

No. 677,746.

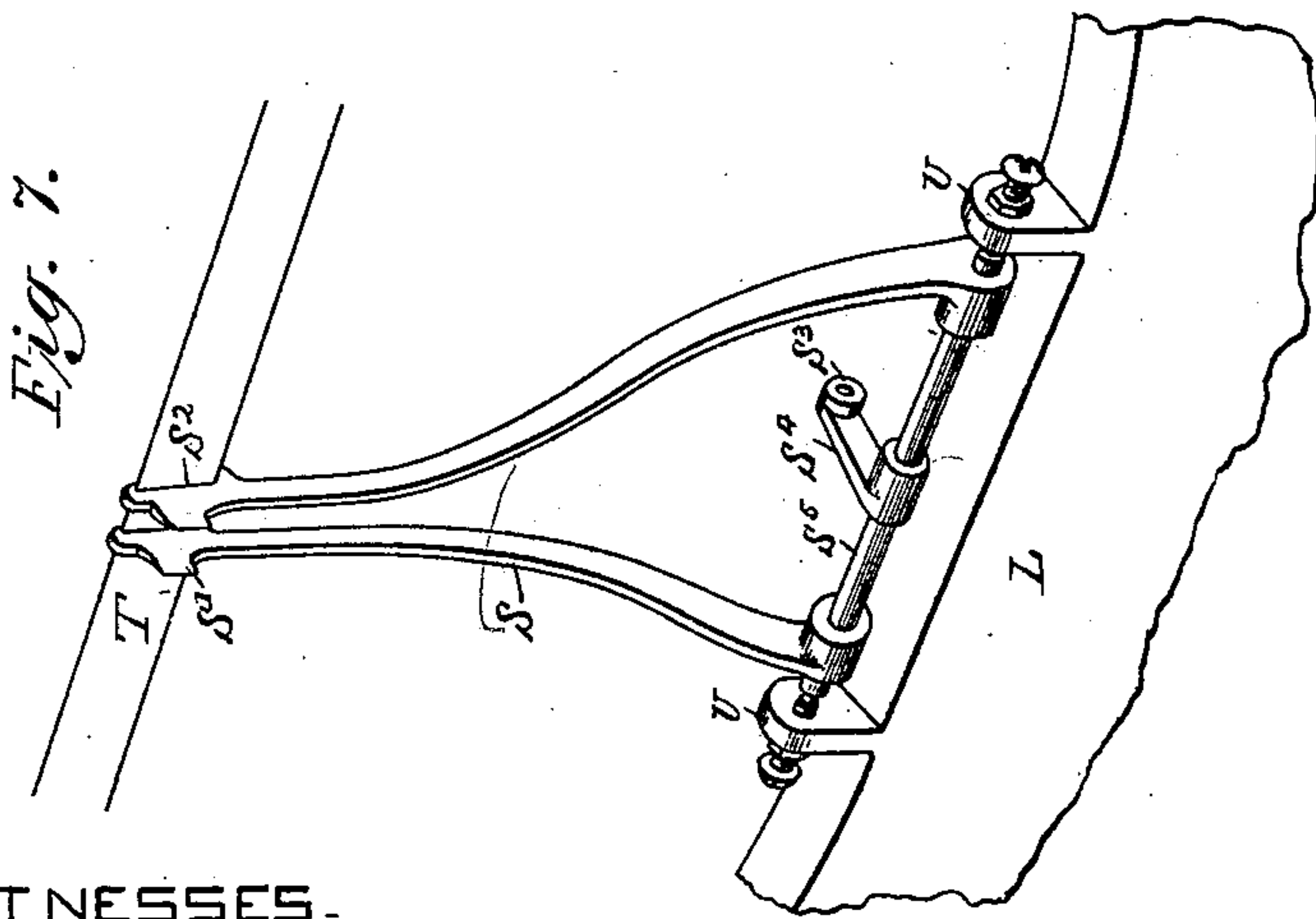
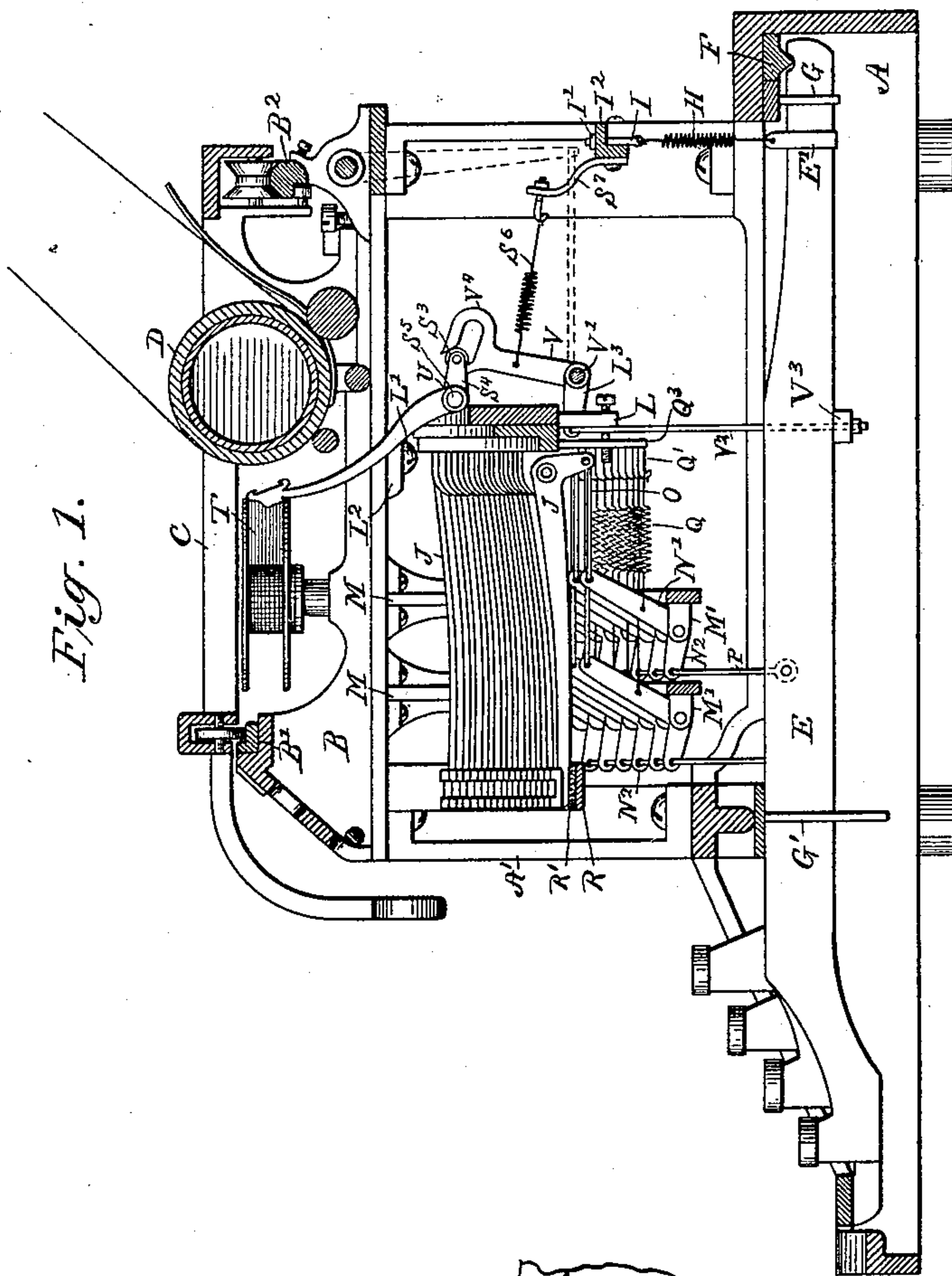
Patented July 2, 1901.

