B. C. STICKNEY.

TYPE WRITING MACHINE.

APPLICATION FILED JAN. 30, 1903.

1,099,213.

Patented June 9, 1914.

3 SHEETS—SHEET 1.

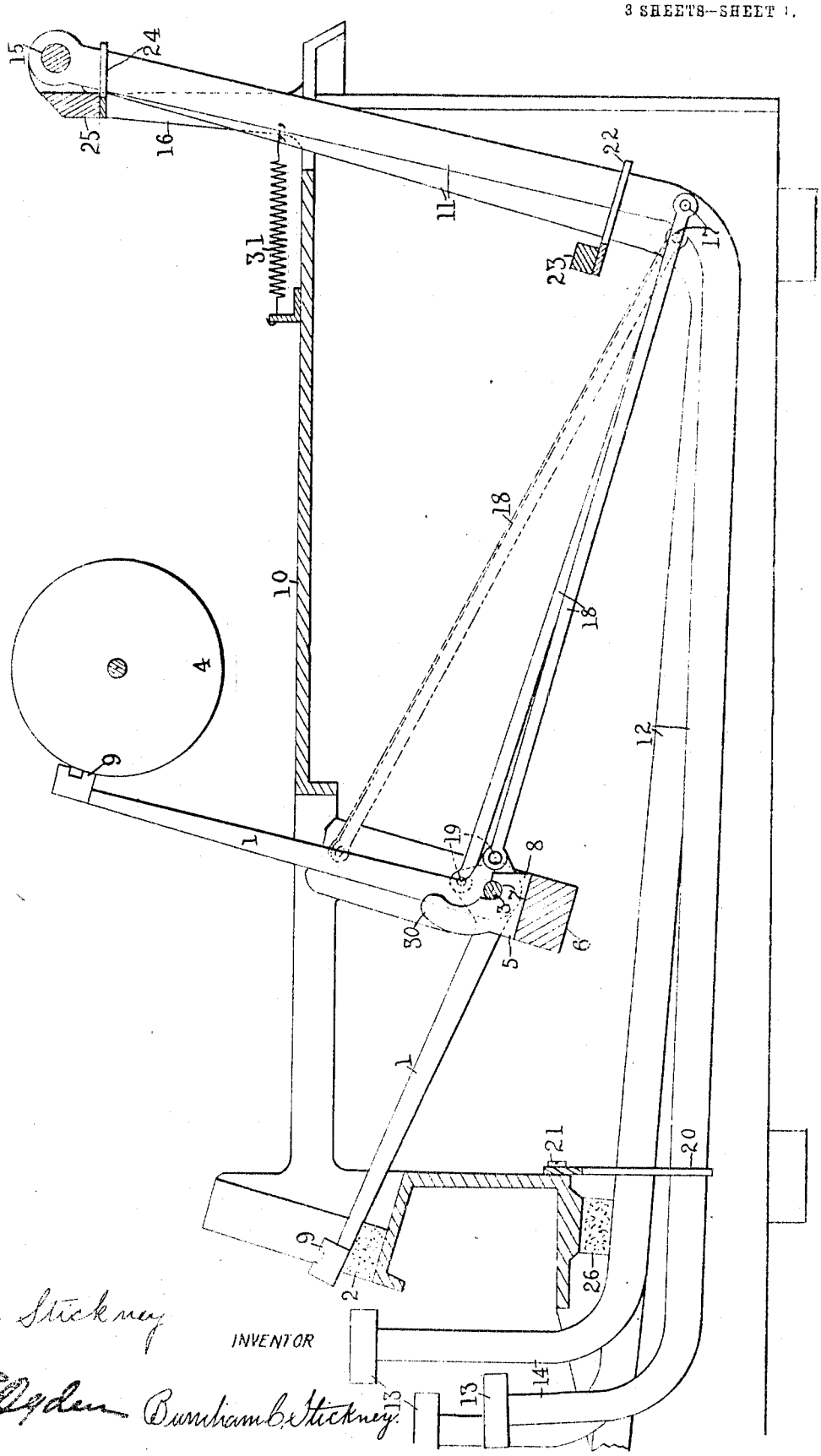

Fig. 1.

WITNESSES

E. A. L. Stickney

F. F. Ogden

INVENTOR

Burnham & Stickney.

