No. 686,487. Patented Nov. 12, 1901.

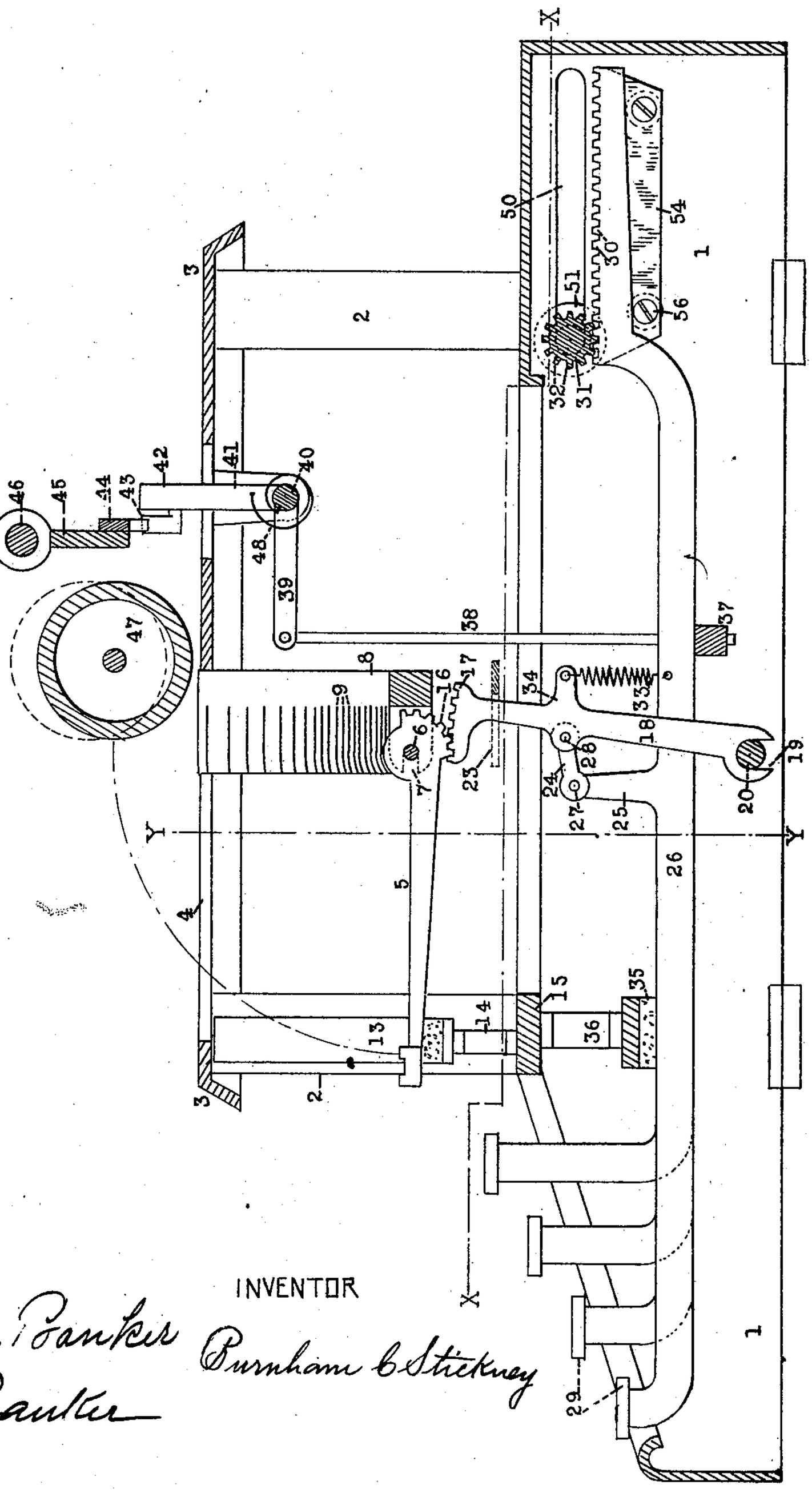
B. C. STICKNEY.

TYPE WRITING MACHINE.

(Application filed Nov. 13, 1900.)

(No Model.) 4 Sheets—Sheet 1.

FIG. 1.



WITNESSES

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P. A. Parker

INVENTOR

Burnham C. Stickney

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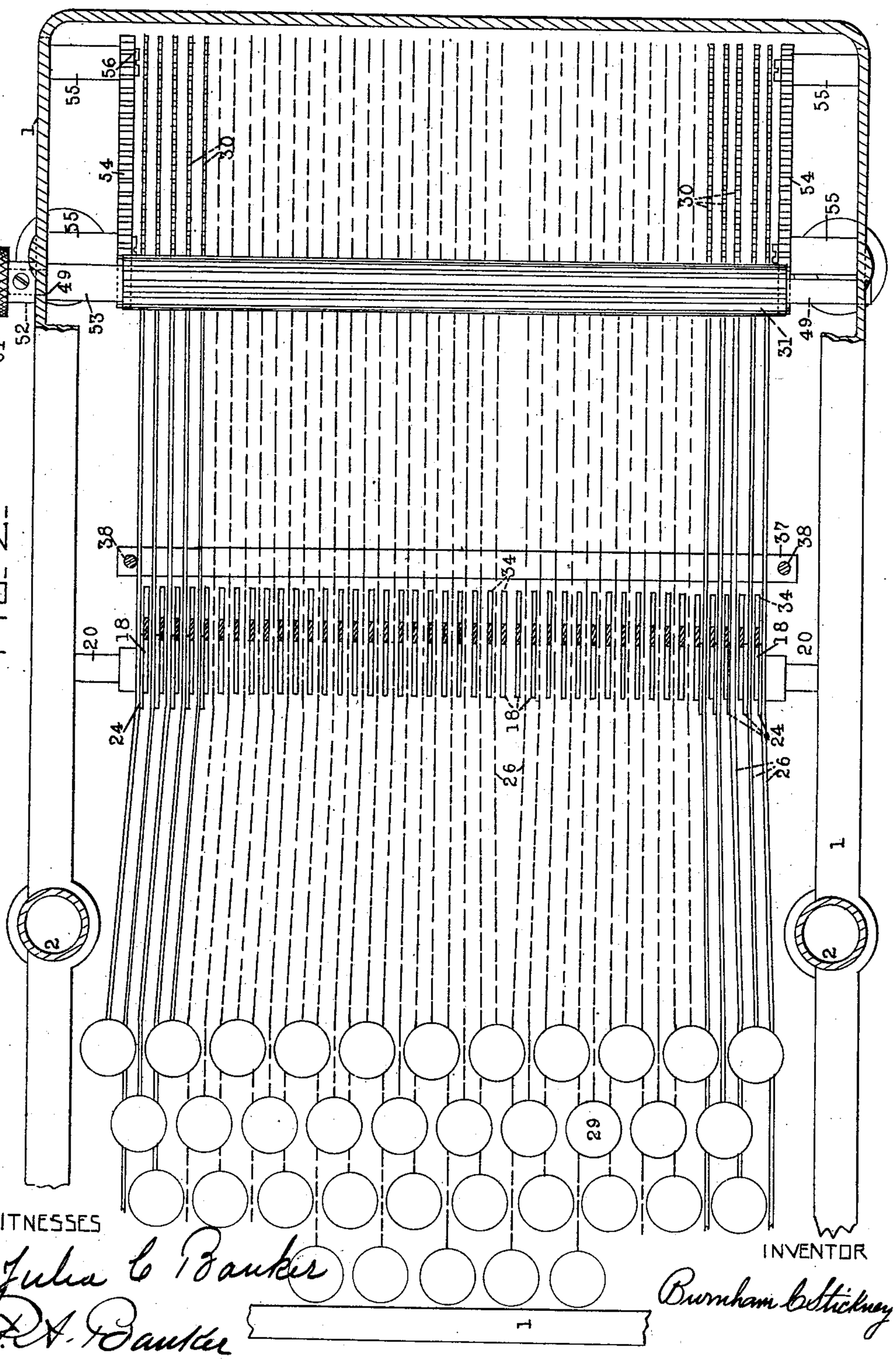
(No Model.) 4 Sheets—Sheet 2.

