a* and at suitable distance above the same and be capable of nice adjustment as may be required. The bearings *o′* of the journals of this pen-beam may be supported at both sides of the machine from any suitable brackets, yet preferably from adjustable brackets of construction shown and in common use, and consisting each (one shown) of a vertical standard P, secured to a sliding base P′, horizontal bar P^2, carrying bearing *o′*, adjusting-screw *p*, clamping-screw *p′*, stationary bed P^3, and adjusting-screw p^2 for moving said sliding base in either direction. A preferred form of this mechanism employed for oscillating the pen-beam O is shown in the drawings, in which—

R is a lever-form arm pivoted to lug *r*, secured to the pen-beam, preferably from its upper side and at a point relatively a little rearward of the axis of the journal o^2 of the pen-beam, as shown in Fig. 2. This lever-form arm is adjustable in a vertical direction by means of adjusting-screws *q q′*. The rear end of said arm is provided with journal R′, (shown by full lines in Fig. 2 and indicated by dotted lines in Fig. 1,) projected relatively laterally and at an angle to said arm R, and is also provided with a finger-piece R^2 for convenience in turning the pen-beam O in either direction by hand, as may be required.

R^3 is a hollow sleeve working loosely on the journal R′.

S is an oscillating lever carried by journal *s*, (shown by full lines in Fig. 2 and indicated by dotted lines in Fig. 1,) secured to or integral with said lever and working in the sleeve-form bearing S′, made integral with a suitable base-piece S^2, secured to the frame. One end of this oscillating lever is projected forward to beneath the sleeve or thimble R^3, loosely mounted on the journal R′, carried by the arm R, and has bearing against the lower side of said sleeve or thimble R^3, as shown in Fig. 2. This sleeve or thimble R^3 may be locked down from rising from the forward end of said lever by any suitable device, yet at this present time I prefer to employ a sliding retaining-bar S^3, suitably held in place with said lever S by keeper s^2 (shown to be provided with slot s^3) and secured to the upper side of said lever and provided with a vertical finger-piece s^4 for convenience in moving said retaining-bar in either direction, as to over and against the upper side surface of the sleeve or thimble R^3, as shown in Figs. 1 and 2, or off from contact with the same, as may be desired or required. When this locking device is in service holding the sleeve R^3 on arm R from rising out of contact with lever S, a jointed connection is formed between said arm R of the pen-beam and the oscillating lever S, and an upward oscillation of the rearward side portion of the pen-beam will be effected when the forward end of lever S is raised, while a reverse direction of oscillation of the pen-beam will be had when said forward end of lever S is moved downwardly by any means whatever.

T is a horizontal rest pivoted on the stud *t*, so as to be capable of being swung from position (shown by full lines in Fig. 1) in direction of arrow and to beneath the sleeve R^3, carried by the arm R, secured to the pen-beam O, when the retaining-bar S^3 is moved rearwardly and off from a bearing on said sleeve R^3, as indicated by dotted lines in Figs. 1 and 2, and the arm R has been raised for turning the rear side edge of the pen-beam O upwardly, that it may carry the pens *o* out of contact with sheets of paper which may be on the endless cloth *a*.

T is an adjusting-screw screwing in the rear end portion of lever S and calculated to be screwed downwardly to a greater or less distance toward check-piece *t′* below, so as to limit the vibration of lever S, and thereby through arm R limit the vertical movement of the pen-beam and its pens *o* toward and from the endless cloth *a*.

T^2 is a thumb set-nut screwing on the adjusting-screw T′ and serving as a jam-nut for holding said screw from being accidentally turned and thereby changing the limit of movement of lever S.

T^3, Fig. 2, is a spring (indicated by dotted lines) contained within a suitable spring-seat formed in the base-piece S^2 at a point beneath the forward end of lever S, and having its upper end bearing against the lower side of said end of that lever. This spring T^3 reacts against the mechanism employed to move the forward end of lever S downwardly and operates to raise the said forward end of that lever, and thereby, through its joint with arm R, carries the rearward side of the pen-beam upwardly and the pens *o*, secured to it, up out of contact with the

paper on the cloth *a* and hold them raised until the said movement of the lever S is reversed.

