

911,644.

L. S. BURRIDGE.  
TYPE WRITING MACHINE.  
APPLICATION FILED JAN. 30, 1901.

Patented Feb. 9, 1909.

7 SHEETS—SHEET 1.

FIG. 1.

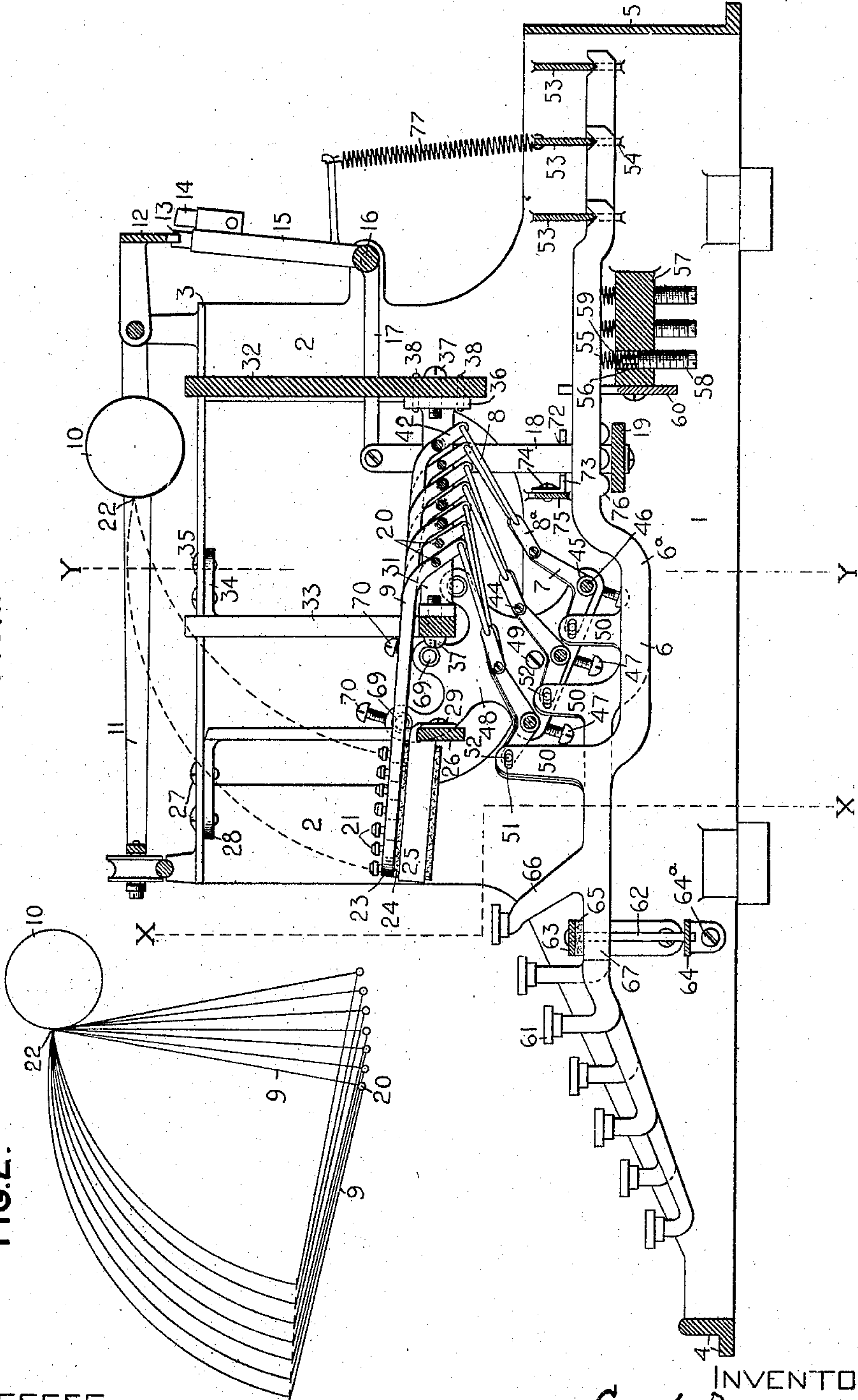
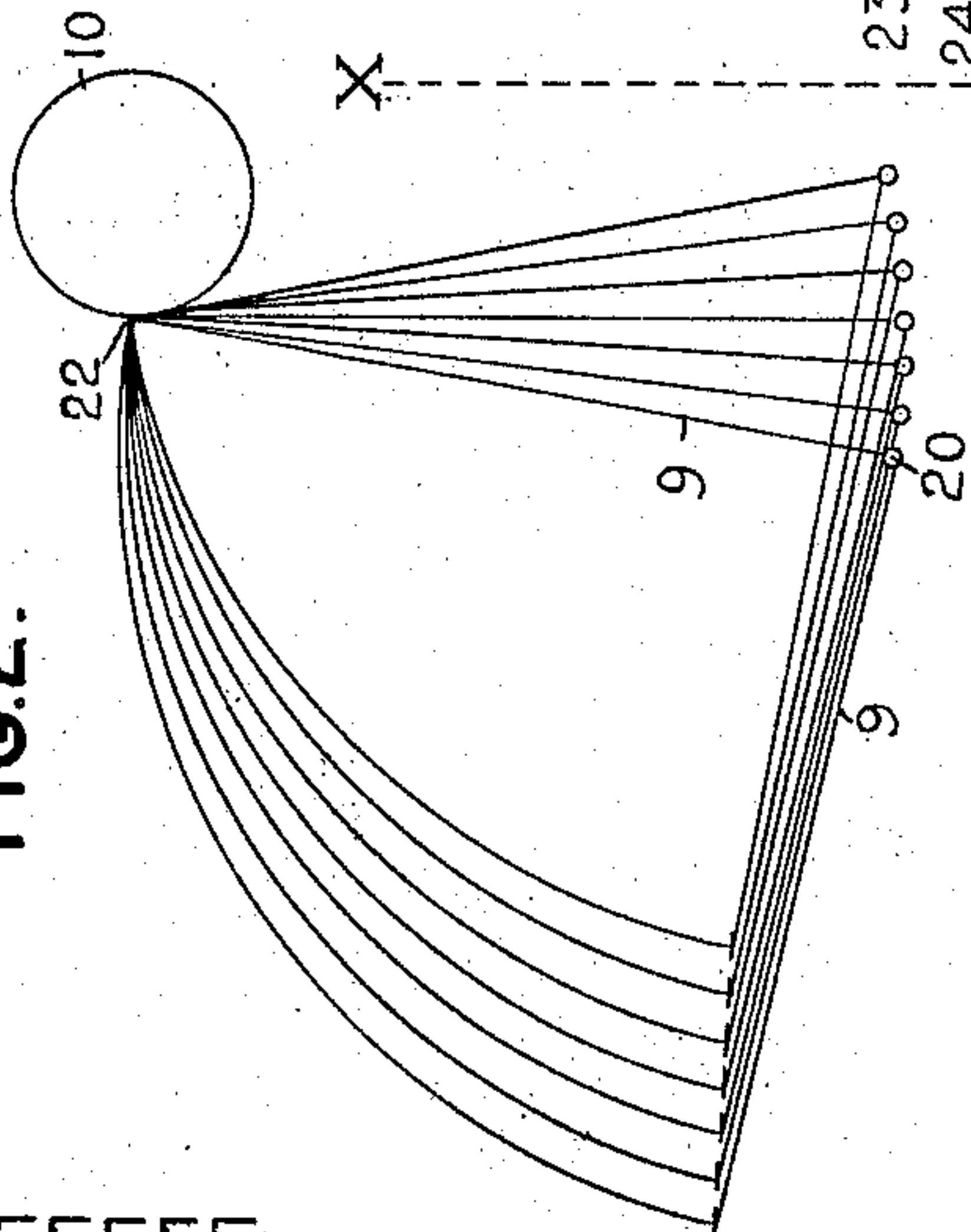


FIG. 2.