G. H. SMITH.
TYPE WRITING MACHINE.

(Application filed Apr. 13, 1901.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES.

K. V. Donovan.
E. M. Wells.

INVENTOR.

George H. Smith

by Jacob Felber

HIS ATTORNEY.

No. 677,746.

Patented July 2, 1901.

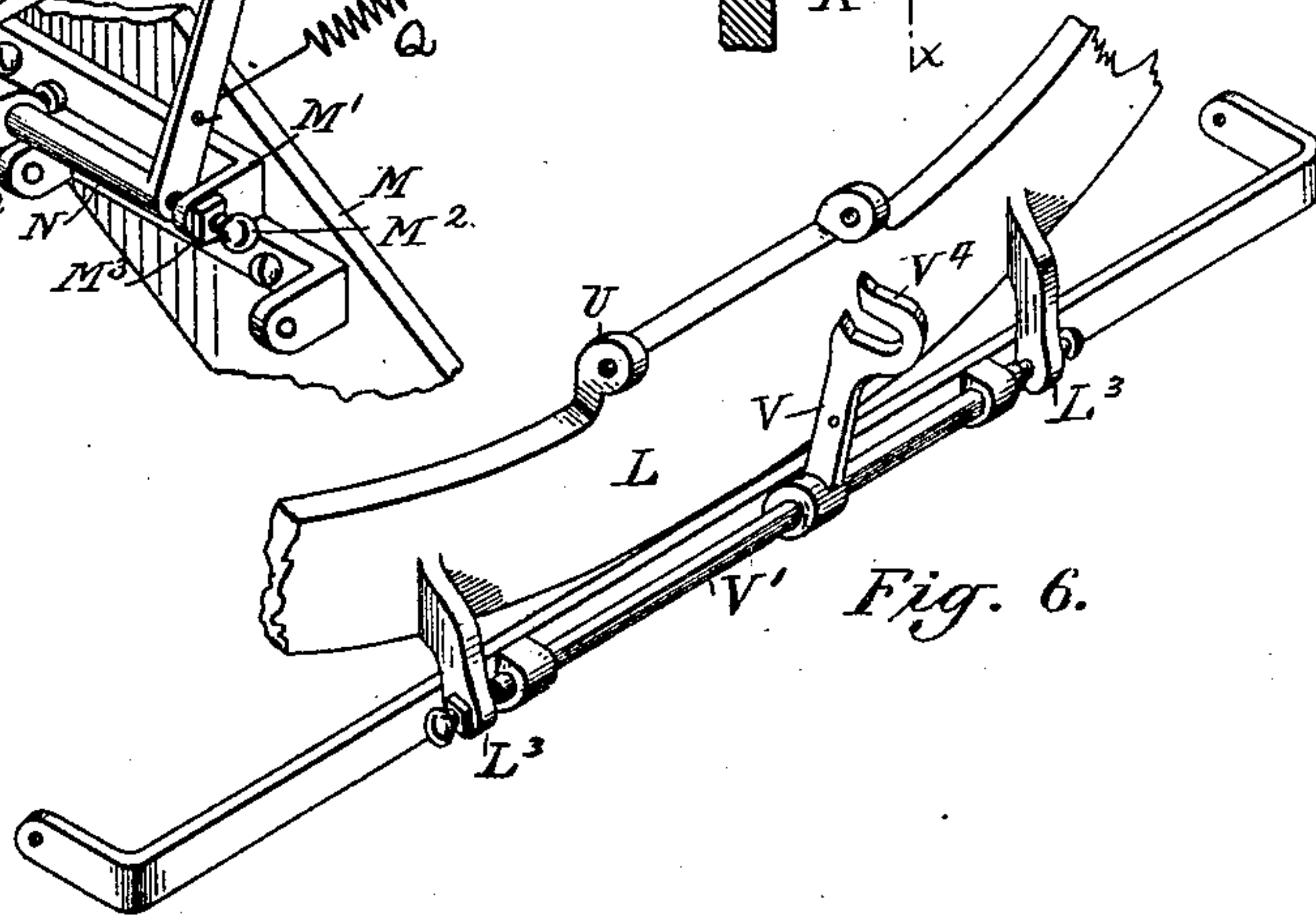
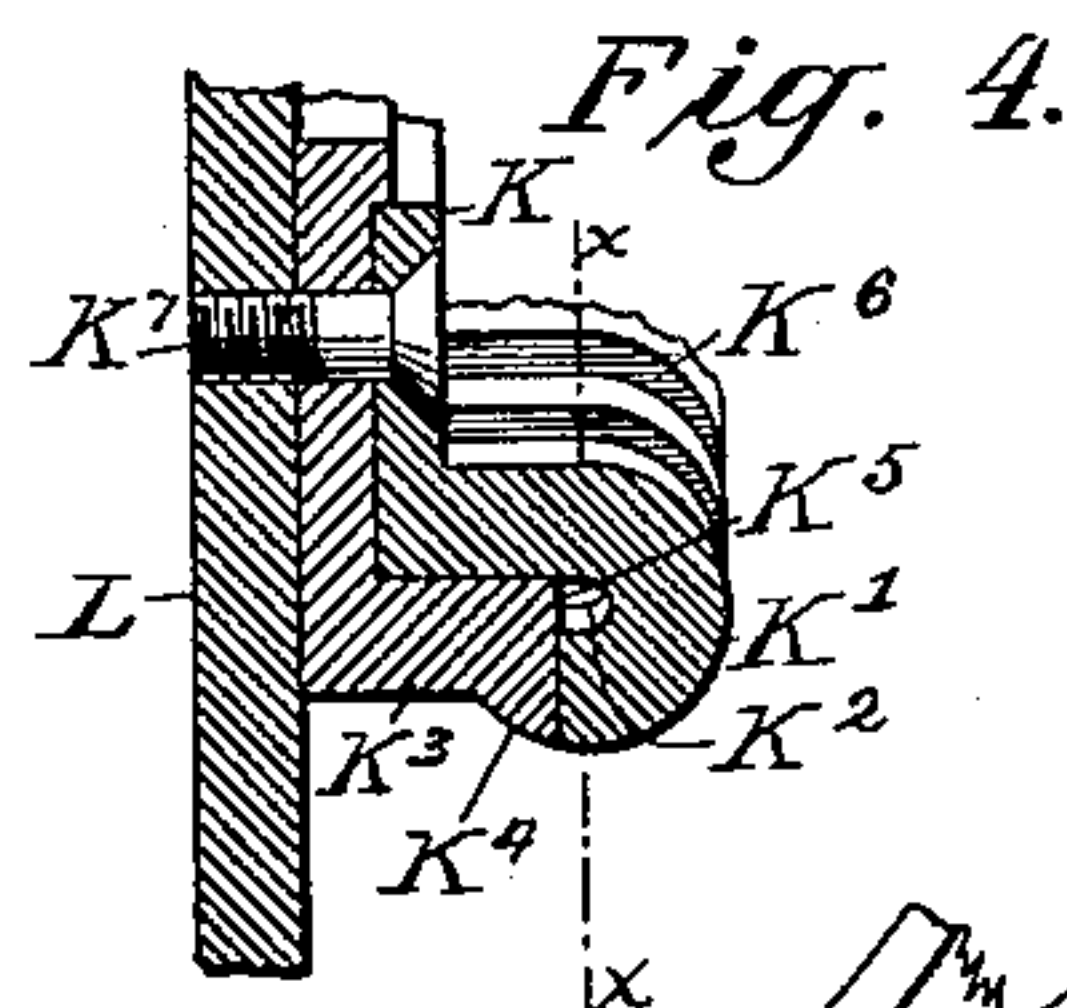