FIG. 2.



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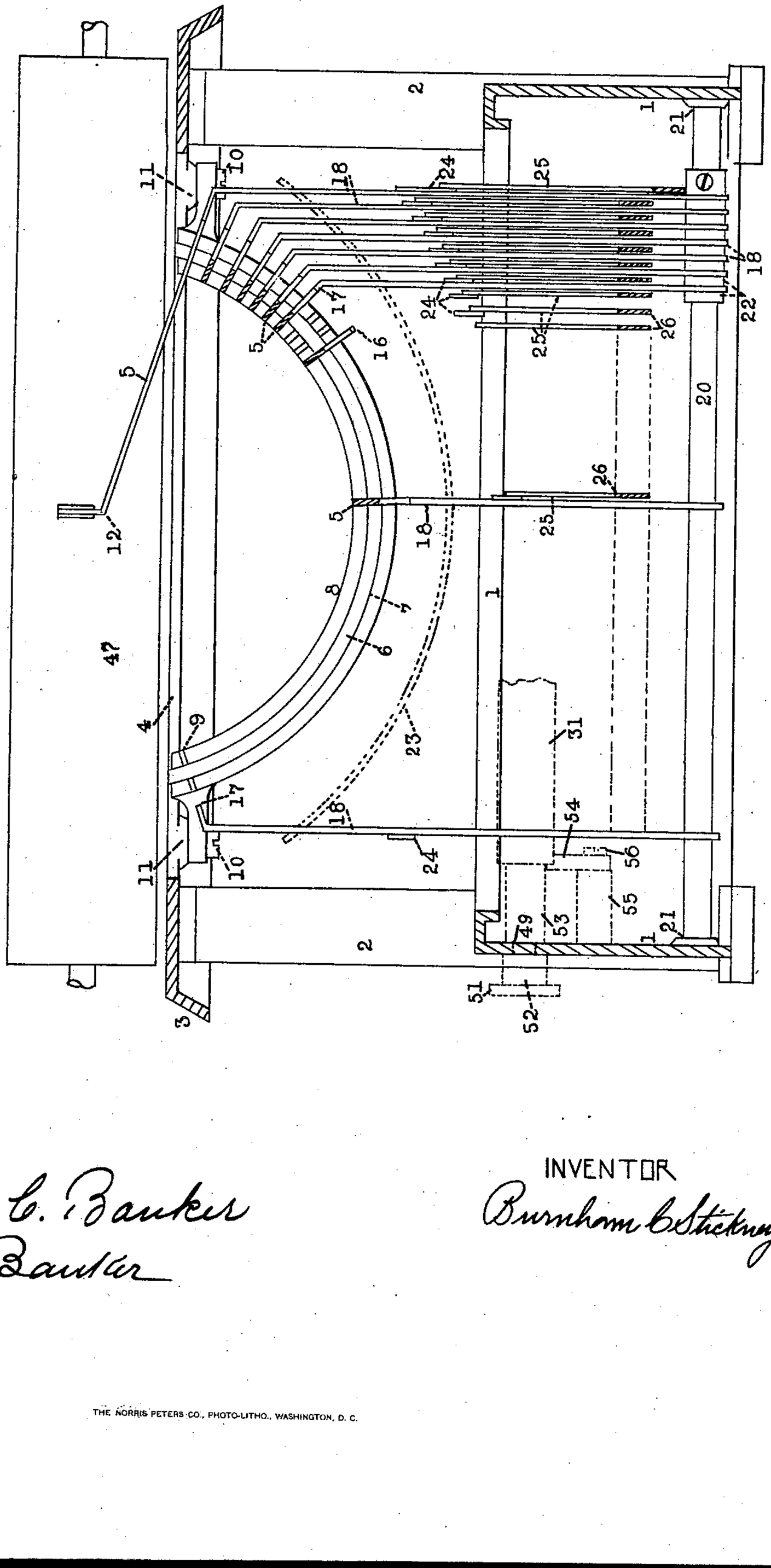
TYPE WRITING MACHINE.

(Application filed Nov. 13, 1900.)

(No Model.)

4 Sheets—Sheet 3.

FIG. 3.



WITNESSES

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B. C. STICKNEY.

TYPE WRITING MACHINE.

(Application filed Nov. 13, 1900.)

(No Model.)

4 Sheets—Sheet 4.

FIG. 4.