WITNESSES.  
B. Stickney  
B. Dudgeon

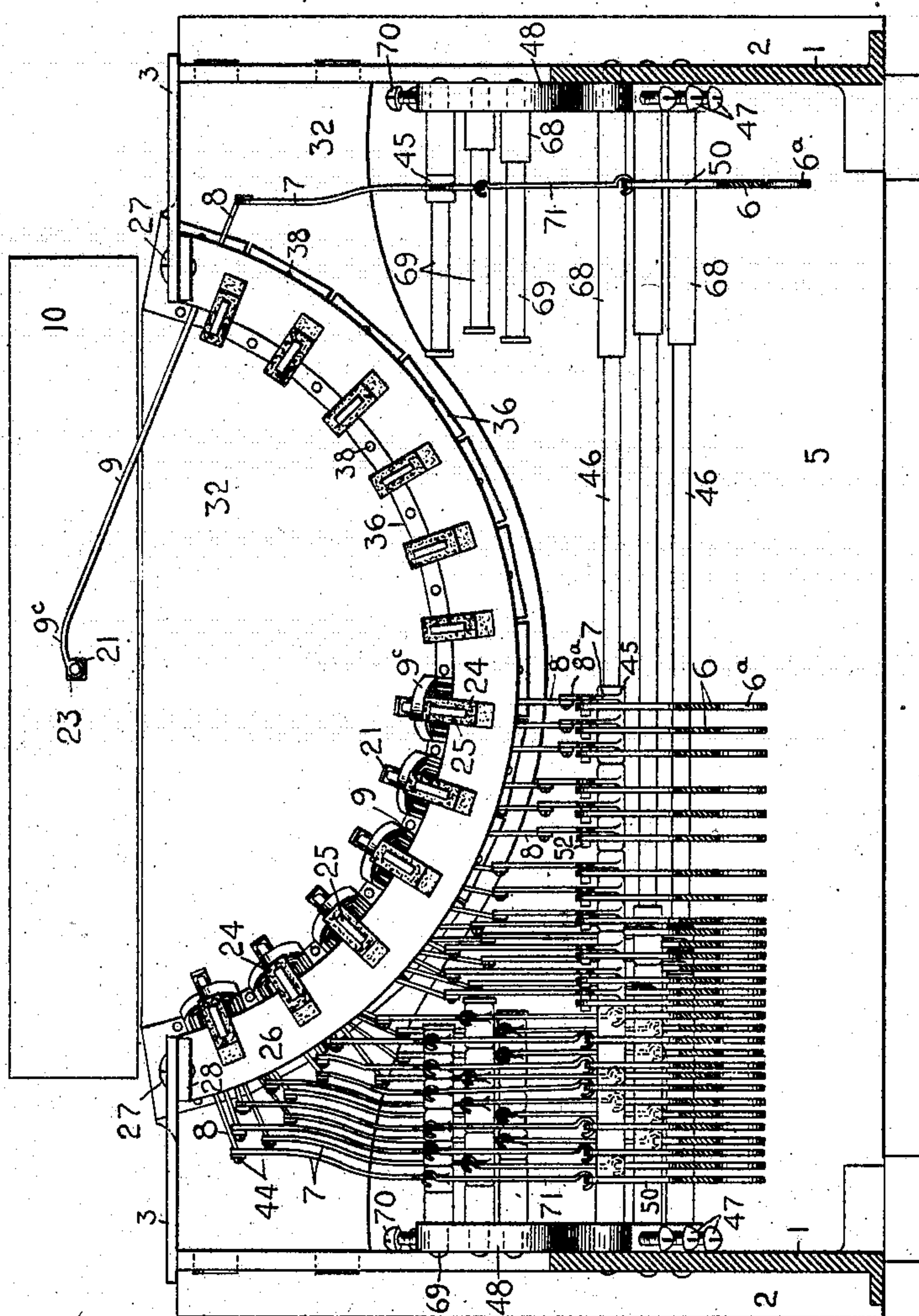
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Lee S. Burridge  
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7 SHEETS—SHEET 2.

FIG. 3.



WITNESSES.  
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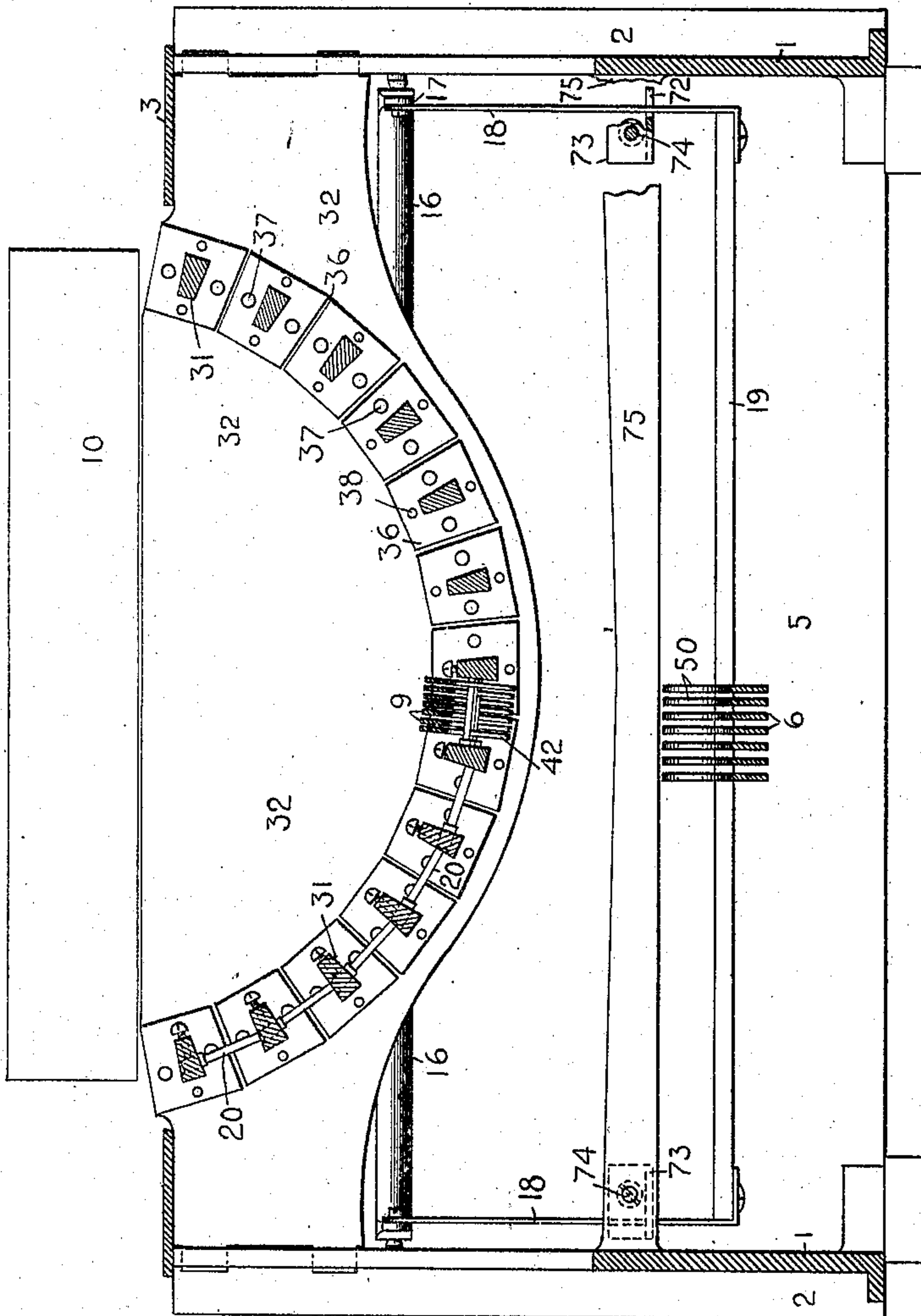
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7 SHEETS—SHEET 3.

FIG. 4.



WITNESSES.

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*H. C. Dudgeon*

INVENTOR.

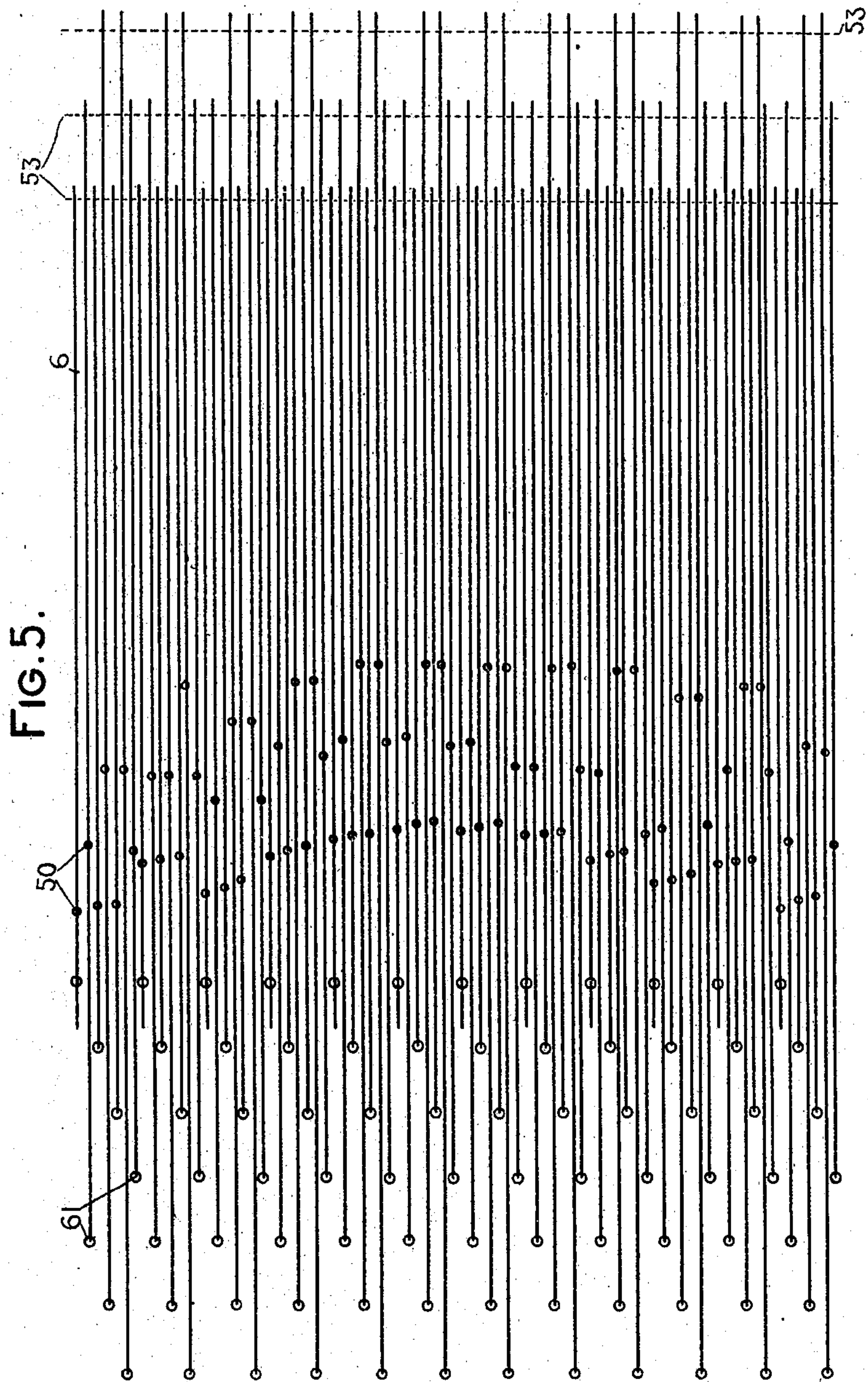
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7 SHEETS—SHEET 4.