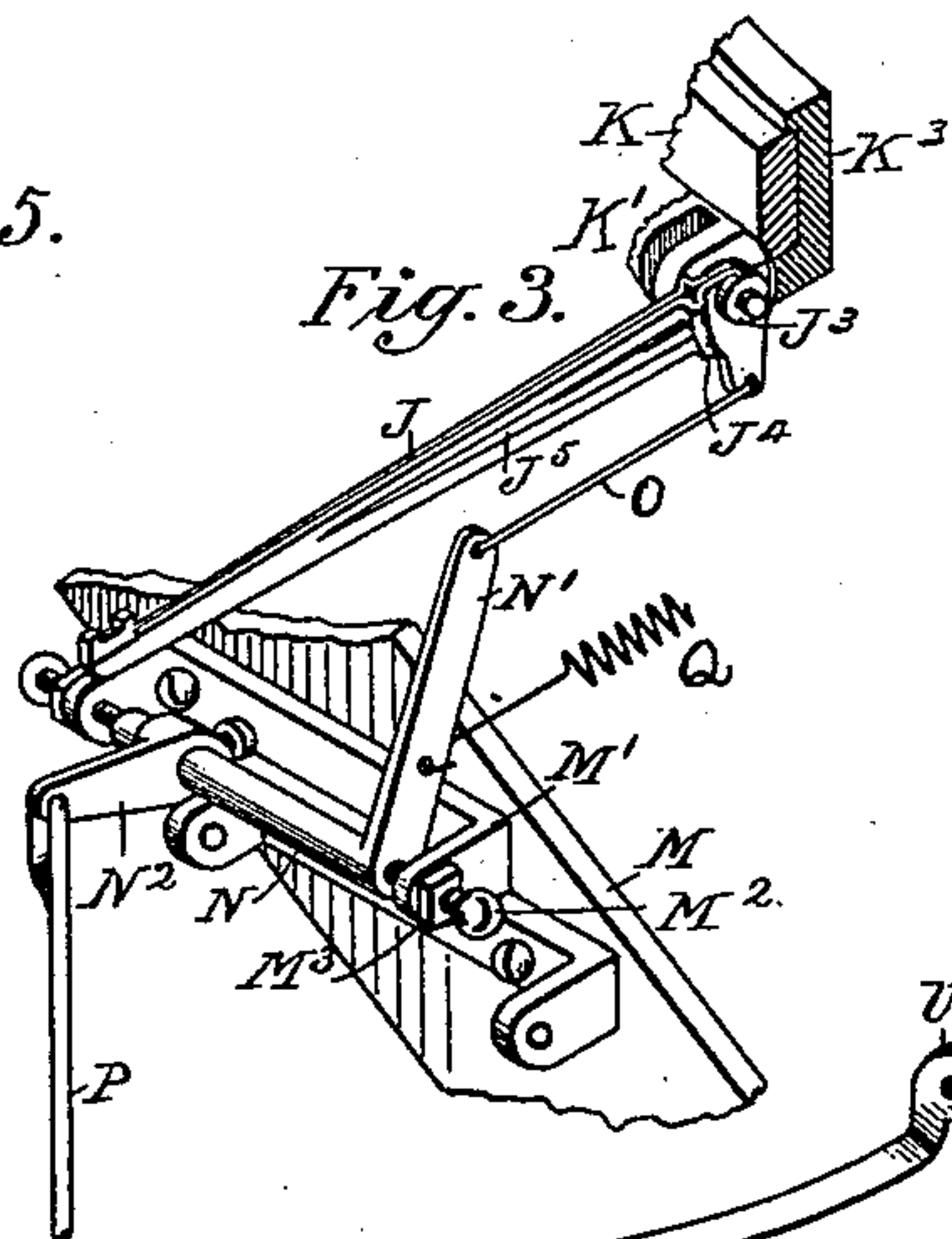
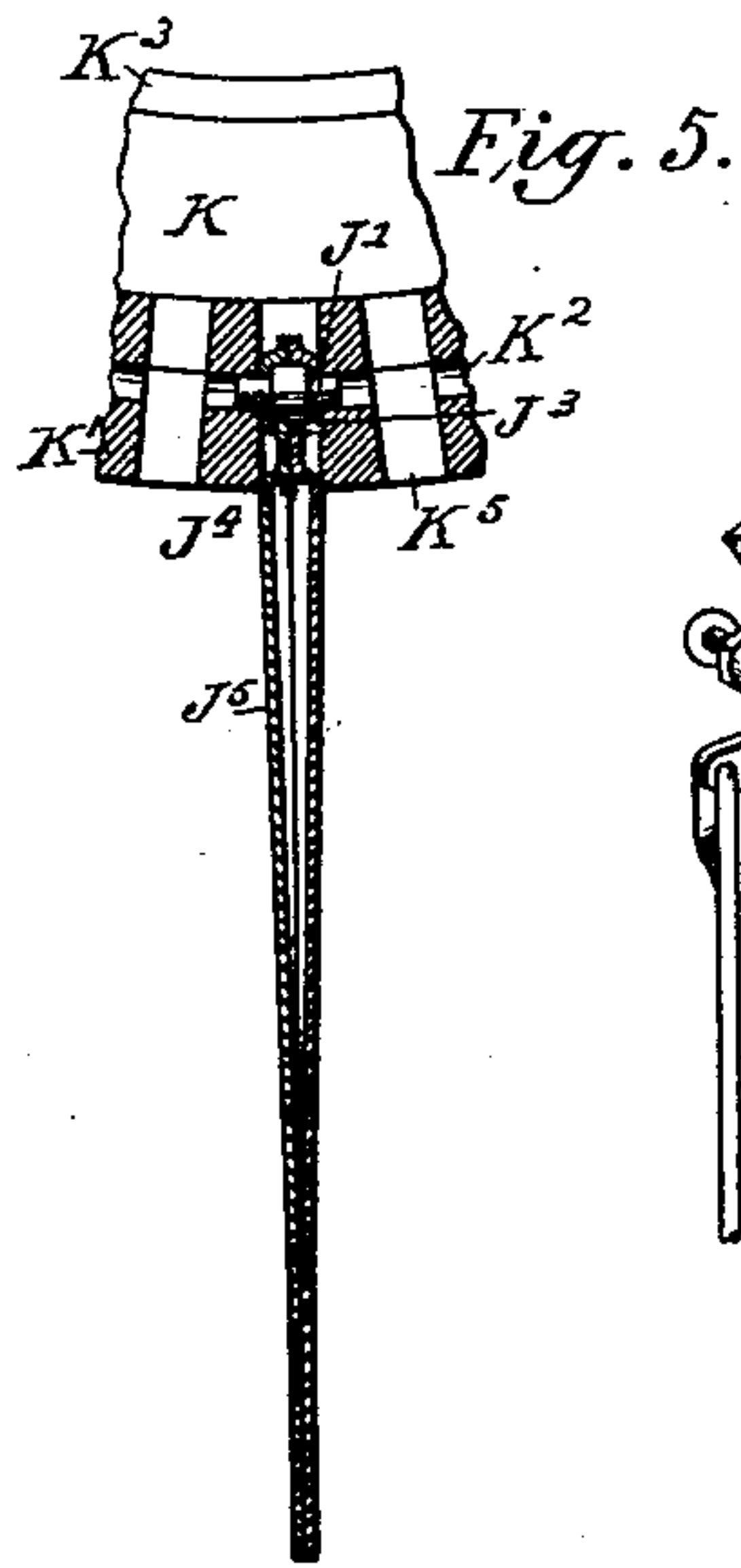
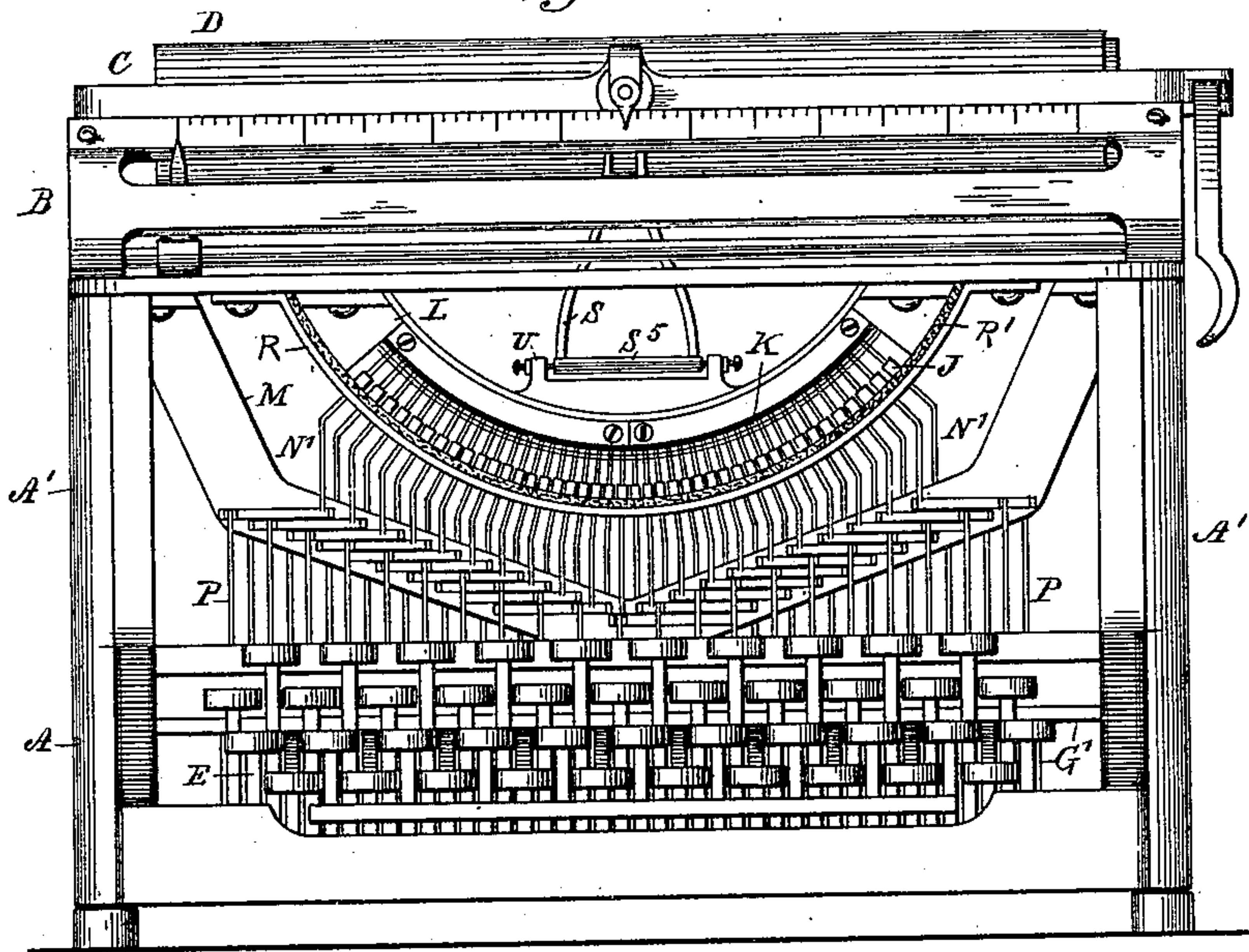
G. H. SMITH.
TYPE WRITING MACHINE.