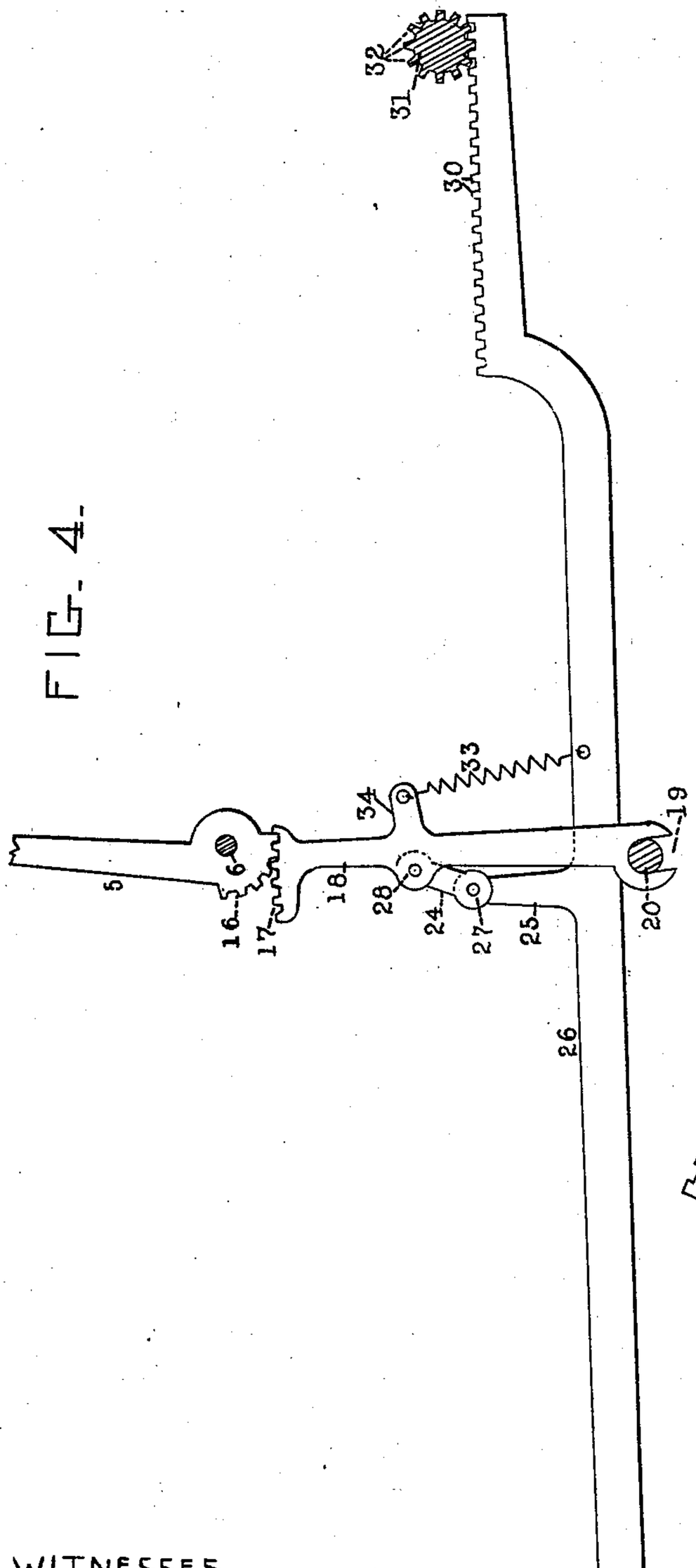
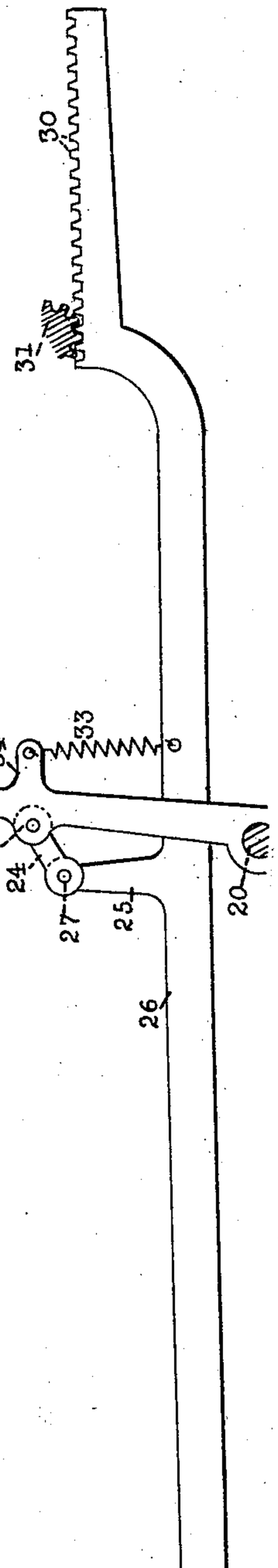


FIG. 5.



WITNESSES

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P. A. Banker

INVENTOR

Burnham C. Stickney

UNITED STATES PATENT OFFICE.

BURNHAM C. STICKNEY, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO THE UNION TYPEWRITER COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 686,487, dated November 12, 1901.

Application filed November 13, 1900. Serial No. 36,325. (No model.)

To all whom it may concern:

Be it known that I, BURNHAM C. STICKNEY, a citizen of the United States, and a resident of Elizabeth, county of Union, and State of New Jersey, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

This application relates to the type actions of writing-machines.

The return movement of the type-bar from the printing-point is usually made at such speed that the type-bar rebounds upon striking the basket or rest, and hence is liable to collide with the next-operated type-bar. This liability is present especially in "visible-writing" or "front-strike" machines, in which, owing to lack of room, it is the practice to place the type-bars in such close arrangement that adjoining types nearly touch, and hence frequently collide when high speed of operation is attempted. One of the main objects of my invention is to prevent this rebounding of the types from the basket.

Another object of the invention is to cushion the key touch by means of a novel construction, the cushioning effect being produced at both the beginning and the end of the key-stroke, and the construction being also such that the type is caused to deliver a powerful blow upon the platen. At the same time I provide for the rapid recession of the type from the vicinity of the printing-point, so as to leave a clear path for the type next operated.

Another object of the invention is to provide an adjustable purchase or leverage of the finger-keys upon the type-bars, so that the key-strokes may be rendered long and easy or shorter and more resisting. Deep key-strokes with light resistance to the touch of the finger are preferable for operators who give light quick strokes of the fingers, while operators whose finger movements are slower and heavier would prefer short key-strokes with more resistance to the touch of the fingers, so as to aid the recovery or upstroke of the latter and insure prompt return of the type-bars to normal position. I secure this result by means of a novel construction and without sacrificing or interfering with the operation of any of the above-mentioned improvements, so that whether the dip of the keys be great or small the type-bars are always locked in normal position, the key-strokes are cushioned at beginning and termination, and the types jump rapidly away from the impression-point after printing.

Other objects will more fully hereinafter appear.

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

In the accompanying drawings, Figure 1 is a central longitudinal vertical section of a front-strike writing-machine embodying my present improvements. Fig. 2 is a horizontal section or plan taken at about the line X X of Fig. 1. Fig. 3 is a front sectional elevation taken at about the line Y Y of Fig. 1. Fig. 4 is a skeleton view of the type action shown at Fig. 1, the key being fully depressed and the type-bar in printing position. At this figure the mechanism is adjusted to produce a short key stroke or dip. Fig. 5 is a similar skeleton view, the finger-key being shown about midway of its stroke and the mechanism being adjusted for a long or deep key-stroke, as at Fig. 1.

In the several views certain parts are omitted and others broken away, so as to clearly exhibit the invention, and similar parts are designated by similar numerals of reference.