B. C. STICKNEY.

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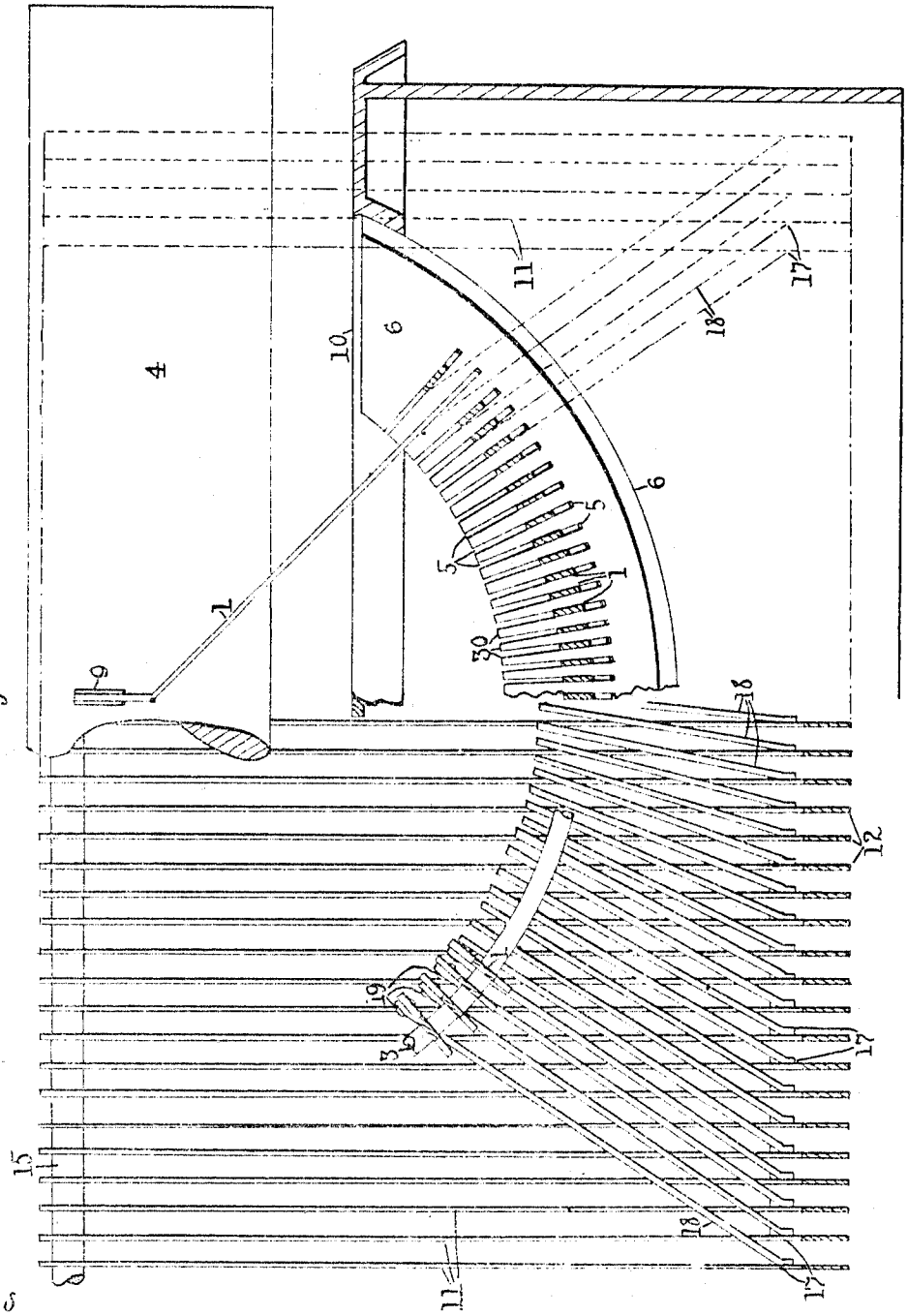
3 SHEETS—SHEET 2.

Fig. 2.