(Application filed Apr. 13, 1901.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 2.



WITNESSES:

K. V. Donovan.
E. M. Wells.

INVENTOR

George H. Smith

by Jacob Felbel

HIS ATTORNEY

UNITED STATES PATENT OFFICE.

GEORGE H. SMITH, OF CEDAR RAPIDS, IOWA, ASSIGNOR TO UNION TYPE-WRITER COMPANY, OF JERSEY CITY, NEW JERSEY.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 677,746, dated July 2, 1901.

Application filed April 13, 1901. Serial No. 55,665. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. SMITH, a citizen of the United States, and a resident of Cedar Rapids, in the county of Linn and State of Iowa, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

My invention relates more especially to "visible" type-writing machines; and the main object is to improve machines of this type, and more particularly the type-bar and keyboard mechanism, with a view to securing lightness and uniformity of touch, simplicity of construction, and general efficiency.

Other objects will appear hereinafter.

My invention consists in certain features of construction, arrangements of parts, and combinations of devices, all as will now be more fully described, and particularly set forth in the appended claims.

In the accompanying drawings, Figure 1 is a central section of a machine embodying my invention, many parts of the full operative machine being omitted as forming no necessary part of this invention. Fig. 2 is a front view of the same. Fig. 3 is a detail view in perspective, showing the mounting of the type-bars and their connected rock-shafts. Fig. 4 is a transverse section of the crown bearing or segment for the type-bars. Fig. 5 is a section of the same in the line $x-x$ of Fig. 4. Fig. 6 is a detail view in perspective, showing the mechanism for oscillating the type-bar and ribbon guide. Fig. 7 is a view in perspective of the ribbon and type-bar guide.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A designates the main-frame base, on which are mounted suitable posts A^1 , and these are surmounted by a top plate A^2 . To the top plate is secured a suitable casting B, taking the tracks B^1 and B^2 , and on these is mounted the carriage C, provided with the platen-roll D. These parts are, in the main, of a typical form and construction and need not be particularly described. It will be observed, however, by reference to Fig. 1 that the top plate is open on the front side, so as to allow the heads of

the type-bars to pass from the position of rest shown to the printing-point and that its sides are adapted for the attachment of brackets on the flat under side, as will be referred to hereinafter.

The key-levers E, which are of a common and well-known form, are pivoted under the fulcrum-bar F and guided by the combs G and G^1 in the usual way. The spring H, which returns each key-lever to normal position after being depressed, connects at one end with a stirrup E^1 and at the other end with an eyebolt I, mounted in a cross-bar J, secured to the rear posts of the main frame. The tension of the spring is adjusted by a suitable nut I^1 on each eyebolt.

The series of type-bars J, certain improvements in the construction of which will be described hereinafter, is pivoted in a crown-bearing K, forming the segment of a circle, as shown in Fig. 2. The construction of this bearing or segment is best shown in Figs. 4 and 5 in connection with Fig. 2. It is composed of a front plate K, which in cross-section is in the nature of an angle-plate with a semicircular head K^1 . In the center of this head is formed a rounded groove K^2 , the depth of which is equal to its width. To the front plate so formed is fitted a back plate K^3 , the head K^4 of which forms a continuation of the semicircular head above described. The shoulder K^5 of this back plate thus forms the inner bearing for the stud J^1 of the type-bar. The crown or segment is milled with a series of radial slots K^6 to take the pivotal portions or hubs of the type-bars, which thus converge to a common printing-point at the front of the platen-roll. As will be seen by reference to Fig. 5, the studs forming the type-bar pivot project but half-way into each adjacent bearing, so that the whole series may be accommodated. A special advantage arising from this construction of the crown is the facility with which the parts may be assembled. The type-bars being placed in the front plate of the crown or segment, but a small portion of the bar projects backwardly to engage the back plate. This admits of the back plate being easily slipped in place, notwithstanding the divergent angles at which the type-bars

and radial slots stand. The crown is secured by screws K^7 to a bracket L , attached to the under side of the top plate, as by screws L' , suitable lugs L^2 being formed on the bracket for that purpose. Forward of this bracket and secured in the same manner to the top plate are two angular depending brackets M , spanning the machine. These are separated some distance apart, and to one of the vertical faces of each is secured a series of bearings M' . These are preferably in substantially the form shown—viz., stirrup-shaped—and provided with conical-pointed and adjustable studs M^2 , screwing into the ends of the stirrups and provided with suitable jam-nuts M^3 . Between these conical bearings or centers are hung rock-shafts N , which of course have centers to take the conical points of said bearing-studs. Each rock-shaft has a fixed arm N' , which connects by a suitable link O with the short arm J^2 of the type-bar. Another arm N^2 is preferably adjustable on the shaft N and connects by a suitable link or connecting-rod P with one of the key-levers. By reference to Figs. 2 and 3 it will be seen that a series of these rock-shafts overlapping each other is arranged in successive steps on either side of the center of the bracket M , the rock-shafts lying one above another. The vertical space being too limited for the whole number of rock-shafts, equal to the number of type-bars, they are arranged in two sets on separate brackets, as above indicated. To each of the arms N' is connected a spring Q , which at the other end connects with a hook or eyebolt Q' , adjustably attached to a plate Q^2 , secured to the crown-bracket L . It will be understood that the links O of the front series of rock-shafts and also the spring connections pass between the arms N' of the back series. By this construction and arrangement it becomes possible to mount each arm N' so that its link-connecting point is directly in front of the corresponding connection with the short arm of the type-bar, and all side strain is thus eliminated. So, also, it is possible to make a direct vertical connection of each arm N^2 with its associated key-lever, thus avoiding any side strain on such lever. The effect of this is to reduce friction to the minimum and give to each key-lever a very light and elastic touch.

When at rest, the type-bars lie in the curve of a suitable inverted arch R , lined with a strip of felt or the like R' . The arch, like the brackets above described, is secured to the under side of the top plate. In printing, the type-bars swing through about ninety degrees.

It will be seen that the system of rearwardly-striking type-bars is of less width than the system of key-bearing levers E and that the latter operate the type-bars by means of intermediate bell-cranks comprising the parts N N' N^2 , the axes of which extend transversely of the machine and are pro-

longed, so that one arm of each bell-crank may lie practically in line with its type-bar and the other arm thereof may lie in a different vertical plane and practically in line with its key-lever, thus securing a direct and free action from the key-lever to the bell-crank and also from the bell-crank to the type-bar. The upwardly-extending arm N' , which is connected to the type-bar, is arranged at the inner end of the prolonged rock-shaft, axis, or hub of the bell-crank, while the arm N^2 , which is connected to the key-lever, is at the outer end of said prolonged axis, and hence offset from the arm N' . The bell-cranks are arranged in two transverse rows or series beneath the type-bars, and the key-levers extend rearwardly beneath the bell-cranks. The links O extend longitudinally of the type-bars, and the links P are arranged in two transverse rows, one row for each set of bell-cranks. Each key-lever link is situated at some distance laterally from its associated type-bar link, and the bell-crank or lever forms a transverse connection between said links. The links from the forward set of bell-cranks pass between the type-bar-operating arms N' of the rear set of bell-cranks and are longer than the links of the rear set of bell-cranks.