The base, of the usual pattern, is designated as 1 and supports corner-posts 2, upon which is secured a top plate 3, having a forward opening at 4 for the passage of the type-bars. The latter, designated as 5, are disposed radially in a curve about a common printing-center, the forward ends of the bars being provided with types and the rear ends being pivoted upon a curved fulcrum-wire 6, which is seated in a curved slot 7, provided in a segment 8, the latter being provided with radial slots 9 for the reception of the hubs of the type-bars and being secured by screws 10 to lugs 11, depending from the top plate 3. Near their free ends the bars 5 are bent to enable

the types to stand vertically when at the printing-center, Fig. 3, and the slots 9 in the segment preferably radiate to this bending point, which is indicated at 12. The forward portions of these horizontally-arranged bars or levers normally rest upon a pad or basket 13, which may be supported upon a standard 14, rising from a cross-bar 15, cast integrally with the base.

Upon each type-bar hub is cut or provided a set of gear-teeth 16, which mesh at a point below or outwardly of the type-bar pivot with gear-teeth 17, provided upon the upper portion of an upright operating-lever 18 of the third order, the latter being detachably pivoted, by means of an open slot 19, formed in its lower end, upon a transverse horizontal fulcrum-rod 20, which may be in the same vertical plane as the type-bar pivot-wire 6, and which is fixed at 21 in the side walls of the base. As will be seen at Fig. 3, the body portions of these operating-levers are substantially parallel and vertical, while the tooth-bearing tips are bent inwardly, so as to be each in substantial parallelism with its type-bar. The levers are spaced upon the rod 20 by washers 22, and at their upper ends may play in any suitable fixed guide or comb, as indicated by dotted lines at 23.

Each lever 18 is connected by a forwardly-extending and substantially horizontal link or pull-rod 24 to an ear 25, which extends upwardly from a horizontally-arranged key-lever 26, the forward pivot of the link being indicated at 27 and its rear pivot at 28. Each lever 26 bears at its forward end a key 29 and at its rear end is formed or provided upon its upper edge with a longitudinally-extending rack or series of teeth or notches 30, which engage an overlying transverse horizontal fulcrum-bar 31, said bar having a series of longitudinally-cut peripheral teeth 32 to match the racks upon the key-levers. Owing to the engagement of the rack-teeth with the fulcrum-bar teeth endwise displacement of the levers is prevented, while the latter are enabled to swing about said bar as a fulcrum and may be readily detached therefrom. Suitable guide-combs (not shown) may be provided to prevent sidewise displacement of the key-levers.

It will be noted that the links 24 are arranged crosswise and at about right angles to the type-operating arms or levers 18 and longitudinally of and nearly parallel with the key-levers 26, the latter extending rearwardly from the keyboard beneath the type-bar system and above the fulcrum-rod 20, which carries the sublevers 18. The movement of the key-levers is vertical, and hence they move in parallel planes and angularly to the planes of vibration of the type-bars 5. The planes of vibration of the sublevers also have an angular relation to the planes of vibration of the type-bars.

The lower ends of the sublevers 18 terminate in a horizontal line, while the upper ends terminate in a curve concentric with the type-bar segment, and hence the levers are of different or graduated lengths. In order to secure a substantially uniform leverage or purchase of the key-levers upon these sublevers, so as to render the dip of the keys substantially uniform for all the levers, I preferably make the key-lever ears 25 of graduated lengths, so that the links 24, connected to the upper ends of the ears, may be connected to the sublevers 18 at graduated heights or at graduated distances from the sublever-pivots, Fig. 3. Thus the upper ends of all the sublevers 18 are moved through uniform distances by substantially uniform movements of the keys. A draw-spring 33, which is connected at its upper end to an arm 34, extending rearwardly from the lever 18, and at its lower end to the key-lever 26, holds up the latter at its rear end against the fulcrum-bar 31 and at its forward end against a transverse rest 35, the latter being supported by one or more hangers 36, which depend from the cross-bar 15. Said spring also serves to hold down the lever 18 securely upon its fulcrum.

A universal bar 37, extending transversely beneath the key-levers, is connected by links 38 to arms 39, which extend forwardly from a horizontal transverse rock-shaft 40, upon which is mounted an upright arm 41, having at its upper end both a detent-dog 42 and a pivoted dog 43. Normally in engagement with the latter is a rack 44, secured upon a carriage 45, the latter sliding upon suitable rails 46. A platen 47 may be supported in any desired manner upon the carriage 45 and should be made vertically shiftable, as indicated by dotted lines at Fig. 1, so that either the lower-case or capital types upon the type-bars may print.

In operation the finger-key 29 is depressed, vibrating the lever 26 downwardly about its point of engagement with the fulcrum-bar 31 and swinging downwardly the forward end of the link 24, which thus assumes a diagonal position. By means of said link the lever 18 is pulled forwardly upon its pivot 20, and by the gears 17 16 the type-bar is swung up to the printing-point. The universal bar 37 is also carried down by the key-lever 30, and through the links 38 and arms 39 the dog-rocker is swung forwardly, so that the detent 42 becomes engaged with the rack. Upon release of the key the spring 33, which was distended during the downward movement of the key-lever, draws the latter upwardly and the sublever 18 rearwardly, so that the type action is restored to normal position, its return movement being, however, assisted by a spring 48, such as is usually provided for retracting the dog-rocker. The return movement of the latter permits the advance movement of the paper-carriage one step, in the usual manner, under the tension of a carriage-propelling spring. (Not shown.) Since the key-lever 26 extends crosswise of the sub-

lever 18, it results that the vibration of the latter is in a direction longitudinally of the key-lever, and since the link 24 extends longitudinally of the key-lever it will be perceived that when the parts are in normal position a movement cannot be transmitted from the sublever to the key-lever—that is, the latter cannot be swung downwardly by means of the sublever. Any attempt to swing the sublever forwardly upon its pivot would only cause a longitudinal stress to be put upon the key-lever, or, in other words, the key-lever would only be pulled or pressed forwardly against the contacting fulcrum-tooth 32, but would have little or no tendency to swing downwardly about said fulcrum. Thus normally the parts are practically at "dead-center," the key-lever and the link cooperating to form a lock for detaining the sublever 18, and hence the type-bar, in normal position, so that when the type-bar upon its return to normal position strikes the basket 13 it cannot rebound therefrom, and hence liability of collision with a subsequently-operated type-bar is avoided.