U is an arm secured to the outer end of the journal-pivot *s* of lever S and projected downwardly and holding between its ways *u u* the pivot-block U′.

V is a reciprocating piece suitably guided by guiding-pieces, as, say, pieces V′ and V^2 V^2, secured to the stationary back piece V^3. This reciprocating piece V is connected by pivot U^2 with pivot-block U′, carried by arm U.

V^4 is a roller mounted on a suitable pintle *v*, also secured to the reciprocating piece V, which roller, when pressed against by the drop-cam C^2, crowds said piece V in direction of arrow 5 and thereby moves arm U in the same direction, thereby operating lever S so as to carry its forward end downwardly on spring T^3 and depress the same and at the same time gently yet positively through arm R move the rearward side of the pen-beam O downwardly and thereby carry the pens *o* to a touch on the paper sheet below and hold the pens touching the paper until they are carried from it by a reversed movement of said beam and the mechanism above described.

W is an adjustable stop, (shown in Fig. 9 and indicated by dotted lines in Fig. 2,) which stop is secured to the rear side of the reciprocating piece V by means of set-screws *w w*, working through slots *w′ w′* in piece V. This stop may be longitudinally moved in either direction within certain limits in relation to piece V, so as to bring its forward end relatively nearer to the axis of roller V^4 or farther therefrom as the intended length of the oscillations of the pen-beam O is to be increased or lessened from any cause or purpose whatever.

X is a latch, (shown by full lines in Fig. 9 and indicated by dotted lines in Figs. 1 and 2,) which latch is pivoted at one end to the stationary back piece V^3, while its opposite free end is provided with a fixed stop *x*, preferably of hardened steel, secured to said latch. X′ is a friction-roller pivoted with said latch so as to project beyond the face side of the same and be in situation to be pressed on by the release-cam C^3, carried by the disk C, Figs. 1 and 2, thereby carrying the said latch inwardly, with its fixed stop *x*, out of engagement with the adjustable stop W, so as to allow the reacting spring T^3 to lift the forward end of lever S and oscillate the pen-beam O upwardly. A spring *x′*, secured to piece V and bearing against the rear side of latch X, operates to throw the latter in place for checking the adjustable stop W, carried by the reciprocating piece V, when the latter is moved back by the action of the drop-cam C^2, carried by disk C, for operating the oscillating lever S and pen-beam O in reversed directions.

Although a stop, as *x*, of uniform thickness, as shown in Fig. 9, to be carried by the latch X, may be employed where each one of several pens *o* are to be carried simultaneously downwardly against the paper and then upwardly from the same for beginning and ending the ruling, they are respectively to produce on points on same lines of beginning and ending, yet where one or more of the ruled lines to be produced are to begin at a point nearer to the upper margin of the sheet than others are to begin I employ in such a case with latch X a step-form stop, as *x′* in Fig. 10, which step-form stop comprises steps 1 and 2. With this step-form stop *x′* I also employ with disk C a second drop-cam, as C^4, (indicated by dotted lines in Fig. 2,) which drop-cam C^4 will be relatively greater in its projection from disk C than the drop-cam C^2, so that when cam C^2 has moved the adjustable step of the reciprocating piece V the distance of the first step 1 of the step-form stop the second drop-cam C^4 will operate at a predetermined time by being placed at a suitable point on disk C to move piece V to a distance sufficient to carry it to the end of step 2 of stop *x′*, so that, through the mechanisms between the pen-beam and the reciprocating piece V, the pen-beam may be oscillated downwardly to carry such a number of pens down on the paper for ruling as may be selected, to be begun at the highest point on the sheet, while the other pens will be arranged in the beam to be carried to a point near the paper, but not quite touch it. Should it be desirable to stop all the pens ruling at one point of distance from the lower margin of the sheet, a single release-cam will be employed on disk C; but should the stoppage of the ruling of some of the pens be at a point distant from that others are to be stopped in relation to the lower margin edge of the sheet, then two release-cams, as C^3 (the shortest one) and C^5, (shown in dotted lines and being the longest in projection,) will be employed on the disk C.