The lateral position of each type-bar is positively controlled at the printing-point by a forked guide S , having a bearing-face S' at the upper end of each member of the guide. Between these two bearing-faces the neck of the type-bar passes at the moment of making the impression. This guide also serves as a support and guide for the ribbon T , being provided with a slotted throat at S^2 to receive the ribbon. The guide is pivoted at its lower end in bearings U on the bracket L , and is thus adapted to tilt forwardly and downwardly, so as to expose to view the last letter or other character printed. As this action cannot be concurrent with the movement of the type-bars, owing to the fact that the guide oscillates only in a vertical plane, while the type-bars enter it in planes radial to the printing-point, provision is made for delaying the guide in its backward guiding position while the type-bar is passing in and out of said guide. The guide is accordingly oscillated intermittently by a cam, which may be of the type illustrated in Figs. 1 and 6, and is described as follows: V is an arm mounted on a rock-shaft V' , mounted in suitable bearings L^3 and connecting by links V^2 with the universal bar V^3 , lying just below all of the key-levers. The upper end of this arm V^4 forms a cam, which engages a roller S^3 , mounted on a stud on an arm S^4 , connecting with the rock-shaft S^5 of the guide. A spring S^6 , connecting with the arm and with a bracket S^7 , restores the cam to normal position. On depressing any key-lever the inclined part of the cam first throws the guide back close to the platen-roll, where it remains in guiding

position during the completion of the stroke of the cam-lever and an equal portion of its return movement. This gives the type-bar time to enter and escape from the guide while in its guiding position and prevents the possibility of any catching or cramping of the moving parts.

An improvement in the construction of the type-bar is illustrated in Figs. 3 and 5. The bar is composed of two similar halves of thin metal, with opposite bosses J^3 pressed outwardly at the junction of the longer and shorter arms of the bar. These bosses are provided with central holes to take the oppositely-extending studs of the pivot J' , the central enlarged portion of which rests in the sockets so formed on the inner sides of said bosses. A short distance from each boss is a rib J^4 , concentric therewith, to serve as a lateral bearing against the walls of the slot in the crown in which the type-bar is mounted, the object of this construction being to steady the type-bar laterally, but with much less aggregate surface than if the boss extended continuously as far as said rib from the axis. From this rib J^4 extends a central longitudinal rib J^5 , pressed outwardly in the same manner and adapted to stiffen the bar in this direction. The two complementary parts are finally soldered or otherwise securely fastened together, with the enlarged part of the pivot-pin held firmly between the two bosses. The construction is such that the bar may be made very light, yet stiff, and that the pivot may be fastened very securely therein.

It will be observed that the system of rearwardly-striking type-bars is curved about the common printing-center and that the type-bars have a radial arrangement or work in radial or converging planes; that the width of the system of type-bars is considerably less than the width of the system of key-levers; that the intermediate bell-cranks connected to the type-bars and key-levers have prolonged axes which extend transversely of the machine; that each bell-crank has one arm which is practically in line with its connected type-bar and connected thereto by a link and has another arm which is practically in line with its connected key-lever and connected thereto by a link, the difference in the relative lateral positions of the type-bars and key-levers being thus compensated by the length of the bell-crank axes or by the lateral separation of the arms upon each bell-crank, as may be seen at Fig. 2, said arms being arranged in different vertical planes; that links are connected at one set of their ends to the short arms of the type-bars and at the other set of their ends to the upwardly-directed arms of the bell-cranks and that a second series of practically parallel links are connected at one set of their ends to the key-levers and at the other set of their ends to the other set of crank-arms; that the type-bars lie practically horizontally when at rest; that the

crown bearing or segment K, which supports the type-bars stands in a practically vertical plane; that the crank-shafts or rock-shafts in each set are mounted in two ascending, diverging, and overlapping series upon a depending bracket; that said shafts are provided with arms connected by links to the key-levers and also with offset and angularly-arranged arms which are connected by vertical links to the type-bars; that the rock-shafts in each series or set are disposed in a vertical plane, one arm upon each rock-shaft being adjustable to the same vertical plane as the key-lever to which it is connected; that the links O extend longitudinally of the type-bars; that the links P extend upwardly from the key-levers in two transverse sets or rows to forwardly-directed arms formed upon the bell-cranks; that at the sides of the system each bell-crank has at the inner end of its axis an arm engaged by a type-bar link and at the outer end of its axis an arm engaged by a key-lever link; that the lateral separation of the arms upon the several bell-cranks gradually decreases as the center of the system is approached, according as the key-levers become less and less out of line with their connected type-bars, as will be seen at Fig. 2; that the key-levers extend rearwardly between the type-bars, bell-cranks, and bell-crank frames; that the bell-cranks may be regarded as a system of levers extending transversely of the machine from the key-lever links P to the type-bar links O; that the system of bell-cranks is divided into two sets or rows, one set or row being arranged forwardly of the other and extending transversely of the machine; that the links O from one set of bell-cranks pass rearwardly between the type-bar-operating arms of the other set of bell-cranks; that a plurality of groups of bell-cranks are connected by short links and long links to a series of pivoted type-operating arms; that said short links and long links alternate; that the vertical links P are of graduated lengths, according to the elevations of their connected bell-cranks, and that at least one arm of each bell-crank is adjustable in a direction parallel with its axis.

Various changes in detail construction, arrangement, and in the form of the type-bar and key-lever connections may be made without departing from the spirit of my invention, and which is more fully set forth in the concluding claims.

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

1. In a type-writing machine, the combination with a platen, of a curved system of rearwardly-striking radial type-bars, a system of key-levers, the width of the system of type-bars being less than the width of the system of key-levers, and an intermediate system of bell-cranks connected to the type-bars and to the key-levers, the bell-cranks having prolonged axes, which extend transversely of the

machine, and each bell-crank having one arm which is practically in line with its connected type-bar and having another arm which is practically in line with its connected key-lever.

2. In a type-writing machine, the combination with a platen, of a curved system of rearwardly-striking radial type-bars, a system of key-levers, the width of the system of type-bars being less than the width of the system of key-levers, and an intermediate system of bell-cranks having prolonged axes which extend transversely of the machine, each bell-crank having an arm which is practically in line with its type-bar and is connected thereto by a link, and also having an arm which is practically in line with its key-lever and is connected thereto by a link.