WITNESSES.

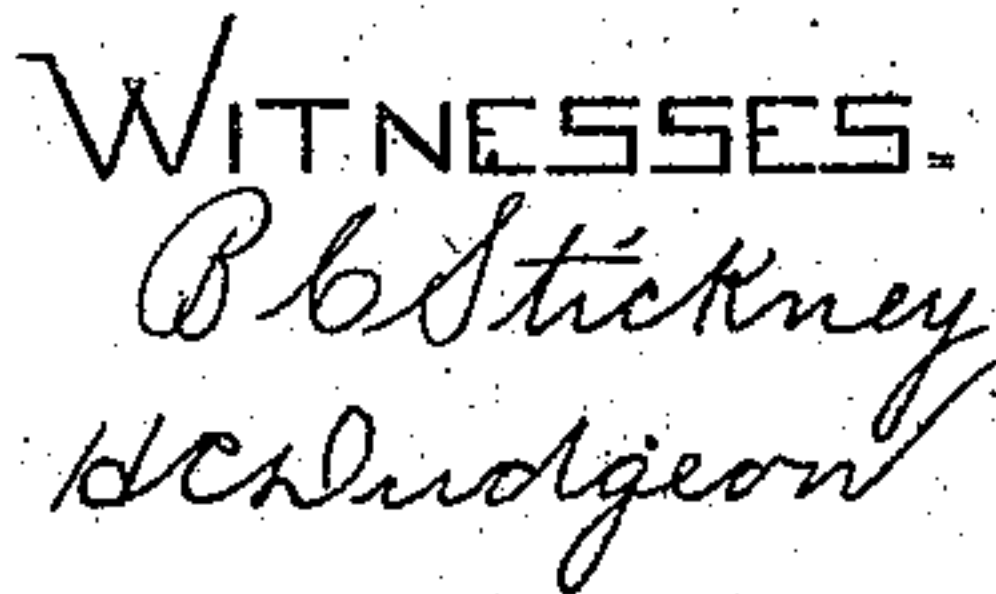
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7 SHEETS—SHEET 5.



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7 SHEETS—SHEET 6.

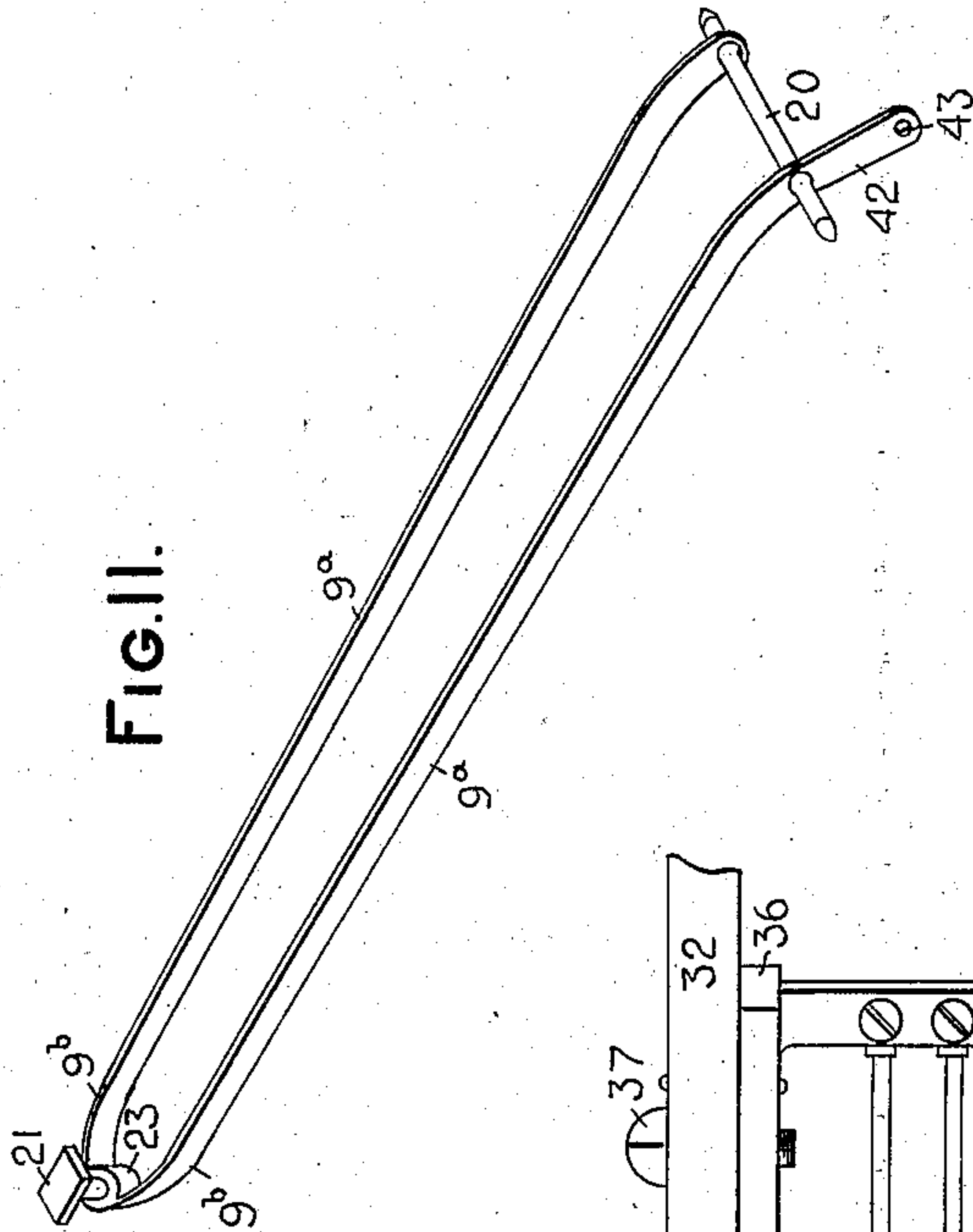


FIG. 11.

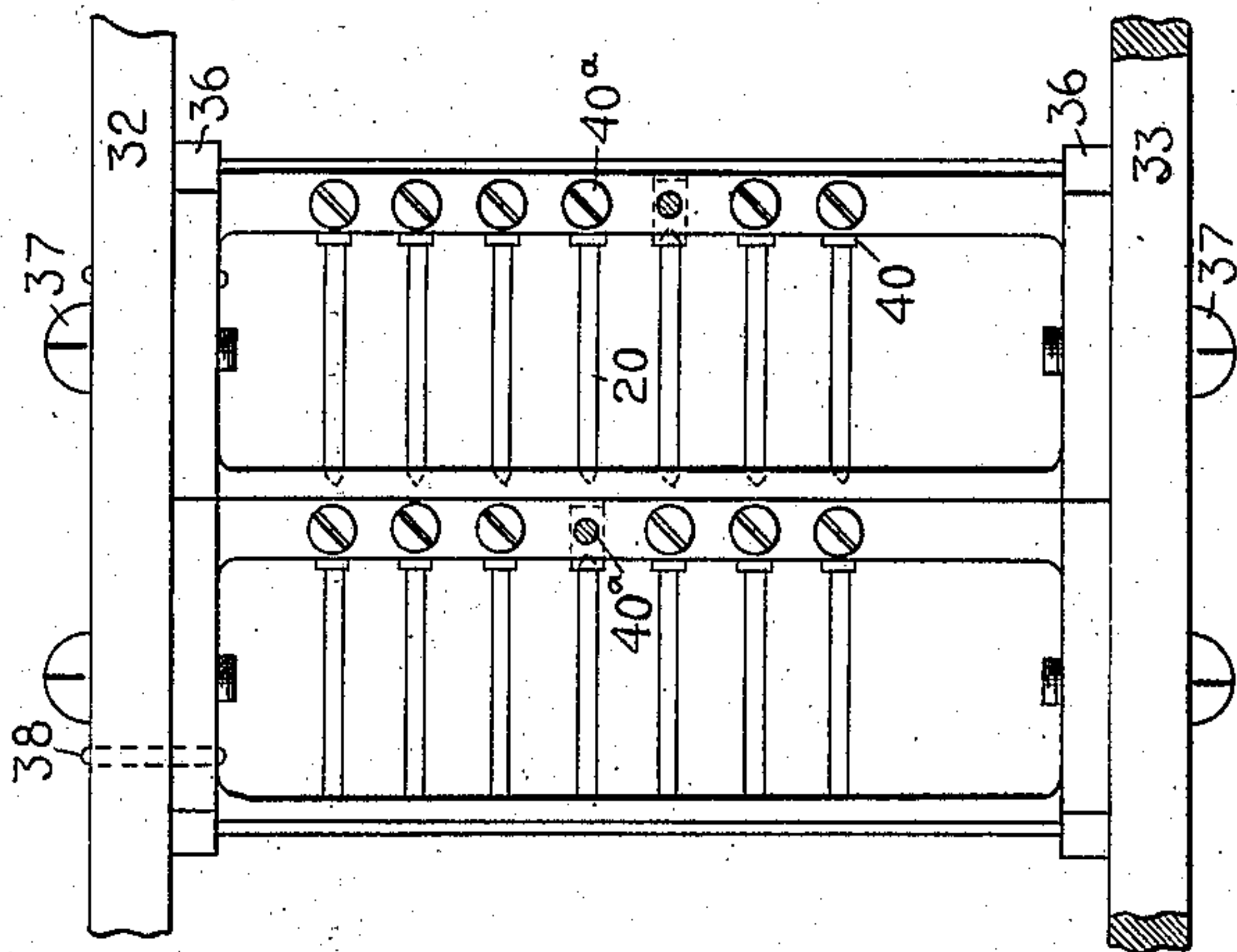


FIG. 10.