In operation of two drop-cams, as C^2 and C^4, and a two-step stop provided with the latch X, as shown in Fig. 10, the drop-cams C^2 C^4 will be arranged at distances apart on the disk C as will be suitable for effecting an interval between the first and second downward impulses of down oscillation of the pen-beam for carrying one set of pens to touch the paper for ruling, with the other set of pens close to but without touching the paper, when the first drop-cam C^2 operates, to be followed at the proper time by the operation of the second drop-stop for imparting to the pen-beam its second downward impulse for carrying the nearly-touching pens to actual touching of the sheet for ruling simultaneously with the first-started ones to the finish. When two release-cams, as C^3 and C^5, are employed for effecting a release of latch X by two impulses, the two impulses for upward oscillation of the pen-beam may be effected at different times for raising one set of pens out of touch of the paper that their

ruled lines may be stopped before those of the other pens are stopped by a subsequent action of cam C^5.

The carrying of two or more sets of pens secured to a pen-beam successively and at intervals to the paper and with varying degrees of pressure by impulses imparted to the pen-beam from a number of drop-cams secured to a revolving disk and successively and at intervals raising the pens from the paper has heretofore been effected by means other than those I have described as being interposed between the cams C^2 C^4 C^3 C^5 and the pen-beam; but these mechanisms employed between the pen-beam and said cams for carrying the pens with varying degrees of pressure to the paper were generally of such construction and arrangement that in their operations they would cause the pens to tremble or stagger when first pressing-contact with the paper was made. It is therefore to be understood that I do not broadly claim, in connection with a revolving disk having a number of cams secured therewith and a pen-beam carrying a corresponding number of pens for pressure with varying degrees on the paper, any or all kinds of mechanisms or means which may be employed for raising and lowering said beams under two or more impulses, but my particular means above described as being interposed between the pen-beam and the said several cams I believe to be new.

I therefore disclaim as being my invention, in a ruling-machine, the combination of a cam-head having a number of cams of different heights secured therewith with a pen-beam, corresponding pens or sets of pens secured in the pen-beam and pressing upon the paper with varying degrees of intensity, and means for raising and lowering said beam from the cams.

By a duplication of the pen-beam, standards, and bearings supporting the same and the several mechanisms described as employed for oscillating the pen-beam the machine may be provided with two similar pen-beams, and the several mechanisms employed and duplicated may be operated by means of suitable drop-cams and release-cams suitably applied, the second revolving disk I at points suitable for oscillating the duplicated pen-beam at predetermined times. In case this duplication of the pen-beam and mechanisms between it and the disk carrying the cams C^2 and C^3, with or without cams C^4 and C^5, is provided in the machine I would arrange the intermediate duplicated mechanisms so that the reciprocating piece V may be at the side of the frame the second disk I is at and provide such an extension to both said piece V and the latch X as may be required to be had, whereby the duplicated drop-cam C^2 and release-cam C^3 may be made to respectively operate said piece V and latch X. This duplication does not require any invention, and therefore I do not show the same in the drawings.

By the above-described improvements a greater variety of rulings may be done at each setting than heretofore has been done, while the several adjustments of parts required to be made for changing the character or features of the intended rulings of sheets may be quickly effected, and the several operating parts will be made to operate with nice exactness and in a positive manner, while the pens carried by the pen-beam will be carried quickly yet gently and positively to a touch with the paper without staggering, vibration, or jars at lines or points predetermined by the operator.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a ruling-machine, the combination with the shaft of the feed-roller, a gear mounted on an end thereof and capable of being moved longitudinally thereon in either direction, of a spline secured longitudinally with the shaft and provided with two or more notches, a groove at the side of the central bore of the said gear and calculated to receive the said notched spline, a latch pivoted at one end on the face side of said gear and calculated to be engaged at will with either of the notches in said spline and a spring operating to hold said latch in such engagement until at will released, substantially as and for the purposes set forth.

2. In a ruling-machine, the combination with a shaft calculated to receive, at will and one at a time, friction-rollers of varying diameters, and capable of being moved laterally in either direction, and a bevel-gear secured to an end of said shaft, of a second shaft having with it a spline provided with two or more notches, a bevel-gear having a central bore and a parallel groove calculated to receive the shaft and its notched spline, a latch pivoted to the latter bevel-gear and calculated to engage with the notches accordingly as the said gear may be moved on said shaft and its notched spline, and a spring connected with said movable gear and calculated to hold said latch in engagement, until released, with the notch of the spline brought in register with said latch, substantially as and for the purposes set forth.