3. In a type-writer, the combination of a series of key-levers, a curved series of radial type-bars, a bearing adapted to support said type-bars and standing in a practically vertical plane, a series of crank-shafts provided each with arms at an angle to each other and arranged in different vertical planes, a series of links connected at one set of their ends to the short arms of the type-bars and at the other set of their ends to one set of the arms on the crank-shafts, and a second series of practically parallel links connected at one set of their ends to the key-levers and at the other set of their ends to the other set of crank-arms.

4. In a type-writer, the combination of a series of radial type-bars and their bearing, said bars lying practically horizontally when at rest, a series of key-levers, a depending bracket, rock-shafts mounted in two ascending, diverging and overlapping series on said bracket, a series of arms on said rock-shafts, a series of links connecting the said arms to the said key-levers, a second series of arms upon said rock-shafts and offset from the first series of arms, and a second series of links connecting said second series of arms to said type-bars.

5. In a type-writer, the combination with a series of radial type-bars and their connecting-links, and a bearing for said bars set in a practically vertical plane, of a double series of rock-shafts arranged in a vertical plane and in an ascending and overlapping order, a fixed arm on each rock-shaft in practically the same vertical plane as the type-bar arm to which it connects, another arm on each rock-shaft adjustable to the same vertical plane as the key-lever to which it connects, a support for said rock-shafts, a series of key-levers, and links to connect the key-levers and the type-bars, respectively, with said rock-shaft arms.

6. In a type-writer, the combination with a series of radial type-bars and their supporting-bearing, of a series of rock-shafts having each an arm to connect with one of said type-bars, and another arm to connect with a key-

lever, a stirrup-shaped support for each rock-shaft, adjustable cone-bearings in said stirrups, a double-inclined, downwardly-converging bracket on which said stirrups are mounted in successive steps, key-levers, and connecting-links, substantially as and for the purpose set forth.

7. In a type-writing machine, the combination with a platen, of a system of rearwardly-striking type-bars, a system of key-bearing levers, the system of levers being of greater width than the system of type-bars, a set of links which are attached to the type-bars and extend longitudinally thereof, a set of links which are attached to the key-levers and extend upwardly therefrom, and a system of bell-cranks connecting said set of links, said bell-cranks having prolonged axes extending transversely of the machine, and each bell-crank having at the inner end of its axis an arm engaged by a type-bar link and having at the outer end of its axis an arm engaged by a key-lever link.

8. In a type-writing machine, the combination with a platen, of a curved system of rearwardly-striking radial type-bars, a system of key-levers extending rearwardly beneath the type-bars, a system of links which are attached to the type-bars and extend longitudinally thereof, a system of links which are attached to the key-levers and extend upwardly therefrom, the width of the system of key-lever links being greater than the width of the system of type-bar links, levers extending transversely of the machine from said key-lever links to said type-bar links, and bearings for said levers.

9. In a type-writing machine, the combination with a platen, of a curved series of rearwardly-striking radial type-bars, a series of bell-cranks connected to said type-bars, the bell-cranks having arms at the outer ends of their axes, and the latter being prolonged transversely of the machine, and a system of key-levers connected to said bell-crank arms.

10. In a type-writing machine, the combination with a platen, of a curved series of rearwardly-striking radial type-bars, a series of bell-cranks connected to said type-bars, the bell-cranks having arms at the outer ends of their axes, and the axes being prolonged transversely of the machine, and a system of key-levers extending beneath the bell-cranks and connected by upwardly-extending links to said bell-crank arms.

11. In a type-writing machine, the combination with a platen, of a curved series of rearwardly-striking radial type-bars, a series of bell-cranks connected to said type-bars, the axes of said bell-cranks being prolonged transversely of the machine and lying one above another, and a system of key-levers connected to arms extending from the outer ends of the axes of the bell-cranks.

12. In a type-writing machine, the combination with a platen, of a curved series of

rearwardly-striking radial type-bars, a series of bell-cranks connected to said type-bars, the axes of said bell-cranks being prolonged transversely of the machine and lying one above another, a system of key-levers connected to arms extending from the outer ends of the axes of the bell-cranks, a series of transversely-arranged stirrups in which said axes are mounted, and means for supporting said stirrups.

13. In a type-writing machine, the combination with a platen, of a curved series of rearwardly-striking radial type-bars, a series of forwardly-extending links attached at their rear ends to said type-bars, a series of bell-cranks having upwardly-extending arms engaged by the forward ends of said links and also having forwardly-extending arms, a series of key-levers beneath said bell-cranks, and a series of links extending upwardly from said key-levers to said forwardly-extending bell-crank arms, the width of the system of key-lever links being greater than the width of the system of type-bar links, and each bell-crank having a long transverse axis, the upwardly-extending arm of the bell-crank being arranged at the inner end and its forwardly-extending arm at the outer end of said axis.

14. In a type-writing machine, the combination with a platen, of a curved system of rearwardly-striking radial type-bars, a system of key-levers, and a system of intermediate bell-cranks connected to said type-bars and key-levers, the system of bell-cranks being divided into two sets, one set arranged forwardly of the other, and each bell-crank having a prolonged axis or hub which extends transversely of the machine.

15. In a type-writing machine, the combination with a platen, of a curved system of rearwardly-striking radial type-bars, a system of key-levers, a system of intermediate bell-cranks connected to said type-bars and key-levers, the system of bell-cranks being divided into two sets, one set arranged forwardly of the other, and each bell-crank having a prolonged axis or hub which extends transversely of the machine, and links connecting said bell-cranks to the type-bars, the links from one set of bell-cranks passing between the type-bar-operating arms of the other set of bell-cranks.

16. In a type-writing machine, the combination with a platen, of a curved system of rearwardly-striking radial type-bars, a system of key-levers, a system of intermediate bell-cranks connected to said type-bars and to said key-levers, the system of bell-cranks being divided into two sets, one set arranged forwardly of the other, and each bell-crank having a prolonged axis or hub which extends transversely of the machine, links connecting said bell-cranks to the type-bars, the links from one set of bell-cranks passing between the type-bar-operating arms of the other

set of bell-cranks, and two transverse rows of links connecting the bell-cranks to the key-levers.

17. In a type-writing machine, the combination with a platen, of a curved system of rearwardly-striking radial type-bars, a system of bell-cranks extending beneath the type-bars, a system of key-levers extending beneath the type-bars, said bell-cranks being divided into two transverse sets and each bell-crank having a prolonged axis or hub, short links connecting the rear set of bell-cranks to the type-bars, long links connecting the forward set of bell-cranks to the type-bars, and upwardly-extending links connecting the key-levers to the bell-cranks.

18. In a type-writing machine, the combination with a platen, of a curved system of rearwardly-striking radial type-bars, a system of key-levers, and an intermediate system of bell-cranks connected to the type-bars and the key-levers, said system of bell-cranks being divided into a plurality of sets, each set extending transversely of the machine, the bell-cranks having prolonged transverse axes which are arranged one above another, and each bell-crank having an arm at the outer end of its axis which is connected to the key-lever, and an arm at the inner end of its axis which is connected to the type-bar.