It will be perceived that this construction enables type-bar machines, especially those of the visible-writing patterns, in which the types are set closely together, to be operated at the same high speed as in the case of "understrike" machines, in which the types are normally more separated. It will be further noted that during the beginning of the downstroke of the key-lever the point 27, where the link is pivoted thereto, travels in an arc or path which is for a short distance nearly concentric with the other link-pivot 28, whence it results that the sublever and type-bar are put in motion very gradually and a large portion of the key-stroke is accomplished by the time that the type is well under way. Owing to this gradual starting of the type-bar the jar commonly experienced in giving a type-key a sharp blow is avoided, or, in other words, a cushioning effect is given to the key touch. At Fig. 5 is shown the position of the parts when the key is about half-way down, and it will be seen that the type-bar has made only one-fourth of its movement to the platen. Owing to the constantly-decreasing leverage or purchase of the key-lever 26 upon the sublever 18, due to the constantly-changing direction in which the pull is exerted through the link 24 as the latter swings rapidly downward about its point of connection with the sublever, the speed of the type-bar increases throughout its stroke, the last three-fourths of which are completed while the finger-key is making the last half of its printing-stroke. Because of this automatically-decreasing leverage or purchase and constantly-increasing type-bar speed the resistance of the key to the finger of the operator constantly increases, so that the momentum of the operator's hand is substantially absorbed before the key is arrested by contact of the type with the platen, and hence a shock is not felt by the operator when the type prints. Thus the key-stroke is cushioned at its beginning and again at its termination, and at the same time the very rapid movement of the type as it nears the completion of the stroke insures the delivery of a powerful blow upon the paper. It will be further perceived that during the first half of the return stroke of the key the type completes three-fourths of its return movement, so that the movement of the type away from the printing-point is very rapid, which is a feature of importance, since the liability of the types colliding near the printing-point is practically eliminated.

It will be observed that the movement of the forward end of link 24 is in a direction crosswise of the movement of the rear end thereof and that the link exerts a diagonal pull during the descent of the key-lever and a diagonal thrust during the return stroke, owing to the operation of the springs 34 and 48. Thus a vertical or down-and-up movement of the key-lever causes a horizontal or forward-and-back movement of the sublever 18.

As will be understood by reference to Fig. 4, the spring 33 renders material aid in starting the type-bar back to normal position, owing to the engagement of the spring's upper end with the arm 34 of the sublever 18. At this moment the leverage of the key-lever upon the type-bar is least, and hence it is desirable to provide a type-bar-restoring spring-power, which shall be in addition to or which shall operate independently of the power which returns the key-lever. Of course, if desired, separate springs could be used for the key-lever and the sublever to accomplish the same object; but I prefer to use a single spring for both purposes, as illustrated, on account of its simplicity and cheapness.

It is the practice to prevent rebounding of the type-bars by applying spring-pressure; but so much power is required for this purpose as to cause great resistance to the touch upon the finger-keys, which of course must overcome the pressure that holds the type-bars in place in the basket. The herein-set-forth type-bar-locking mechanism, however, enables the adoption of a very light returning-spring for the type action, thereby materially improving the touch and lightening the fatigue of operation.

Referring again to the fulcrum-bar 31, it will be seen at Fig. 2 that the toothed portion thereof extends across all of the key-levers and also that the ends thereof are extended and reduced in diameter at 49, so as to work in oppositely-arranged horizontal slots 50, Fig. 1, which are formed in the side walls of the base and are about equal in length to one of the key-lever racks 30. The left-hand end of the fulcrum-rod, which projects through its slot, is provided outside of the base with a finger-wheel 51, the hub 52 whereof abuts against the base and coöperates with an abut-

ting shoulder 53, provided upon the fulcrum-rod within the base, to prevent endwise displacement of said rod. Upon each side of the key-lever system and parallel therewith is fixed a rack-bar 54, said bars being supported upon inwardly-extending studs 55 by means of screws 56. The teeth formed upon the key-levers aline with the teeth upon the rack-bars 54, and the toothed portion or barrel of the fulcrum-bar 31 meshes also with said rack-bars 54. By rotation of the finger-wheel 51 the fulcrum-bar may be rolled backward or forward along the fixed racks 54 without becoming disengaged from the key-lever racks or disturbing the position of the key-levers, so that the fulcrum or bearing points of all of the latter may be shifted simultaneously. The key-levers have practically no tendency or power to cause the fulcrum-rod to rotate. On the contrary, the upward pressure of the rear ends of the key-levers causes friction at the rack-bar journals or bearings sufficient to prevent accidental rotation of said fulcrum-bar. When the fulcrum-bar is shifted along the key-levers to its foremost position, as at Figs. 1, 2, and 5, it is nearest the working portions or load-points 25 of the key-levers, and hence the purchase or leverage of the keys upon the type-bars is greatest and the dip of the keys is the deepest. When, however, the fulcrum-bar is adjusted to its rearmost position, as at Fig. 4, it is most remote from the load-points of the key-levers and the purchase of the keys is least and their strokes shallowest. The fulcrum-bar may of course be shifted to any intermediate point with corresponding results. Thus the machine may readily be adjusted to suit the requirements of different operators, giving either an easy deep stroke or a short and more resisting stroke. This adjustment, it will be observed, is accomplished without disturbing any of the spring mechanism by which the type-bars and spacing-dogs are returned to their normal positions. Since neither the key-lever nor any other member of the type-action is moved at the adjustment of the fulcrum-rod 31, it is immaterial to what position said fulcrum-rod may be adjusted, so far as the locking, stroke-cushioning, and type-bar-speed features are concerned. In other words, the leverage of the keys upon the type-bars may be changed by means of the adjusting mechanism at the rear ends of the key-levers without interfering with the operation of the type-bar-locking and key-stroke-cushioning devices. Hence whether the dip of the keys be shallow or deep the type-bars are still locked in normal position, the key-strokes are effectively cushioned at both the beginning and completion thereof, and the relative speed of the type-bars is greatest when they are in the vicinity of the printing-point.

Within the scope of the invention many changes may be made in details of construction and arrangement, and my improvements may in some cases be adapted as well to top-strike and under-strike machines. Parts of the invention may be used without others.

Although I prefer to employ the links 24 for the twofold purpose of locking the type-bars and cushioning the key-strokes, still it will be perceived that in certain novel combinations, as recited in the claims, said links may be adapted for the single purpose of locking the type-bars or for the single purpose of cushioning the key-strokes.

I am aware of the prior invention of Carl Gabrielson and which is made the subject-matter of a patent granted to him February 26, 1901, No. 668,713, and do not claim herein any feature of improvement shown, described, or claimed in said application, nor do I wish to make claims herein similar to the claims of the Gabrielson application, for the reason that the Gabrielson invention was made before my invention, and hence my claims are and must be confined to special features of construction and arrangement and combinations of parts not disclosed in the Gabrielson application, with which I am familiar.

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

1. In a front-strike writing-machine, the combination with a series of radial type-bars bearing types at their forward ends and a series of keys, of means, including a series of key-operated levers, for automatically decreasing the purchase or leverage of said levers upon said type-bars during the printing strokes of the keys, and independent mechanism for effecting an adjustment of the leverage of said levers upon the type-bars, the construction and arrangement being such that the leverage may be changed by said adjusting mechanism without interfering with the operation of said automatic leverage-decreasing means.

2. In a front-strike writing-machine, the combination with a series of type-bars and a series of key-levers, of a series of sublevers operatively connected to said type-bars, means for automatically decreasing the purchase or leverage of said key-levers upon said sublevers and type-bars during the printing strokes of the keys, and independent mechanism for effecting adjustment of the leverage of the keys upon the type-bars, the construction and arrangement being such that the leverage may be changed by said adjusting mechanism without interfering with the operation of said automatic leverage-decreasing means.