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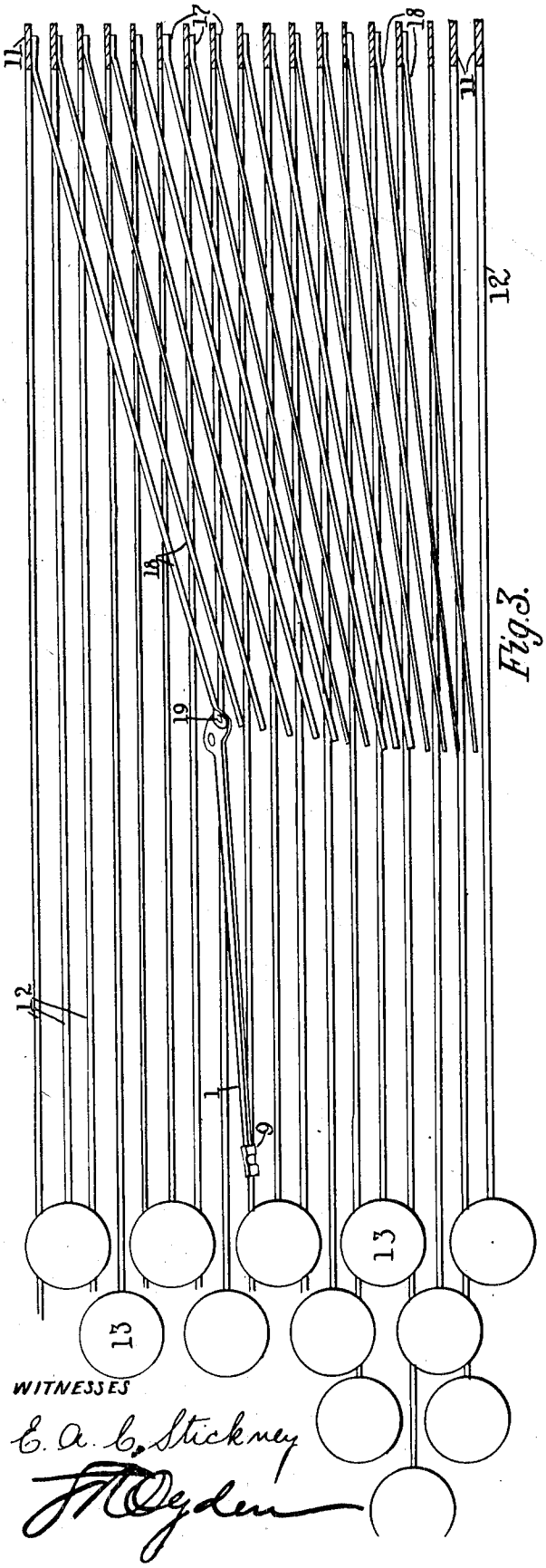

Fig. 3.

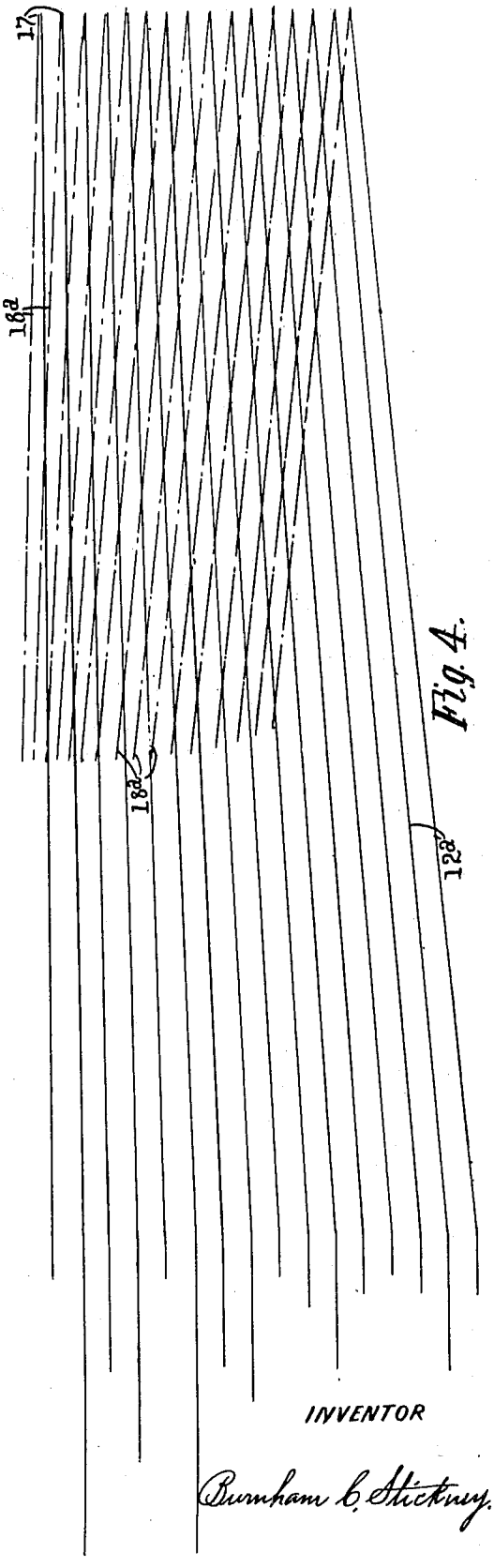

Fig. 4.