19. In a type-writing machine, the combination with a platen, of a series of rearwardly-striking type-bars, a series of key-levers, a series of intermediate bell-cranks connected to the type-bars and to the key-levers, the axes of said bell-cranks lying transversely of the machine, and means for adjusting at least one arm of each bell-crank in a direction parallel with its axis.

20. A bearing for radial type-bars, comprising an arched front plate terminating forwardly in a head semicircular in section having a pivot-groove equal in depth and width central to said head, and a back plate fitted to said front plate, with a plane face abutting on the groove therein, a portion of the back plate forming a continuation of the semicircular head, and the head being slotted radially to receive type-bars, substantially as described.

21. The described bearing for type-bars, comprising a pair of arched angle-plates, the front part of the front plate forming a segmental head, semicircular in cross-section, with a rounded groove central to said head, the depth and diameter of the groove being equal, and the back plate having a segmental portion abutting on said groove and forming a continuation of said semicircular head, substantially as described.

22. A type-writer type-bar composed of two similar but opposing parts of thin metal, each having at the angle in the body a circular boss pressed outwardly, with a central hole therein, a pivot-pin with an enlarged middle seated between said bosses, an adjacent rib

concentric with the boss at a little distance therefrom, and a longitudinal rib extending therefrom, the two parts of the type-bar being soldered or otherwise fastened together, substantially as described.

23. A type-writer type-bar provided with lateral bosses on each side, concentric with the pivot-pin, and an adjacent segmental rib or projection concentric with said pin and flush with said bosses, a short distance from them, substantially as and for the purpose set forth.

24. A type-bar guide pivoted to tilt forwardly and downwardly after each impression, an oscillating cam engaging therewith, and adapted to delay the guide at the guiding position during the entire period of contact of the type-bar therewith, a rock-shaft to which said cam is attached, and a connection off said rock-shaft with the universal bar, substantially as and for the purpose set forth.

25. A pivoted type-bar guide adapted to tilt forwardly and downwardly after each impression, and having a projecting arm with a stud thereon, an oscillating cam engaging with said stud, and adapted to tilt said guide and hold it in guiding position during the contact of the type-bar therewith and mechanism substantially as described for oscillating said cam.

26. In a front-strike writing-machine, the combination with a platen, of a curved system of rearwardly-striking radially-arranged type-bars, a system of key-levers, and a plurality of sets or rows of intermediate bell-cranks connected to said type-bars and key-levers, one set being arranged forwardly of another, and each set or row extending transversely of the machine.

27. In a front-strike writing-machine, the combination with a platen, of a curved system of rearwardly-striking radially-arranged type-bars, a plurality of sets of bell-cranks connected thereto, one set being arranged forwardly of another and each set being arranged transversely of the machine, and keys connected to said bell-cranks.

28. In a front-strike writing-machine, the combination with a platen, of a curved system of radially-arranged type-operating arms, a plurality of groups of bell-cranks, one group being arranged forwardly of another, short links and long links connecting said bell-cranks to the type-operating arms, and keys connected to said bell-cranks.

29. In a front-strike writing-machine, the combination with a platen, of a curved system of radially-arranged type-bars, two sets of bell-cranks arranged below the type-bars, fixed supports for said bell-cranks, alternating short links and long links connecting said bell-cranks to the type-bars, and key-levers connected to said bell-cranks.

30. In a front-strike writing-machine, the combination with a platen, of a curved system of radially-arranged type-bars, two sets of bell-cranks arranged below the type-bars,

alternating short links and long links connecting said bell-cranks to the type-bars, and key-levers connected to said bell-cranks, the bell-cranks in each set being mounted in ascending series.

31. In a front-strike writing-machine, the combination with a platen, of a curved system of radially-arranged type-bars, two sets of bell-cranks arranged below the type-bars, fixed supports for said bell-cranks, short links and long links connecting said bell-cranks to the type-bars, the bell-cranks in each set being mounted in ascending series, and two sets or rows of links connecting said bell-cranks to said key-levers, the links in each set or row being of graduated lengths, according to the elevations of their connected bell-cranks.

32. In a front-strike writing-machine, the combination with a platen, of a curved system of rearwardly-striking radially-arranged type-bars, a plurality of sets of bell-cranks, one set being arranged forwardly of another and all of the sets extending transversely of the machine, means for connecting said bell-cranks to said type-bars, a system of key-levers, and a plurality of sets of links connecting said bell-cranks to said key-levers.

33. In a front-strike writing-machine, the combination with a platen, of a curved system of rearwardly-striking radial type-bars, a system of key-levers extending beneath the type-bars, a system of bell-cranks arranged between the type-bars and the key-levers, said system of bell-cranks being divided into a plurality of sets, one set arranged forwardly of the other, and the several bell-cranks being connected to the key-levers, and sets of links connecting said bell-cranks to said type-bars, the links of one set of bell-cranks passing between the type-bar-operating arms of another set of bell-cranks.

34. In a front-strike writing-machine, the combination with a platen, of a curved system of rearwardly-striking radially-arranged type-bars, a system of key-levers arranged below the type-bars, two sets of bell-cranks, one set arranged forwardly of the other, two sets of links extending forwardly from the type-bars to the bell-cranks, and two transverse rows of links extending upwardly from said key-levers to forwardly-extending arms formed upon said bell-cranks.

35. In a front-strike writing-machine, the combination with a platen, of a curved system of rearwardly-striking radially-arranged type-bars, two sets of bell-cranks arranged beneath the type-bars, one set arranged forwardly of the other, means for connecting said bell-cranks to said type-bars, fixed supports for said bell-cranks, a system of key-bearing levers extending rearwardly beneath said type-bars, bell-cranks and supports, said levers being fulcrumed at their rear ends, and two sets of links extending upwardly from said key-bearing levers to forwardly-directed arms formed upon said bell-cranks.

36. In a front-strike writing-machine, the

combination with a platen, of a curved series
of rearwardly-striking radially-arranged type-
bars, a system of key-levers, the width of the
type-bar system being less than the width of
5 the key-lever system, and bell-cranks con-
nected to the type-bars and key-levers, the
bell-cranks at the sides of the system having
their type-operating arms widely separated
or offset from their key-lever arms, and the
10 separation or offsetting of said arms being
gradually less toward the middle of the sys-

tem, as the key-levers become less out of line
with their connected type-bars.

Signed at the borough of Manhattan, city
of New York, in the county of New York and 15
State of New York, this 12th day of April,
A. D. 1901.

GEORGE H. SMITH.

Witnesses:

K. V. DONOVAN,
E. M. WELLS.