3. In a type-writing machine, the combination with a series of type-bars and a series of sublevers operatively connected thereto, of a series of key-operated levers, means arranged between said key-levers and said sublevers for automatically decreasing the purchase or leverage of said key-levers upon said sublevers and type-bars during their printing strokes, and independent mechanism for effecting an adjustment of the leverage of

the keys upon the type-bars, the construction and arrangement being such that the leverage may be changed by said adjusting mechanism without interfering with the operation of said automatic leverage-decreasing means.

4. In a type-writing machine, the combination with a series of type-bars and a series of sublevers operatively connected thereto, of a series of key-operated levers, devices arranged between said key-levers and said sublevers for automatically decreasing the purchase or leverage of said key-levers upon said sublevers during the printing strokes of the keys, and independent mechanism for effecting an adjustment of the leverage of said key-levers upon said sublevers and type-bars, the construction and arrangement being such that the leverage may be changed by said adjusting mechanism without interfering with the operation of said automatic leverage-decreasing means.

5. In a front-strike writing-machine, the combination of a series of type-bars, a series of key-levers extending rearwardly beneath the type-bars, a series of upwardly-extending sublevers operatively connected at their upper ends to the type-bars, means arranged between said key-levers and sublevers for automatically decreasing the purchase or leverage of said key-levers upon said sublevers and type-bars during the printing strokes of the keys, and independent mechanism for effecting an adjustment of the leverage of said key-levers upon said sublevers and type-bars, the construction and arrangement being such that the leverage may be changed by said adjusting mechanism without interfering with the operation of said automatic leverage-decreasing means.

6. In a front-strike writing-machine, the combination of a series of type-bars, a series of key-levers extending rearwardly beneath the type-bars, a series of upwardly-extending sublevers operatively connected at their upper ends to the type-bars, means arranged between said key-levers and said sublevers for automatically decreasing the purchase or leverage of said key-levers upon said sublevers and type-bars during the printing strokes of the keys, and mechanism arranged at the fulcrums of the key-levers for effecting an adjustment of the leverage of said key-levers upon said sublevers and type-bars.

7. In a type-writing machine, the combination of a series of type-bars, a series of key-levers, a series of sublevers, devices arranged between the key-levers and the sublevers for automatically decreasing the leverage of the key-levers upon the sublevers and type-bars during the printing strokes of the keys, and mechanism arranged at the key-lever fulcrums for adjusting the purchase of the key-levers upon the sublevers and type-bars.

8. In a front-strike writing-machine, the combination with a series of type-bars and a series of keys, of means, including a set of key-levers and a set of sublevers, for automatically decreasing the purchase or leverage of said keys upon said type-bars during the printing strokes of the keys, and independent mechanism arranged at the fulcrums of one of said sets of levers for effecting an adjustment of the leverage of the keys upon the type-bars, the construction and arrangement being such that the leverage may be changed by said adjusting mechanism without interfering with the operation of said automatic leverage-decreasing means.

9. In a type-writing machine, the combination of a series of type-bars, a series of type-bar-operating levers, a series of keys, means for automatically decreasing the leverage of said keys upon said levers during their printing strokes, and independent mechanism for effecting an adjustment of the leverage of the keys upon said levers and type-bars, the construction and arrangement being such that the leverage may be changed by said adjusting mechanism without interfering with the operation of said automatic leverage-decreasing means.

10. In a type-writing machine, the combination of a system of type-operating levers, a system of key-operated levers, a system of links directly connecting the two systems of levers, said links extending lengthwise of the said key-operated levers, so that when the key-levers are operated the links are swung rapidly about their points of connection to said type-operating levers, and the construction and arrangement being such that owing to said swinging movement of the links the leverage or purchase of the keys upon the type-operating levers is substantially decreased during the strokes of the keys, and means for adjusting the purchase or leverage of the keys upon the type-operating levers.

11. In a type-writing machine, the combination of a series of type-bars, a series of key-operated levers, a series of sublevers, a series of links directly connecting the key-levers to the sublevers, the construction and arrangement being such that said links are swung during the key-strokes so as to substantially decrease the leverage of the keys upon the type-bars, and means for adjusting the purchase or leverage of the keys upon the type-bars.

12. In a type-writing machine, the combination of a set of type-bars, a set of key-operated levers, a set of sublevers, a set of links directly connecting the key-levers to the sublevers, the construction and arrangement being such that said links are swung during the key-strokes so as to substantially decrease the leverage of the keys upon the type-bars, and mechanism arranged at the fulcrums of one of said sets of levers for effecting an adjustment of the leverage of said keys upon said type-bars.

13. In a type-writing machine, the combination of a set of type-bars, a set of substantially horizontal key-levers, a set of upwardly-extending sublevers, a set of links directly

connecting said key-levers to said sublevers in such a manner that the leverage of the key-levers upon the sublevers is substantially diminished during their printing strokes, and means arranged at the fulcrums of the key-levers for adjusting the purchase of said levers upon the sublevers and type-bars.

14. In a type-writing machine, the combination of a set of type-operating levers, a set of key-operated levers, a set of links directly connecting the two sets of levers, the construction and arrangement being such that throughout the key-stroke the movement of one end of the link is in a direction crosswise of the movement of the other end of the link, and the leverage of the key upon the type-bar constantly and substantially decreases, and means arranged independently of said links for adjusting the purchase of the keys upon the type-bars.

15. In a front-strike writing-machine, the combination of a series of type-bars, a series of substantially horizontal key-levers, a series of upright sublevers operatively connected at their upper ends to said type-bars, a series of diagonally-operating links extending from said key-levers to said sublevers, and means for shifting the fulcrums of said key-levers.

16. In a front-strike writing-machine, the combination of a series of type-bars, a series of key-levers below the type-bars, a series of sublevers of the third order operatively connected at their upper ends to the type-bars and extending in a direction crosswise of the key-levers, diagonally-operating links directly connecting the said sublevers to said key-levers, and means for shifting the fulcrum-points of said key-levers at will.

17. In a type-writing machine, the combination with a series of type-bars and a series of keys of means controlled by the keys for locking the type-bars in normal position and means for effecting an adjustment of the leverage or purchase of the keys upon the type-bars.

18. In a type-writing machine, the combination with a series of type-bars and a series of key-levers of means controlled by the key-levers for locking the type-bars in normal position, and means for shifting the fulcrums of the key-levers.

19. In a type-writing machine, the combination of a series of type-bars, a series of key-operated levers, a series of intervening links which lock the type-bars in normal position, and means for shifting the fulcrum-points of said levers.