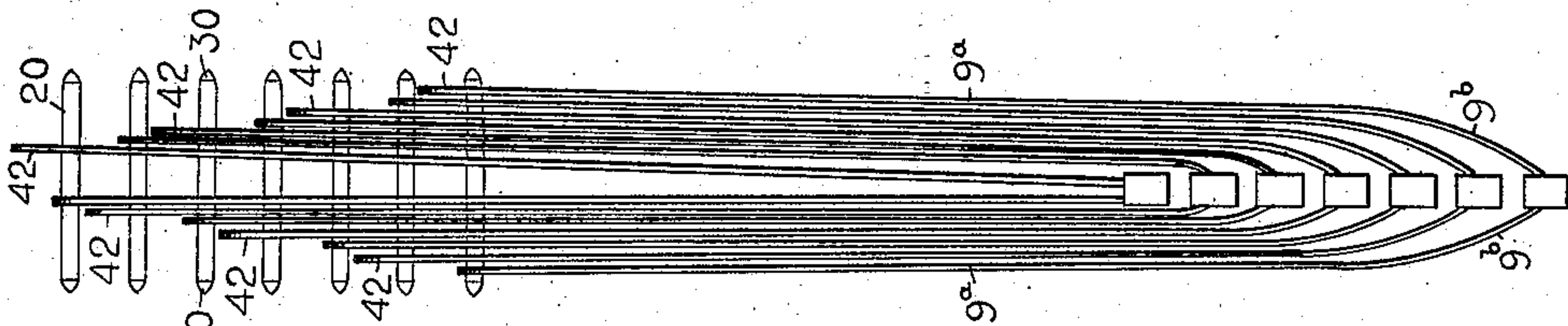


FIG. 9.

WITNESSES.

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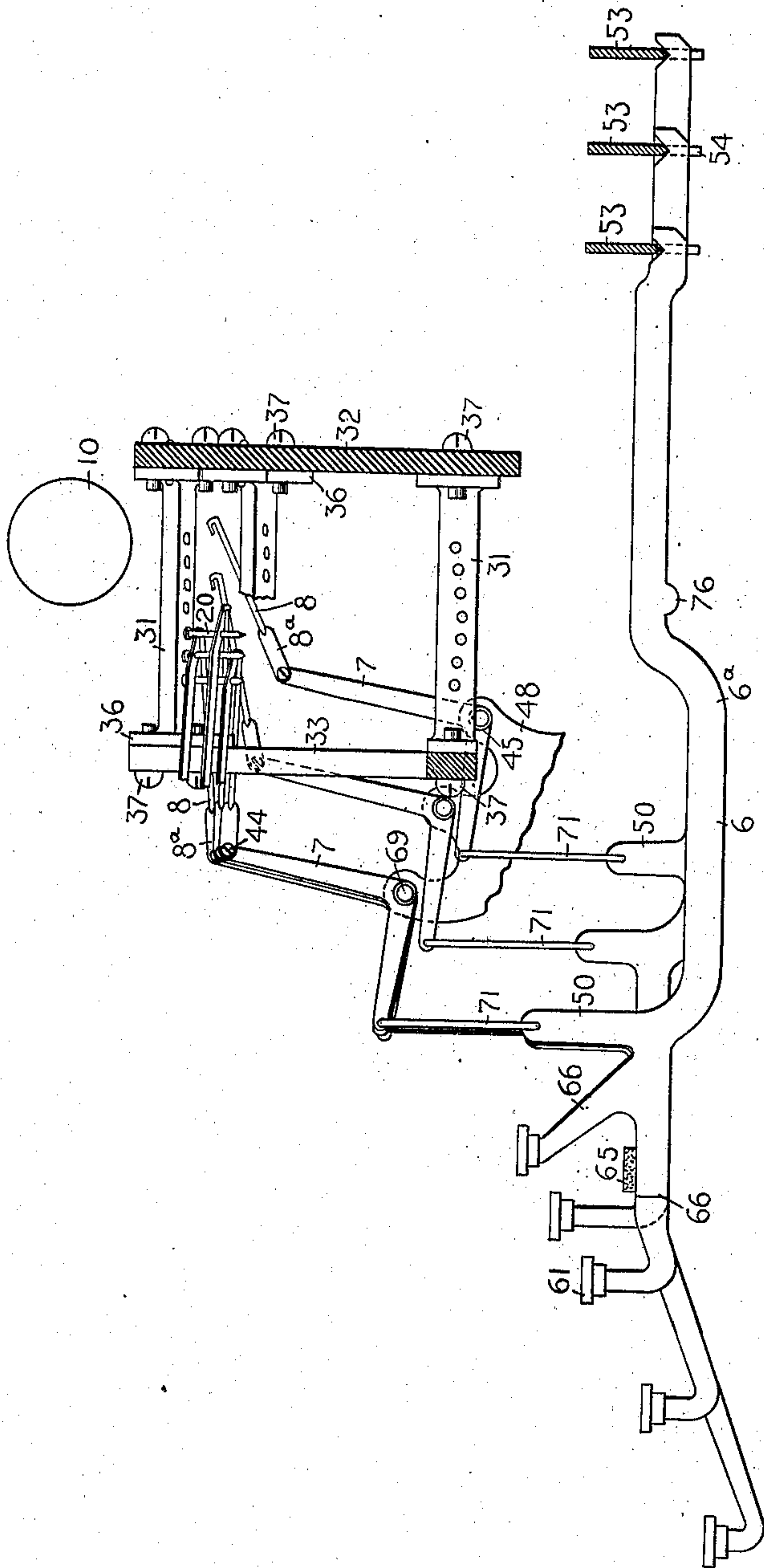
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7 SHEETS—SHEET 7.

FIG. 13.



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# UNITED STATES PATENT OFFICE.

LEE S. BURRIDGE, OF NEW YORK, N. Y., ASSIGNOR TO UNION TYPEWRITER COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## TYPE-WRITING MACHINE.

No. 911,644.

Specification of Letters Patent.

Patented Feb. 9, 1909.

Application filed January 30, 1901. Serial No. 45,318.

*To all whom it may concern:*

Be it known that I, LEE S. BURRIDGE, citizen of the United States, and resident of the borough of Manhattan, in the city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

10 This invention relates to type actions of writing machines.

The object of the invention is to produce a full keyboard, front strike writing machine, of simple construction and inexpensive to manufacture.

15 The invention includes a novel arrangement, whereby a large number of type-bars may be mounted in a small space, this feature being of special importance in constructing a full keyboard front strike or other visible writing machine having eighty or more type bars, which should occupy less than half a circle.

20 The invention also includes novel adjustable pivots for the type bars and novel connections from the latter to the keys.

My invention consists in certain features of construction, combinations of devices and arrangements of parts, all as will be fully hereinafter set forth and particularly pointed out in the concluding claims.

25 In the accompanying drawings, Figure 1 is a vertical section taken longitudinally of a full keyboard, front strike writing machine, made in accordance with my invention. Fig. 2 is a diagram illustrating the relative arrangement of the platen and the type bar pivots. Fig. 3 is a front sectional elevation taken forwardly of the type bars and in rear of the keys, on about the line X X of Fig. 1. Fig. 4 is a front sectional elevation, taken through the type bars and key levers at about the line Y Y of Fig. 1. Fig. 5 is a diagrammatic plan view of the key lever system. Fig. 6 is an enlarged fragmentary plan view of a central portion of the type system, showing a single group or nest of type bars and their supports. Fig. 7 is a perspective view of one form of type bar having an integral operating arm. Fig. 8 is a fragmentary perspective view of the hub end of one form of type bar showing the operating arm thereof separated from the main portion. Fig. 9 is a plan view of a nest of type bars of the preferred

form. Fig. 10 is a fragmentary plan of a modified multiplex hanger. Fig. 11 is a perspective view of one of the type bars shown at Fig. 9. Fig. 12 is a side view of a hanger arm. Fig. 13 is a sectional elevation similar to Fig. 1, but showing the type-bar actions at the left-hand side of the machine.

In the several views, portions are omitted or broken away for the sake of more clearly disclosing the invention, and similar parts are designated by similar numerals of reference.

The framework of the machine comprises side plates having base portions 1, upwardly extending standards or posts 2, upon which is supported a top plate 3, said plates being connected by a front bar 4 and rear plate 5. In the base are mounted horizontal key levers 6, which are connected by bell cranks or sub-levers 7 and links 8 to pivoted type bars 9, carrying each a single type at its forward end. The type impressions are made upon a platen 10, which may be supported upon any suitable carriage 11, the latter having an escapement rack 12, in which work the usual feeding and detent dogs 13 and 14, carried upon a rocker 15 which is mounted upon a horizontal rock shaft 16, the shaft having oppositely arranged operating arms 17, from which is suspended by links 18 a horizontal transverse universal bar 19.