3. In a ruling-machine, the combination with a disk or wheel revolved by the friction of another wheel, a counter-shaft arranged across the face side of said disk and capable of being moved nearer to or farther from said face, and provided with a spline or feather for receiving and holding with friction-rollers of varying diameters, which may be employed, one at a time, for revolving the said disk, and a bevel-gear mounted on an end of said shaft, of a shaft arranged at an angle with said movable shaft and provided with a spline containing two or more notches, a bevel-gear, for

engagement with the bevel-gear on said movable shaft, provided with a central bore and a groove parallel with it for receiving the notched spline and shaft portion said spline is secured to, a latch pivoted to the latter bevel-gear and calculated to be engaged with either of the notches in said spline, and a spring calculated to hold said latch in engagement with the notch the latch may register with when the bevel-gear, it is pivoted with, is set on its shaft for engagement with its coacting bevel-gear as it may be set nearer to or away from the plane of the disk to be revolved by the selected friction-roller, substantially as and for the purposes set forth.

4. In a ruling-machine the combination with a disk calculated to be revolved by a friction-roller applied to its face side, a shaft arranged transversely to the axis of said disk and calculated to receive and hold with any one of several friction-rollers which may at will be placed on said shaft for actuating said disk, of bearings supporting said shaft by its journals, brackets carrying said bearings and calculated to be moved longitudinally in either direction for carrying said shaft toward or from the face of the said disk and mechanism calculated to hold and secure said brackets at places adjusted to substantially as and for the purposes set forth.

5. In a ruling-machine the combination with a shaft calculated to carry and revolve gears of different diameters, of a bearing supporting one end of said shaft, a longitudinally-movable bracket pivoted with said bearing with its axis at an angle to said shaft, a bearing receiving the opposite end journal of said shaft, and calculated to be readily removed from said journal or applied to the same by an endwise movement of said bearing, a bracket containing at one end a holder into or out of which the said bearing may be moved by a movement of said bearing in direction calculated to free it from said bearing-holder or effect its reception therein, the bracket for receiving this removable bearing being calculated to be adjustable in its extension from the stationary piece with which it is secured, substantially as and for the purposes set forth.

6. In a ruling-machine the combination with a journal-bearing, a bracket pivoted therewith and projected in direction at an angle with the axis of said bearing, a series of two or more annular grooves provided on the end of said bracket by which it is held, of a sleeve-form bracket-holder secured to a stationary piece of the machine, and calculated to receive the grooved end portion of said bracket and a retaining-screw screwing in a wall portion of said sleeve and engaging with the groove, in said bracket, which may register with said screw when said bracket is adjusted to its intended place in said sleeve, substantially as and for the purposes set forth.

7. In a ruling-machine, the combination with a bracket calculated to hold a bearing of an adjustable shaft intended to hold with and revolve actuating-wheels of different diameters, one at a time, of a screw-thread on the body of the bracket opposite from that holding the bearing, a split sleeve receiving the body of the bracket, a clamping-screw calculated to tighten, at will, said split sleeve on said body of the bracket, of a wheel-form nut supported between sections of said sleeve and bearing, with its sides, against said sections, and working on the screw-threaded portion of said bracket, substantially as and for the purposes set forth.

8. In a ruling-machine the combination with the shaft of a vibrating gate of the same, and provided with a transverse slot secured to said shaft, an arm provided at one end with a sleeve-form journal, which is calculated to loosely receive a journal end of the said shaft at near said slotted arm, and also with a screw-threaded perforation registering with the said slot of the first-mentioned arm, a binding-screw working through said slot of the one arm and screwing into the screw-threaded perforation of the adjoining arm and a bearing receiving the sleeve-form journal, a bracket secured on the said sleeve-form journal and calculated to rock the same, and an arm secured to said rocking bracket and calculated to be operated endwise reciprocatingly, substantially as and for the purposes set forth.

9. In a ruling-machine, the combination with the pen-beam arranged across the endless cloth of the machine and above the same and calculated to have its rear side portion, receiving the pens, oscillated vertically, of a lever-form arm arranged transversely to the said pen-beam and pivoted with an end of the same, and adjusting-screws working through said arm, one at each side of the pivot of said beam, of an oscillating lever pivoted to a stationary piece and a jointed connection between said oscillating lever and said arm, substantially as and for the purposes set forth.