20. In a type-writing machine, the combination of a series of type-bars, a series of levers provided with finger-keys, a series of links pivoted to said levers and extending in the same general direction as said levers, said links being operatively connected to said type-bars and coöperating with said levers to lock the type-bars in normal position, and means for shifting the fulcrums of the levers.

21. In a type-writing machine, the combination of a series of type-bars, a series of key-levers, a series of sublevers having gear-teeth in mesh with teeth provided upon the type-bars, means controlled by said key-levers for locking said sublevers and type-bars in normal position, and means for shifting the fulcrums of said key-levers.

22. In a type-writing machine, the combination of a series of type-bars, a set of levers provided with finger-keys, a set of sublevers connected to said type-bars, a series of links connecting said sublevers to said key-levers in such a manner as to lock said sublevers and type-bars in normal position, and means for shifting the fulcrums of one of said sets of levers at will.

23. In a type-writing machine, the combination with a series of type-bars and a series of keys of means controlled by the keys for both locking the type-bars in normal position and automatically decreasing the leverage of the keys upon the type-bars during the key-strokes, and means for effecting adjustment of the leverage or purchase of the keys upon the type-bars.

24. In a type-writing machine, the combination with a series of type-bars and a series of key-levers of means controlled by the key-levers for both locking the type-bars in normal position and automatically decreasing the leverage of the key-levers upon the type-bars during their printing strokes, and means for shifting the fulcrum-points of said key-levers.

25. In a type-writing machine, the combination of a series of radial type-bars, a series of key-levers, connections extending from the key-levers to the type-bars and constructed to both lock the latter in normal position and decrease the leverage of the key-levers upon the type-bars during their printing strokes, and means for shifting the fulcrum-points of the key-levers simultaneously.

26. In a front-strike writing-machine, the combination of a series of type-bars, a series of key-levers extending rearwardly beneath the type-bars and fulcrumed at their rear ends, means controlled by said levers for both locking the type-bars in normal position and decreasing the leverage of the keys upon the type-bars during their printing strokes, and means for shifting the fulcrum-points of the key-levers forwardly and rearwardly.

27. In a type-writing machine, the combination of a series of type-bars, a series of key-operated levers, a series of intervening links which both lock the type-bars in normal position and decrease the leverage of the keys upon the type-bars during the key-strokes, and means for shifting the fulcrums of said levers.

28. In a type-writing machine, the combination of a series of type-bars, a series of key-levers, and means, including a series of sublevers, for, first, locking said type-bars in normal position; second, automatically decreasing the leverage of the key-levers upon the

type-bars during their printing strokes, and, third, effecting an adjustment of the leverage of the key-levers upon the type-bars.

29. In a front-strike writing-machine, the combination of a series of pivoted type-bars, a series of key-levers arranged below the type-bars, a series of upwardly-extending sublevers having at their upper ends gear-teeth in mesh with teeth provided upon the type-bar hubs, means controlled by said key-levers for both locking said sublevers and type-bars in normal position and decreasing the leverage of the key-levers upon the sublevers and type-bars during their printing strokes, and means for shifting the fulcrums of said key-levers.

30. In a type-writing machine, the combination of a series of type-bars, a series of levers provided with finger-keys, a series of sublevers connected to said type-bars, a series of links connecting said sublevers to said key-levers in such a manner as both to lock said sublevers and said type-bars in normal position and to decrease the leverage of said key-levers upon said sublevers and type-bars during their printing strokes, and means for shifting the fulcrum-points or fulcrums of the key-levers.

31. In a type-writing machine, the combination of a series of type-bars, a series of detachably-mounted levers, connections from said levers to said type-bars so constructed and arranged that the leverage or purchase of said levers upon said type-bars decreases automatically during their printing strokes, and means for shifting the fulcrum-points of said levers simultaneously.

32. In a type-writing machine, the combination of a series of type-bars, a series of key-levers detachably mounted upon and spring-pressed against a fulcrum-bar which is adjustable along said levers, and connections extending from said key-levers to said type-bars, said connections being so constructed and arranged that the leverage or purchase of said levers upon said type-bars decreases automatically during their printing strokes, independently of the adjustment of said fulcrum-bar.

33. In a type-writing machine, the combination with a series of type-bars of a series of operating-levers therefor and a fulcrum-bar upon which said levers are detachably fulcrumed, said fulcrum-bar being constructed for adjustment along said levers.

34. In a type-writing machine, the combination with a series of types of a series of operating-levers having racks, and an adjustable fulcrum-bar having teeth to engage said racks.

35. In a type-writing machine, the combination with a series of types of a series of detachably-mounted operating-levers, a fulcrum-bar which is adjustable along said levers, and means for preventing endwise displacement of said levers.

36. In a type-writing machine, the combination of a series of type-bars, a series of operating-levers, an adjustable fulcrum-bar for said levers, and a finger-wheel provided at the end of said fulcrum-bar.

37. In a type-writing machine, the combination of a series of type-bars, a series of operating-levers having racks, an adjustable fulcrum-bar having teeth in mesh with said racks, and a finger-wheel for said fulcrum-bar.

38. In a type-writing machine, the combination of a series of type-bars, a series of key-levers having racks, an adjustable fulcrum-bar having teeth in mesh with said racks and extending through a slot provided in the framework of the machine, and a finger-wheel upon the extended end of said fulcrum-bar.

39. In a type-writing machine, the combination of a series of types, a series of operating-levers, a movable fulcrum-bar, and fixed racks engaging teeth provided upon said fulcrum-bar.

40. In a type-writing machine, the combination of a series of types, a series of operating-levers, a movable fulcrum-bar provided with a finger-wheel, and fixed racks engaging teeth provided upon said fulcrum-bar.

41. In a type-writing machine, the combination of a series of types, a series of operating-levers having racks, a pair of fixed racks, and a toothed fulcrum-bar in engagement with all of said racks.

42. In a type-writing machine, the combination of a series of types, a series of spring-pressed operating-levers having racks, a pair of fixed racks, and a toothed fulcrum-bar in engagement with all of said racks.

43. In a type-writing machine, the combination of a series of types, a series of key-levers connected thereto, a series of racks provided upon the rear ends of said levers, an overlying toothed fulcrum-bar adjustable along said levers, and a series of springs for said levers.

44. In a type-writing machine, the combination of a series of types, a series of key-levers connected thereto, a fulcrum-bar overlying said key-levers, and means for shifting said fulcrum-bar along said key-levers.

45. In a type-writing machine having a base, the combination of a series of type-bars, a series of key-levers arranged within the base and connected to the type-bars, an overlying toothed fulcrum-bar in mesh with teeth formed upon said levers, and a slot in the base through which an end of said fulcrum-bar projects, said projecting end being provided with a finger-wheel.

46. In a type-writing machine, the combination with a series of type-operating key-levers of racks 30 provided thereon, fixed rack 54, studs 55, toothed fulcrum-bar 31, and finger-wheel 51.