The type bar system comprises preferably twelve substantially similar groups of seven bars each, the bars in each group lying side by side and overlapping and being rigidly secured upon rows of transverse parallel pivots 20, the pivots in each row being arranged at such intervals as to cause a proper separation of the types 21 at the ends of the bars. The types in each group lie in a row that extends longitudinally of the type bars and transversely of the entire system of types, so that said system is made up of a series of twelve rows, the bars in each row being parallel or substantially parallel. It will be seen from an inspection of Fig. 3 that if a series of lines are drawn from the types 21 to the printing point, these lines will indicate radial planes each of which cuts the printing point and the types 21 of a group of bars. The pivots 20, which extend at right angles to the type bars, are of such length as to project at each side beyond the type bar groups, thus giving wide



bearings for the bars. The type bars in each group swing in parallel planes, while the bars in different groups swing in different angular planes, owing to the arrangement of the groups in a curved series about the common printing center. The type bars are of substantially equal length from type to pivot, and the pivots are arranged at equal distances from the common printing center, which is designated as 22; that is, the pivots for each group lie in an arc whose center is the printing point and whose radius is equal to the length of a type bar from pivot to type, as illustrated at Figs. 1 and 2. At the latter figure, it will be observed that if all the type bars in a group could be simultaneously in printing position, their pivotal ends would fan out and occupy an arc concentric to the printing point. Each group of type bars occupies a different radial position relatively to the printing center, the type bars at the center of the entire system standing about vertically when in printing position, and those upon either side thereof standing at gradually increasing inclinations, until at the extreme right and left-hand sides of the system the bars stand in nearly horizontal positions when printing. There is one type only on each bar and the types of each group of type bars are all arranged in a straight line one behind the other longitudinally and midway of the group, the outer ends of the type bars being bent inwardly towards each other from opposite sides of the median line of the group so as to bring all of the types in said line, and which line in each group is in a plane radial of the printing point. Owing to their long pivots, the type bars at all parts of the system are enabled to vibrate freely and to strike the printing point with accuracy; while owing to the novel disposition of the type bars in radial groups or nests, a large number of bars may be assembled in a comparatively small space, so that the types may lie within easy striking distance from the platen.

Preferably each type bar is divided longitudinally or made in loop form, as illustrated at Figs. 9 and 11, the sides of the loop being indicated as 9<sup>a</sup>; and the forward ends thereof being bent inwardly at 9<sup>b</sup> and provided at their meeting points with a socket 23 for receiving the shank of the type. The inner or rear type bar may be made either in loop form, as illustrated at Fig. 9, or in the undivided form illustrated at Fig. 6. The other type bars in the group have loops of gradually increasing width, so that the type bars may nest or lie one within another. In the modification shown at Fig. 6, the type bar arms are plain or undivided, being arranged three on each side of the central type bar, their extreme forward ends being curved or otherwise bent inwardly at

9<sup>c</sup>, so that the type sockets 23 may lie in a row or line; but the construction shown at Figs. 9 and 11 forms a stiffer bar without unduly increasing the weight thereof, the bending stress occurring at the impact of the type being borne evenly by the two sides 9<sup>a</sup> of the loop, and there being little or no torsional stress thereon.

From the foregoing description, it will be understood that the pivots of the various type-bars are arranged in a plurality of vertical parallel planes that extend transversely of the machine and that the various types are likewise arranged in a plurality of vertical parallel planes that extend transversely of the machine and which are parallel and equal in number to the planes in which the pivots of the type-bars are situated.

The type ends of the bars in each group rest upon a cushion 24, which is made in sleeve form and slips over the free end of a forwardly projecting arm 25, whose rear end is shaped to fit upon a curved plate or bar 26, the latter being secured by ears 28 and screws 27 to the underside of the top plate, and the arms 25, of which there is one for each type nest, being secured to the plate 26 by screws 29.

The pivots 20 are coned or pointed at each end at 30, and have opposite bearings in parallel hangers or bars 31, which extend horizontally between segments 32 and 33, the latter being secured by ears 34 and screws 35 to the top plate 3, and curving concentrically with the type system, and the former being in the form of a vertical plate having a horizontal upper edge and forming preferably a part of the general framework of the machine. The bars 31 have opposite heads 36, which abut against the opposing faces of the segments 32 and 33, and are secured thereto by screws 37, which pass through holes in the segments and are tapped into the heads 36, dowel pins 38 being also provided to insure accurate positioning. The segments 33 and 32, taken together with the cross bars 31, form a rigid grating so that there is no liability of the hangers becoming displaced or the type bars deranged, with resulting irregularity of type impressions. The right-hand coned end of each pivot fits in a shallow conical depression or bearing 39, Fig. 12, formed in the side of the bar or hanger 31, while its left-hand coned end fits in a conical depression formed in the end of a bushing or bearing block 40, which is seated in a hole or perforation 41 in the opposite hanger 31. The bushing may be moved longitudinally or axially within the hole, and hence adjusted closely to the pivot, whereby the latter is firmly supported and also enabled to work freely. After their adjustment the bushings 40 are secured in position by set screws 40<sup>a</sup>, tapped into the up-



per edge or face of the hanger 31. Upon releasing the bushing and pushing it to the left, the type bar may be withdrawn. The perforations 41 for the bushings alternate with the conical depressions 39, the latter being formed, however, only upon one side of each fixed bar 31.

In the construction shown at Fig. 10, each group or nest of type bars is supported wholly by an integral four-sided frame, the heads 36 whereof are secured to the segments 32 and 23, and the sides whereof are provided with bearings for the type bars. The two-piece multiplex hanger, illustrated at Fig. 6, is, however, preferred, since the arms thereof are separable and since each arm contains bearings for two adjoining nests of type bars, thus simplifying the construction and reducing the cost of manufacture. It will be perceived at Fig. 6 that each arm which is interposed between type bar groups has bearings for the bars in both groups.

It will be seen that the spaces between adjacent groups of type bars provide unobstructed passages which afford ready access from the front of the machine to the screws 40<sup>a</sup> so that individual type bars may be readily removed and replaced when desired.

Each type bar is provided at its rear end with a short downwardly extending operating arm 42, formed integrally with one of the sides 9<sup>a</sup> of the loop. Said operating arms alternate, as illustrated at Fig. 9, the arm of the outer or forward type bar being upon the right side thereof, that of the next rear or inner type bar upon the left thereof, and so on, so that the same arms are given a staggering arrangement, whereby room is afforded for the attachment of the links 8. For the same purpose the undivided type bars shown at Figs. 6 and 8 may have offset operating arms, as required. In both constructions the operating arms are arranged one in rear of or behind another, as seen at Fig. 1.

Referring particularly to Fig. 1, which illustrates the central nest of type bars, it will be seen that the links 8 extend forwardly at a downward inclination from the type bars, and are pivotally attached by screws 44 to the tips of the upwardly and rearwardly extending arms of the bell cranks 7, each link 8 being substantially in line with the arm of the bell crank or sub-lever to which it is connected. Each of said links 8 comprising a hook-like rear end for engaging a hole 43 in the type bar operating arm, and a plate-like forward end 8<sup>a</sup> for pivoting upon the screw 44. The seven bell cranks for this group of type bars are divided into three groups, the forward group, which comprises three bell cranks, being connected to the three forward type bars, the second group of two bell cranks being arranged rearwardly of and a little lower than the

first group and being connected to the next two type bars, and the third group of two bell cranks being arranged in rear of and lower than the second group and connected to the two rear type bars. The links 8 may either lie in parallelism or separate at their rear or forward ends, as required. The links and bell cranks in the second set underlie to some extent those in the first set, and those in the rear set underlie those in the second set, so that sufficient room is afforded for the movements of the several devices, and also so that the links in either set may be conducted in any required direction from the bell cranks to the type bar operating arms 42.

The bell cranks 7 are pivoted by means of wide hubs 45 upon three transverse horizontal fulcrum rods 46, which at their ends are secured by set screws 47 in sockets formed upon opposite vertical plates 48, arranged at the sides of the machine and secured by screws 49 to the side walls 1 of the base, said hubs 45 being preferably of equal size and of sufficient width to properly space the bell cranks along the fulcrum rods, the latter being arranged one behind and slightly below another and hence in different horizontal and vertical planes, so that the bell cranks are arranged in different tiers, the upwardly and forwardly extending arms in one tier being respectively behind and below similar arms in another tier.

The key levers 6 are connected to the forwardly extending bell crank arms by means of upwardly extending ears 50, whose upper ends are perforated at 51 to engage pins 52 projecting laterally from the bell cranks, the perforations 51 being in the form of horizontal slots, so as to accommodate the forward and rearward movements of the pins 52 due to the swinging of the bell cranks upon their pivots. The ears 50 terminate at different heights and are arranged at different points longitudinally of the key levers, according to the vertical and horizontal positions of the bell cranks with which they engage. The key levers dip or are bowed downwardly at 6<sup>a</sup> to pass beneath the bell crank system, and are pivoted at their rear ends upon three fulcrum bars 53, which extend one behind another horizontally across the machine and are fixed at their opposite ends to the side plates 1, the levers being notched at their rear ends to engage the lower edges of the fulcrum bars, and the latter being vertically slotted at 54 to form guides for the levers. Compression springs 55, which bear up against the under sides of the levers forwardly of their fulcrums, are arranged in vertical perforations 56 formed in a fixed transverse bar 57, said perforations being tapped to receive screws 58, which pass upwardly thereinto and form adjustable supports for the springs



55, so that the tension of the latter may be adjusted to meet the requirements of each key lever and type bar. The upper ends of the screws may be provided with stems 59 for guiding the coiled springs 55. Secured to the forward edge of the spring supporting bar or plate 57 is a key lever guide comb 60. The forward ends of the levers, which are provided with keys 61, are guided in a comb 62, constructed of vertical reeds or wires, which are fixed at their top ends in a horizontal plate 63, and which at their bottom ends engage perforations formed in a horizontal plate 64, detachably secured upon the base by screws 64<sup>a</sup>. A pad or rest 65 is secured to the under side of the plate 63. Preferably the comb 62 is arranged partly beneath and partly forwardly of the rear bank of keys 61, and accordingly the keys in said bank are fixed upon rearwardly inclined stems 66, which have forwardly projecting toes 67, guided by the comb 62 and normally resting against the pad 65 under the tension of the spring 55.