10. In a ruling-machine, the combination with an arm secured to the pen-beam for oscillating the same, a pivot secured to the oscillated end of said arm and a sleeve or thimble loosely secured on said pivot, of a vertically-oscillating lever pivoted with a stationary part of the machine and having one of its ends provided with a screw for limiting the oscillation of the lever in one direction, and its opposite end projected beneath the sleeve or thimble on the pivot end of said arm for bearing against the lower side of said thimble, substantially as and for the purposes set forth.

11. In a ruling-machine, the combination with an arm secured to the pen-beam for use for oscillating the same, a pivot secured to the outer end of said arm, a sleeve or thimble loosely secured on said pivot, a vertically-oscillating lever pivoted with a stationary part of the machine and having one of its ends provided with a screw, calculated to

limit the oscillation of said lever, and having its opposite end beneath the lower side of said sleeve or thimble, of a movable retaining-bar held in suitable connection with said oscillating lever and calculated to be moved at will over and against the upper side of said sleeve or thimble, and the reverse, substantially as and for the purposes set forth.

12. In a ruling-machine the combination with an oscillating lever pivoted to a stationary piece and calculated to impart to the pen-beam an oscillating movement for alternately raising and lowering the pens carried by it of a reacting spring contained within a spring-seat and having an upward pressure against the lower side of one of the limbs of the said lever for raising the same, of an oscillating arm secured to the pivot-journal of said lever, a reciprocating piece moving in direction transversely to the direction of length of said oscillating arm, and a pivot connection between the latter and the said reciprocating piece, substantially as and for the purposes set forth.

13. In a ruling-machine, the combination with an oscillating lever which is actuated in one direction by a reacting spring and an arm secured to the pivot-journal of said lever, a guided pivot-bearing, carried by the free end of said arm, and a reciprocating piece suitably guided in direction of its line of movement, of a cam carried by a revolving disk and calculated to move said reciprocating piece in one direction and thereby, through said arm, oscillate said lever in direction against the said reacting spring, substantially as and for the purposes set forth.

14. In a ruling-machine the combination with a fixed piece, a reciprocating piece, guided in direction of its line of movement, and provided with one or more guide-slots, of an adjustable stop applied to a side of said reciprocating piece, screws working through said slots and screwing into the said stop for binding it in place set to, on said reciprocating piece, of a latch pivoted to said stationary piece and carrying by its free end a stop which is calculated to react against the adjustable stop, and a spring secured to the stationary piece and pressing on the side of the latch opposite that on which its stop is secured, substantially as and for the purposes set forth.

15. In a ruling-machine, the combination with a reciprocating piece, an oscillating lever calculated to be operated by said reciprocating piece in one direction by an arm secured to the pivot-journal of the said lever, a spring calculated to oscillate said lever in an opposite direction, an arm secured to the pen-beam and having a jointed connection with said oscillating lever, a pivoted latch provided with an outwardly-projected piece and carrying a stop for action with a stop carried by said reciprocating piece and a spring for crowding said latch toward said reciprocating piece for effecting an engagement with its stop, of a revolving disk carrying a drop-cam and a release-cam operating respectively with said stationary piece and said latch, substantially as and for the purposes set forth.

16. In a ruling-machine, the combination with a pen-beam for carrying a series of pens, an oscillating lever having a jointed connection with said pen-beam through an arm connected with it, a reacting spring applied to the lower side of said oscillating lever for oscillating it in one direction, an arm secured to the pivot-journal of said lever, a reciprocating piece pivoted with said arm and carrying an adjustable stop, a pivoted latch carrying a step-form stop which is calculated to have two distinct engagements with said adjustable stop of the reciprocating piece, of a revolving disk and two drop-cams of unequal projection from said disk, the succeeding drop-cam being longer than its preceding drop-cam, and two relief-cams of unequal length of projection, with the preceding one shorter than its succeeding one, substantially as and for the purposes set forth.

CHAS. BURROWS.

Witnesses:
ALEX. SELKIRK,
CHARLES SELKIRK.