47. In a front-strike type-writing machine, the combination of key-levers 26, racks 30, toothed fulcrum-bar 31, links 34, sublevers 18, springs 33, gears 17, 16, and type-bars 5.

48. In a front-strike type-writing machine,

the combination of key-levers 26, racks 30, toothed fulcrum-bar 31, fixed racks 54, ears 25, links 24, sublevers 18, springs 33, gears 17, 16, and type-bars 5.

49. In a front-strike writing-machine, the combination of a series of pivoted type-bars, a series of key-levers arranged below the type-bars, a series of upwardly-extending sublevers pivoted at their lower ends and having at their upper ends gear-teeth in mesh with teeth provided upon the type-bar hubs, and means controlled by said key-levers for locking said sublevers and type-bars in normal position.

50. In a front-strike writing-machine, the combination of a series of type-bars, a series of key-levers extending beneath the type-bars, a series of sublevers pivoted below the key-levers and operatively connected at their upper ends to the type-bars, and a series of links connecting said sublevers to said key-levers and operating to lock said sublevers and said type-bars in normal position.

51. In a front-strike writing-machine, the combination of a series of type-bars having toothed hubs, a series of key-levers, a series of toothed sublevers which extend upwardly to the type-bar hubs and directly engage the latter below or outwardly of the type-bar pivots, and a series of links connecting said sublevers to said key-levers and operating to lock said sublevers and said type-bars in normal position.

52. In a front-strike writing-machine, the combination of a series of pivoted bars having types at their forward ends, a series of key-levers extending rearwardly beneath the type-bars, a series of upwardly-extending sublevers pivoted at their lower ends and having at their upper ends gear-teeth in mesh with teeth provided upon the type-bar hubs, and a series of links extending longitudinally of said key-levers and crosswise of said sublevers.

53. In a front-strike writing-machine, the combination of a series of type-bars having toothed hubs, a series of substantially horizontal key-levers, a series of toothed sublevers pivoted at their lower ends and extending upwardly to the type-bar hubs and directly engaging the latter below or outwardly of the type-bar pivots, and a series of forwardly-extending substantially horizontal links connecting said sublevers to said key-levers.

54. In a front-strike writing-machine, the combination of a series of type-bars having toothed hubs, a series of substantially horizontal key-levers, a series of toothed sublevers pivoted at their lower ends and extending upwardly to the type-bar hubs and directly engaging the latter below or outwardly of the type-bar pivots, a series of forwardly-extending horizontal links pivoted at their rear ends to said sublevers between the ends of the latter, and a series of upwardly-extending ears provided upon said key-levers and pivotally attached to the forward ends of said links.

55. In a front-strike writing-machine, the combination of a series of radial type-bars, a series of key-levers extending beneath the type-bars, a series of upwardly-extending sublevers of graduated lengths and having a common axis and connected at their upper ends to the type-bars, and a series of links extending from the key-levers and attached to the sublevers at graduated distances from the fulcrums of the latter.

56. In a front-strike writing-machine, the combination of a series of radially-arranged type-bars, a series of key-levers extending beneath the type-bars, a series of upwardly-extending sublevers of graduated lengths having a common axis and connected at their upper ends to the type-bars, and a series of links extending from the key-levers and attached to the sublevers at graduated distances from the fulcrums of the latter, said links extending crosswise of said sublevers and longitudinally of said key-levers.

57. In a front-strike writing-machine, the combination of a series of radially-arranged type-bars, a series of key-levers below the type-bars, a series of upwardly-extending sublevers of graduated lengths connected at their upper ends to the type-bars, and a series of links extending from the key-levers and attached to the sublevers at graduated heights.

58. In a front-strike writing-machine, the combination of a series of radially-arranged type-bars, a series of key-levers below the type-bars, a series of ears of graduated heights provided upon the key-levers, a series of upwardly-extending sublevers of graduated lengths connected at their upper ends to the type-bars, and a series of links extending from the ends of said ears to said sublevers and attached to the latter at graduated heights.

59. In a front-strike writing-machine, the combination of a series of radially-arranged type-bars having toothed hubs, a series of key-levers extending rearwardly beneath the type-bars, a series of toothed sublevers of graduated lengths pivoted concentrically at their lower ends and extending upwardly to the type-bar hubs and directly engaging the latter below or outwardly of the type-bar pivots, a series of upwardly-extending ears of graduated lengths provided upon said key-levers, and a series of links extending rearwardly from said ears and attached to the sublevers at graduated heights.

60. In a front-strike writing-machine, the combination of type-bars 5, teeth 16 thereon, key-levers 26, sublevers 18 having teeth 17 and fulcrumed upon straight horizontal bar 20 below the key-levers, ears 25, and links 24.

61. In a front-strike writing-machine, the combination of a series of type-bars having toothed hubs, a series of key-levers below the type-bars, a series of toothed sublevers de-

tachably fulcrumed at their lower ends upon a rod arranged beneath the key-levers and engaging at their upper ends said type-bar hubs, and a series of links extending from said key-levers and attached to said sublevers between the ends of the latter.

62. In a front-strike writing-machine, the combination of type-bars 5, teeth 16 thereon, detachable key-levers 26, sublevers 18 having at their upper ends teeth 17 and detachably fulcrumed at their lower ends upon straight horizontal bar 20, and springs 33 extending from the key-levers to the sublevers.

63. In a front-strike writing-machine, the combination of type-bars 5, teeth 16 thereon, detachable key-levers 26, sublevers 18 having at their upper ends teeth 17 and detachably fulcrumed upon a rod, arms 34 upon said sublevers, and springs 33 extending from said arms 34 to said key-levers.

64. In a front-strike writing-machine, the combination of a series of type-bars, a series of key-levers arranged below the type-bars, a series of sublevers of the third order operatively connected at their upper ends to the type-bars and extending in a direction crosswise of the key-levers, and diagonally-operating links directly connecting said sublevers to said key-levers.

65. In a front-strike writing-machine, the combination of a series of type-bars, a series of key-levers extending rearwardly below the type-bars, a series of sublevers pivoted below the key-levers and operatively connected at their upper ends to the type-bars, and means controlled by said key-levers for both locking said sublevers and type-bars in normal position and decreasing the leverage of the key-levers upon the sublevers and type-bars during the key-strokes.

66. In a front-strike writing-machine, the combination of a series of type-bars, a series of key-levers below the type-bars, a series of upwardly-extending sublevers pivoted at their lower ends and having at their upper ends gear-teeth in mesh with teeth provided upon the type-bar hubs, and means controlled by said key-levers for both locking said sublevers and type-bars in normal position and decreasing the leverage of the key-levers upon the sublevers and type-bars during their printing strokes.

Signed at Elizabeth, in the county of Union and State of New Jersey, this 12th day of November, A. D. 1900.

BURNHAM C. STICKNEY.

Witnesses:
S. R. OGDEN,
JULIA ROSS.