By the provision of a guide comb with a detachable member such as 64 I am enabled to place in the comb key levers of the character shown, which levers could not be placed in the comb if the parts were rigidly connected on account of the projections 50 situated at one side and the key heads at the other side of the comb.

The forward type bars are connected by the forward bell cranks to levers pivoted upon the forward fulcrum bar 53 and having keys in the rear banks at the keyboard, these key levers hence being the shortest in the system. The rear type bars are connected by the rear bell cranks to the longest key levers, which terminate at the front portion of the keyboard and are pivoted upon the rear fulcrum bar 53; while the intermediate bell cranks connect the intermediate type bars to the key levers of medium length, which extend to the middle banks of the keyboard and are pivoted upon the middle fulcrum bar 53. The forwardly extending arms of the bell cranks may be of various lengths as required, and the ears 50 placed at corresponding points longitudinally of the key levers in order to secure uniform key movements. The bell cranks at the center of the system are the shortest and of the most obtuse formation, the remaining bell cranks being longer and more acute or having more nearly erect type operating arms, according to their distance from the center of the system. Sleeves 68 are placed upon the ends of the rods 46, to prevent sidewise displacement of the several sets of bell cranks.

As may be seen at Fig. 1, the bell cranks or angle lever which are arranged at the central portion of the machine and directly beneath the lowermost type bars, where

there is but little room between the key levers and the type bars, are considerably inclined, whereby their height is somewhat reduced, and whereby they are also given a better initial purchase upon the type bars at the center of the system, which are the most affected by gravity. That is to say, each of said bell cranks or sub-levers 7 has a rearwardly directed arm which is arranged end to end with its associated link 8 and substantially in line therewith so that together they form a toggle connection for accelerating the type bar. This construction is such that it affords an easy action at the initial portion of the key stroke by the breaking of the toggle from a substantially straight-line position, and thus causing the type bar to be accelerated during its entire travel to the printing point. As the type bar system curves upwardly from the central portion of the machine, more space is gained between the type bars and key levers, and hence the upright arms of the bell cranks may stand more erect, and these arms may be gradually lengthened so as to bring up the forward ends of the links 8 and avoiding undue inclination thereof. The forwardly extending arms of the bell cranks may also be proportionately lengthened and the ears 50 placed at correspondingly advanced positions upon the key levers. Said ears are arranged at varying distances from the key lever fulcrum, corresponding to the positions and lengths of the horizontal arms of the bell cranks, as illustrated in the diagram at Fig. 5. In all cases the forward movement of the front ends of the links 8 is substantially the same, and the bell crank arms are given such proportions and the key lever ears are so positioned as to secure substantially uniform key depressions.

The extreme ends of the type bar system curve rapidly upward, leaving a great space between the type bars and the key levers; but in order to avoid the use of unduly lengthened bell cranks, which would necessarily encroach upon the room required for the keyboard, I provide at each side of the machine a set of three auxiliary bell crank fulcrum rods 69, the outer ends whereof are secured by means of set screws 70 in perforations formed in the upper part of the bracket 48. These auxiliary fulcrum rods have a similar arrangement to that of the main rods 46; that is the second rod is arranged behind and lower than the first, and the third behind and lower than the second, whereby the same advantages are secured as already referred to in connection with the arrangement of the main rods. The bell cranks mounted upon these short rods 69 are connected to the associated key lever ears 50 by means of vertical links 71.

The entire system of type bar links 8 fans or spreads outwardly from the type bar op-



erating arms, and hence the width of the entire system of links is considerably in excess of the width of the type bar system. The width of the key lever system is, however, substantially equal to that of the bell crank system. Thus it will be seen that while a great number of type bars is confined within a small compass, so that each type is enabled by a short movement to reach the common printing center, still the system of key levers is of such width as not to necessitate undue crowding of either the levers or keys; while the connections between the key levers and the type bars are not subject to any cramping or binding action, the power being transmitted directly from the keys through the bell cranks and links to the type bars, and lateral strains being avoided, whereby free and light action of the mechanism is insured. Some of the extreme right and left-hand bell cranks may have inwardly bent type operating arms, as illustrated at Fig. 3, so that the links 8 connected thereto may lie more nearly parallel with the planes of vibration of said bell cranks, thus avoiding liability of undue lateral stress upon the latter.

The links 18, which suspend the universal bar 19, are guided at their lower portions in cutaways 72 formed in angle brackets 73, which are secured by screws 74 upon a fixed transverse bar 75. Each key lever is provided upon its bottom edge with a rounded projection 76, for actuating the universal bar, said projections being so arranged with respect to the fulcrums of their levers as to always move the universal bar through equal distances, thereby securing uniform motions of the dog rocker 15, which is a desideratum in this class of machines. Said projections 76 extend in three rows across the system of key levers, those in the forward row being formed upon levers which are pivoted upon the forward fulcrum rod 53, those in the middle row upon those levers pivoted upon the middle fulcrum rod, and those in the rear row upon those levers pivoted upon the rear fulcrum rod. The universal bar, which is of sufficient breadth to be operated by any projection 76, is so guided by the device 72 that it moves in substantial parallelism, so that its upper or working surface remains constantly horizontal and its downward movement is the same in all cases.

In operation, a key 61 is depressed, and by means of its lever 6 the bell crank connected to the ear 50 thereon is vibrated, and through the link 8 and arm 42 the type bar is swung upwardly and rearwardly to print. At the same time the universal bar is depressed by the projection 76 upon the key lever, and through the rods 18 and arms 17 the dog rocker is vibrated. Upon the release of the key, the parts connected thereto are returned to normal position by the springs 55, and

the dog rocker is also returned by a spring 77, permitting the usual advance movement of the carriage under the tension of a driving spring (not shown).

From the foregoing description it will be understood that although the different key actuated levers 6 have different angular movements the variation of contact between said key levers and the universal bar at different points widthwise of the bar and at different points from the front of the machine results in a construction wherein means are provided for equalizing the movements imparted to the universal bar by the different key actuated levers and for causing the universal bar to be taken up or the movement thereof to be started with a uniform extent of depression of the different keys, so that the escapement will be actuated alike by the different keys and the touch on the different keys will be uniform.

Very many changes may be made in details of construction in adapting the invention to various styles of machines, and portions thereof may be used without others.

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

1. In a typewriting machine, the combination of a platen and a plurality of type bars arranged in a radial group and lying side by side and pivoted to vibrate in parallelism, their types being substantially equidistant from their pivots.

2. In a typewriting machine, the combination with a platen, of a type bar system consisting of a plurality of radial groups of pivoted type bars having substantially a segmental arrangement, the type bars in each group vibrating in parallelism, and the several groups occupying different angular positions.

3. In a typewriting machine, the combination with a platen, of a type bar system consisting of a plurality of radially arranged groups of pivoted type bars, the type bars in each group vibrating in parallelism, and their types being substantially equidistant from their pivots, the types in each group lying in a row which extends longitudinally of the type bars.

4. In a typewriting machine, the combination with a platen, of a plurality of type bars arranged side by side and mounted upon parallel pivot wires, their types being equidistant from their pivots.

5. In a typewriting machine, the combination with a platen, of a plurality of radial groups of type bars, the bars in each group being mounted upon pivot wires which are parallel one to another and extend at right angles to the type bars, the types upon said bars being arranged in a row longitudinally thereof and being substantially equidistant from the pivots of said bars.

6. In a typewriting machine, the com-



combination with a platen, of a type system comprising a curved series of rows of types and a curved system of bar groups upon which said types are carried, each row of types extending longitudinally of its bar group.

7. In a typewriting machine, the combination with a platen, of a series of radially arranged groups of nested type bars, the type bars of each group extending beyond one another towards or from the front of the machine, and each type bar being mounted upon a transverse pivot which extends laterally beyond the nested type bars of its group and which is provided at its ends with suitable bearings.

8. In a typewriting machine, the combination with a platen, of a series of nests of type bars, having substantially a segmental arrangement, each type bar being mounted upon a transverse pivot which extends at both ends beyond the nest and is provided at its ends with suitable bearings, all the pivots in each group being parallel, and the types being substantially equidistant from the pivots.

9. In a typewriting machine, the combination with a platen, of a series of groups of pivoted type bars, the pivots for each group of type bars lying in an arc that extends fore and aft of the machine and whose center is the printing point and whose radius is equal to the length of the type bar from pivot to type.

10. In a typewriting machine, the combination with a platen, of a series of groups of pivoted type bars, the groups being radially arranged and the type bars in each group vibrating in substantial parallelism on parallel axes but angularly to the type bars in other groups, and the types on said bars being situated at a substantially uniform distance from the pivots thereof.

11. In a typewriting machine, the combination with a platen, of a type system comprising a series of rows of types, radially and segmentally disposed groups of bars upon which said types are carried, the types being arranged in a curved series that extends transversely of the length of the bars and each row of types extending longitudinally and centrally of its group of type bars, and means for moving each of said bars independently.

12. In a typewriting machine, the combination with a platen, of a group of type bars lying side by side and having their ends bent laterally so as to bring the types thereon into a longitudinal row within the group, said type bars being so pivoted as to vibrate in substantial parallelism and having their types substantially equidistant from their pivots.

13. In a typewriting machine, the combination with a platen, of a series of segmentally arranged groups of type bars that extend

fore and aft of the machine and strike upwardly and rearwardly to print, the type bars of each group lying side by side and being mounted upon parallel pivotal axes, and one or more of the bars of each group having ends bent towards each other from opposite sides of the group so that the types upon the bars lie in a row extending longitudinally of the bars.

14. In a typewriting machine, the combination with a platen, of a curved series of type bar nests, each nest comprising a central bar and a plurality of bars disposed at the sides of said central bar, said side bars having ends bent inwardly from opposite sides towards said central bar so that all the types upon the bars may lie in a row extending longitudinally of the bars.

15. In a typewriting machine, the combination with a platen, of a series of radially arranged nests of type bars, each nest comprising a centrally arranged type bar and one or more type bars of loop form confining said centrally arranged type bar and the type bars of each nest extending beyond one another towards or from the front of the machine, and the types of all of the bars being arranged in line with the type of the central bar.

16. In a typewriting machine, the combination with a platen, of a series of radially arranged adjacent groups of nested loop-form type bars that extend fore and aft of the machine and strike upwardly and rearwardly to print, the type bars of each group being substantially parallel, said nests being angularly disposed with respect to one another.

17. In a typewriting machine, the combination with a platen, of a series of radially arranged nests of looped type bars, the type bars in each nest vibrating in substantial parallelism and being substantially equal in length from type to pivot.

18. In a typewriting machine, the combination of a series of adjacent radially and segmentally arranged groups of type bars, the type ends of each group lying in a row extending fore and aft of the machine, and a series of cushions for the type ends of the bars, one cushion for each group.

19. In a typewriting machine, the combination with a series of adjacent radially arranged groups of type bars, of plate 26, a series of arms 25 thereon, and cushions 24 upon said arms.

20. In a typewriting machine, the combination of a platen, a plurality of type bars lying side by side and pivoted to vibrate in parallelism, their types being substantially equidistant from their pivots, and arranged centrally and longitudinally of the set of type bars, and a single support or hanger for said type bars.

21. In a typewriting machine, the combination



nation with a platen, of a type bar system comprising a plurality of radially and segmentally arranged groups of type bars and a plurality of hangers, one hanger for each group of type bars, the type bars in each group being pivoted in their hanger so as to vibrate in parallelism, and the types being all arranged to be cut by a radial plane that contains the printing point.

22. In a typewriting machine, the combination with a platen, of a series of radially arranged nests of type bars, and a series of hangers, one hanger for each nest, the type bar pivots of each nest being parallel and at different distances from the front of the machine and each type bar having a pivot that extends transversely of the machine and is supported upon a hanger, the pivot ends of the type bars being confined between the arms of the hangers, and the length of the pivots being greater than the width of a nest.

23. In a typewriting machine, a multiplex type bar hanger having parallel arms arranged longitudinally of the machine and opposite bearings in said arms for a group of type bars, the axes of the bearings being parallel and transverse of the group and arranged in a curve which is concentric with the printing point.

24. In a typewriting machine, a multiplex type bar hanger having parallel arms arranged longitudinally of the machine, said arms having opposite bearings for a group of type bar pivots, the axes of the bearings being parallel and transverse of the group and arranged in a curve which is concentric with the printing point, and said arms also having bearings for an adjoining group of type bar pivots.

25. In a typewriting machine, a multiplex type bar hanger comprising separable parallel arms, each of said arms having a plurality of pivotal bearings in its inner face and a plurality of pivotal bearings in its outer face, the bearings in the inner faces of said arms being adapted to support a plurality of type bars between said arms and the bearings in the outer face of each of said arms being arranged to coact with a like number of bearings in an adjacent arm forming part of another hanger.

26. In a typewriting machine, a series of type bars arranged radially of a common printing center, and a series of detachable supports interposed between the type bars and each having a bearing for the type bars between which it is interposed.

27. In a typewriting machine, a series of radially arranged groups of type bars and a series of fixed bars interposed between the groups of type bars, each fixed bar having bearings for the groups of type bars between which it is interposed.

28. In a typewriting machine, the combi-

nation of a pair of segments supported upon the framework, a series of independent hangers extending between and secured by their ends to said segments, and type bars pivoted in said hangers.

29. In a typewriting machine, the combination of a pair of segments supported upon the framework, a series of hangers each comprising separable arms or sides, which extend between and are secured by their ends to said segments, and type bars pivoted upon said hangers.

30. In a typewriting machine, the combination with a platen, of a pair of segments supported upon the framework, a series of hangers extending between and secured by their ends to said segments, and a group of type bars mounted upon each hanger by parallel pivots.

31. In a front-strike typewriting machine, the combination of a series of segmentally arranged hanger bars that extend fore and aft of the machine, each bar having a series of type bar pivot bearings arranged along the length thereof, and certain of said bearings comprising bearing blocks that are mounted for movement longitudinally of the axes of the pivots of the associated type bars; screws that are received in tapped openings in said hanger-bars and bear against the bearing blocks to retain them in their adjusted positions, the heads of the screws extending upwardly into the basket so that access may be readily gained thereto; and type bars having pivots received in said bearings.

32. In a front-strike typewriting machine, the combination of a series of segmentally arranged hanger bars that extend fore and aft of the machine, each bar having a series of type bar pivot bearings in the sides and arranged along the length thereof, certain of said bearings comprising bearing blocks that are mounted for movement longitudinally of the axes of the pivots of the associated type bars; screws that are received in tapped openings in said hanger-bars and bear against the bearing blocks to retain them in their adjusted positions, the heads of the screws extending upwardly in the basket so that access may be readily gained thereto from the front of the machine; and type bars having pivots received in said bearings, a group of such type bars being received between adjacent hanger-bars, the spaces between adjacent groups of type bars affording unobstructed passages which give access to said screws.

33. In a front strike typewriting machine, the combination with a platen, of a series of segmentally, and radially arranged type bars pivoted at their rear ends so as to vibrate rearwardly to the printing point in different planes, each of said type bars being in loop form so as to bring the types of all



of the bars in a line radially of the printing point and having at its rear portion an operating arm formed integrally with one side of the loop.

34. In a typewriting machine, the combination with a platen, of a series of groups of radially arranged rearwardly striking type bars having operating arms at their rear ends, the operating arms in each group having a staggering arrangement and some of the arms of each group being off-set from their bars, so that some of the arms will each vibrate in the plane of movement of the associated bar whereas other arms will each vibrate in a plane parallel to the plane of movement of the associated bar.

35. In a typewriting machine, the combination with a platen, of a series of radially disposed groups of nested type bars of loop form pivoted upon hangers supported upon the framework, and means to which access may be gained at all times without disturbing the adjacent type bars or their bearings for readily effecting a detachment of each of the type bars from its hanger.

36. In a typewriting machine, the combination with a platen, of a series of groups of type bars that are arranged radially of the printing point, the types in each group being arranged in a single line that extends fore and aft of the machine and radially of the printing point, and a series of hangers, the type-bars in each group having parallel pivots which are detachably assembled upon a single hanger.

37. In a front strike writing machine, the combination with a platen, of a series of rearwardly striking pivoted type bars, a series of forwardly extending links, and a series of key-operated bell cranks connected by said links to said type bars, said bell cranks being of different sizes, the smaller ones being arranged at the middle of the system and the larger ones at the sides of the system, and a series of key-actuated levers connected to said bell cranks at different points in the lengths of said levers.

38. In a front strike writing machine, the combination with a platen, of a series of rearwardly striking pivoted type bars to a fixed portion of the machine, a series of forwardly extending links, a series of bell cranks pivoted beneath the type bars, said bell cranks being of small size at the middle of the system and increasing in size as the sides of the system are approached, and a system of key bearing levers extending rearwardly beneath said bell cranks and connected thereto at different points in the length of said levers.

39. In a front strike writing machine, the combination with a platen, of a series of rearwardly striking pivoted type bars and a series of bell cranks connected thereto, the bell cranks which operate the type bars at

the middle of the system being short and obtuse, and the other bell cranks being longer and more acute as the sides of the machine are approached.

40. In a front strike typewriting machine, the combination of a platen, a series of type bars arranged forwardly thereof and pivoted at their rear ends, a series of keys, and means for affording the keys different initial purchases upon the type bars, the type bars at the central portion of the system having the best initial key purchase, and the initial purchases of the other keys upon their type bars being gradually less as the sides of the machine are approached.

41. In a front strike writing machine, the combination with a system of rearwardly striking type bars, of a system of key operated bell cranks connected to the type bars and arranged in different tiers, said bell cranks having forwardly extending arms and upwardly extending arms, the forwardly extending arms in one tier extending beneath those in another tier, and the upwardly extending arms in one tier extending in rear of those in another tier.

42. In a front strike writing machine, the combination with a system of rearwardly striking type bars, of a system of key operated bell cranks connected to the type bars and fulcrumed upon transverse rods which are arranged in different horizontal and vertical planes, each rod carrying a tier of bell cranks.

43. In a front strike writing machine, the combination with a system of rearwardly striking type bars, of a system of bell cranks connected to the type bars and fulcrumed upon transverse rods, one rod being arranged in rear of and below another, and key bearing levers connected to said bell cranks.

44. In a front strike writing machine, the combination of a series of rearwardly striking type bars, fulcrum rods, bell cranks pivoted upon said fulcrum rods and connected to the type bars at the middle portion of the system, fulcrum rods mounted at the sides of the machine, bell cranks pivoted thereon and connected to the type bars at the sides of the system, and key bearing levers connected to all of said bell cranks.

45. In a front strike writing machine, the combination with a series of rearwardly striking type bars, of a series of key bearing levers, a transversely arranged series of bell cranks arranged over said key bearing levers and connected to said type bars, said bell cranks having arms of various lengths, and ears projecting upwardly from said key levers at different points in the lengths thereof and engaged to the free ends of said bell crank arms.

46. In a front strike writing machine, the combination with a series of rearwardly striking type bars, of a series of key bearing



levers, a series of bell cranks of different sizes pivoted in line transversely over said key bearing levers and connected to said type bars, and ears projecting upwardly from said key levers at different distances from their fulcrums and engaged to the bell cranks.

47. In a front strike writing machine, the combination with a series of rearwardly striking type bars, of a series of key bearing levers, bell cranks arranged in different tiers over said key bearing levers and connected to said type bars, and rows of ears projecting upwardly from the key bearing levers, the ears in one row being connected to the bell cranks in one tier, and the ears in another row being connected to the bell cranks in another tier.

48. In a front strike writing machine, the combination with a platen, of a series of groups of rearwardly striking type bars, the bars and types in each group being arranged one behind another, a series of rearwardly extending key levers, a plurality of key lever fulcrum bars arranged one behind another, and bell cranks arranged some behind others between the key levers and type bars, the forward type bars being connected by forward bell cranks to key levers pivoted upon the forward fulcrum bar and terminating at the rear portion of the keyboard, and the rear type bars being connected by the rear bell cranks to key levers pivoted upon the rear fulcrum bar and terminating at the front portion of the keyboard.

49. In a front strike writing machine, the combination with a platen, of a series of groups of rearwardly striking type bars, the bars and types in each group being arranged one behind another, a series of rearwardly extending key levers, forward, rear and intermediate key lever fulcrum bars, and bell cranks arranged some behind others between the key levers and the type bars, the forward type bars being connected by forward bell cranks to key levers fulcrumed upon the forward fulcrum bar and terminating at the rear portion of the keyboard, the rear type bars being connected by the rear bell cranks to key levers fulcrumed upon the rear fulcrum bar and terminating at the front portion of the keyboard, and the intermediate type bars being connected by intermediate bell cranks to key levers fulcrumed upon the intermediate fulcrum bar and terminating at the middle portion of the keyboard.

50. In a front strike writing machine, the combination with a platen, of a group of type bars of equal length pivoted at their rear ends and having operating arms arranged one behind another and also having their types arranged in a line longitudinally of the group, a plurality of key operated

bell cranks, and connections from said bell cranks to said operating arms.

51. In a front strike writing machine, the combination with a platen, of a group of type bars of equal length pivoted at intervals in a common hanger and having their types arranged in a single line longitudinally of the group, operating arms formed upon the rear ends of said type bars and arranged one behind another, a plurality of bell cranks connected to said operating arms, and key bearing levers connected to said bell cranks.

52. In a typewriting machine, the combination with a series of type operating key levers of a guide comb for said levers, said comb comprising a series of reeds or wires fixed at one end in a plate and engaging at their other ends perforations formed in a detachable plate.

53. In a typewriting machine, a group of independent type bars extending longitudinally fore and aft of the machine and arranged side by side and having their types all arranged fore and aft of the machine in a line one behind the other longitudinally of the group and arranged to be cut by a radial plane that contains the printing point.

54. In a typewriting machine, a group of independent type bars arranged side by side and having their types all arranged in a line one behind the other longitudinally of the group and arranged to be cut by a radial plane that contains the printing point, and each type being arranged at substantially the same distance from its pivot as every other type.

55. In a typewriting machine, a series of groups of type bars arranged in an arc and the center of which is the printing point each group consisting of a plurality of type bars situated side by side to swing in parallel planes and having their types arranged in line midway of the group and to be cut by a radial plane that contains the printing point.

56. In a typewriting machine, a group of type bars of equal length having each a single type and the type of the various bars being all arranged in a line within the group and to swing in a plane radially of the printing point.

57. In a typewriting machine, a group of pivoted type bars of equal length and at their type ends bent towards each other and to a line midway of the group and each type bar having a type that is arranged along said median line.

58. In a typewriting machine, a radial group of type bars the pivots of which are equidistant from the types and all of the types of the groups of bars being in the same radial plane from the printing point.

59. In a typewriting machine, a group of



pivoted type bars, the pivots of said type bars being arranged in an arc struck from the printing point as a center and the types being arranged one behind the other at equal distances from the pivots and cut by a radial plane passing through the printing point, and the same radial plane cutting the pivots and types.

60. In a typewriting machine, a group of pivoted type bars, the pivots of said type bars being arranged in an arc struck from the printing point as a center and the types being arranged one behind the other at equal distances from the pivots and arranged to be cut by a radial plane passing through the printing point, and the pivots being at right angles to the bars and being cut by the radial plane which cuts the types.

61. In a front strike typewriting machine, substantially segmentally arranged rearwardly striking type-bars, the types on all of said bars being arranged in planes that radiate from the printing point and types on the different bars being cut by a single radial plane.

62. In a typewriting machine, the combination of a platen, and pivoted type-bars which have their pivots situated in a plurality of planes extending transverse of the machine and which likewise have their types situated in a plurality of transverse planes, all of the types on different bars extending in rows that are in planes which radiate from the printing point.

63. In a typewriting machine, the combination of a platen, pivoted type-bars which have their pivots arranged in a plurality of parallel planes that extend transversely of the machine and which have their types arranged in a plurality of parallel planes that extend transversely of the machine, and types on different bars extending in rows fore and aft of the machine.

64. In a typewriting machine, the combination of a platen, and rearwardly striking pivoted type-bars which have their pivots arranged in a plurality of vertical parallel planes that extend transversely of the machine and which have their types arranged in a plurality of vertical parallel planes that extend transversely of the machine, the planes in which the type-bar pivots are situated being equal in numbers to the planes in which the types are situated, and the types extending in parallel rows fore and aft of the machine.

65. In a typewriting machine, the combination of a carriage, carriage mechanism, printing instrumentalities, key levers having different angular movements, and a universal bar, with which said key levers contact at different points transversely thereof, the different key levers being arranged to take up the universal bar uniformly.

66. In a typewriting machine, the com-

bination of a carriage, carriage feed mechanism, printing instrumentalities, key levers therefor, a universal bar with which said key levers cooperate, and projections between the key levers and universal bar and forming the operative connection between them, said projections being located at different distances fore and aft of the machine, the different key levers being arranged to take up the universal bar uniformly.

67. In a typewriting machine, the combination of a carriage, an escapement mechanism, a series of types, a series of pivoted levers for operating said types, a universal bar connected to said escapement mechanism, and projections upon said levers for engaging said universal bar, said projections being arranged at different points longitudinally of the lever system, so as to impart equal movements to said universal bar.

68. In a typewriting machine, the combination of a carriage, an escapement mechanism, a series of types, a series of levers for operating said types, said levers being pivoted at different points longitudinally of the lever system, a universal bar connected to said escapement mechanism, and projections upon said levers for engaging said universal bar, said projections being arranged at different points longitudinally of the lever system, so as to impart equal movements to said universal bar.

69. In a typewriting machine, the combination of a carriage, carriage feed mechanism, printing instrumentalities, key levers therefor, said key levers having different angular movements, the finger keys of said levers being arranged in banks and the levers of different banks being pivoted at different points fore and aft of the machine, and a universal bar with which the different key levers contact, the points of contact between the universal bar and the different key levers being at different distances from the front of the machine, the points of contact of the entire set of key levers being arranged to take up the universal bar uniformly.

70. In a typewriting machine, the combination of a carriage, feed mechanism therefor, printing instrumentalities, a vertically movable universal bar, means for guiding the universal bar, and key levers fulcrumed at their ends and operatively connected intermediate of their ends with said printing instrumentalities, and contacting with the universal bar, the points of contact between the universal bar and the different key levers being at different distances from the front of the machine and between the fulcrums of the key levers and the points where they are operatively connected with the printing instrumentalities.

71. In a typewriting machine, the combination of a carriage, feed mechanism therefor, key levers pivoted at different points



fore and aft of the machine, printing instrumentalities which are operatively connected to said key levers at different points in their lengths, and a universal bar with which the key levers contact, the points of contact between the universal bar and the different key levers being at different distances from the front of the machine, and all of the key levers operating to take up the universal bar uniformly.

72. In a typewriting machine, the combination of a platen, a series of groups of type bars, the pivots for each group of type bars being situated one behind the other and lying in an arc that extends fore and aft of the machine and whose center is the printing point and whose radius is equal to the length of a type bar from pivot to type.

73. In a front-strike typewriting machine, the combination of a platen, a series of groups of upwardly and rearwardly striking type bars, the pivots for each group of type bars being situated one behind the other in different planes fore and aft of the machine and lying in an arc that extends fore and aft of the machine and whose center is the printing point and whose radius is equal to the length of a type bar from pivot to type.

74. In a typewriting machine, the combination of a carriage, carriage feed devices, key actuated devices having different angular movements, and a universal bar with

which said key actuated devices contact at different points widthwise of the universal bar.

75. In a typewriting machine, the combination with a carriage and feed mechanism therefor, of a series of finger keys, levers actuated by said keys, the levers having different angular movements, a universal bar actuated by said levers, and means for equalizing the movements imparted to the universal bar by the different levers and for causing the movement of the universal bar to be started with a uniform extent of depression of the different keys.

76. In a typewriting machine, the combination with a carriage and feed mechanism therefor, of key actuated levers having different angular movements, and a universal bar that is actuated by said key actuated levers, the contact between the universal bar and key actuated levers being at different points widthwise of the universal bar and at different points from the front of the machine.

Signed at borough of Manhattan, city of New York, in the county of New York and State of New York, this 29th day of January, A. D. 1901.

LEE S. BURRIDGE.

Witnesses:

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