WITNESSES

E. A. C. Stickney

INVENTOR

Burnham C. Stickney.

UNITED STATES PATENT OFFICE.

BURNHAM C. STICKNEY, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO UNDERWOOD TYPEWRITER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

TYPE-WRITING MACHINE.

1,099,213. Specification of Letters Patent. Patented June 9, 1914.

Application filed January 30, 1903. Serial No. 141,156.

To all whom it may concern:

Be it known that I, BURNHAM C. STICKNEY, a citizen of the United States, and resident of the city 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 invention relates to the class of "visible writing" machines in which the type bars are radially arranged and strike rearwardly against a platen.

The object of the invention is to improve the type actions, particularly with a view to providing simple, inexpensive and easy-working movement trains between the keys and types.

In the accompanying drawings, Figure 1 is a central sectional elevation taken longitudinally of a typewriting machine embodying my improvements. Fig. 2 is a sectional front elevation taken just forwardly of the type bar segment, the segment and the platen being broken away to exhibit the rear portions of the key-levers and their connections at the left side of the figure, and the levers and connections being omitted from the right side of the figure. Fig. 3 is a plan showing the left side of the key lever system, the levers being shown as parallel, and an illustration being given of the manner in which the links converge from the levers to the type bars, the extreme left-hand type-bar being shown. Fig. 4 is a diagrammatic plan showing the right-hand side of another system of key levers and links, the levers converging from front to rear, and the links also converging, but not so much as at Fig. 3.

Like signs denote like parts in the several views.

Type bars 1, resting at their forward ends upon a curved pad 2, are pivoted at their rear ends upon a curved rod 3, and strike rearwardly against a platen 4. The fulcrum ends of the type bars work in radial slots 5 cut upon the upper or inner concave side of a segment 6, and the fulcrum wire 3 rests in a curved slotted seat 7 formed upon the upper edges of the radial fins 8 into which the segment is divided by the slots 5. The segment is inclined from the perpendicular at an angle preferably materially less than forty-five degrees, and the type bars are hence pivoted in an arc which inclines forwardly and downwardly from the platen, so that the types 9 strike the platen a little above the level of the platen axis, but below a point midway of the top and front of the platen; the type bar pivots being preferably all below the platen. The segment may be secured at its ends to the top plate 10 of the machine framing.

For operating the type bars I provide a system of bent levers, comprising pendent portions 11 in rear of the type bars and forwardly extending portions 12 beneath the type bars and rigid with the pendent portions, keys 13 being mounted upon stems 14 fixed upon the forward ends of portions 12. The pendent portions 11 are pivoted at their upper ends in rear of the platen upon a transverse horizontal rod 15, mounted upon standards 16 at opposite sides of the top plate. To the lower ends of said portions or arms are pivoted in line at 17 links 18, which extend forwardly to the type bars and are pivoted thereto at 19. The key levers are pivoted at such an elevation as to cause the keys to swing downwardly and rearwardly, the fulcrum rod 15 being at a materially higher elevation than any of the keys, as will be seen at Fig. 1, in which one type action is shown in normal position and another in printing position, the depressed key being somewhat in rear of its normal position. Preferably the distance from the lever pivots to the keys is greater than the distance from the lever pivots to the points of attachment 17 of the links. By having the former distance double the latter, as illustrated, ample forward and rearward movement of the pivots 17 is secured, so that the necessity is avoided of placing the pivots 19 so close to the type-bar fulcrums as to entail harsh action and binding. By having the levers thus proportioned, and placing the links 18 substantially at right angles to the pendent arms 11, easy working of the type actions is attained, particularly since this construction involves the use of extra long links as shown, which work more freely than short links between levers which vibrate in parallel planes and type bars which vibrate in radial planes.

The arms 11 are forwardly inclined and lie in a plane which is substantially parallel with the plane in which lies the arc of the type bar pivots, so that the fulcrum rod 15 may be placed well toward the rear of the machine where it will not crowd other por-

tions of the typewriter mechanism. By placing the links 18 substantially at right angles to the pendent arms 11, the pivots 17 are brought well down toward the bottom of the machine, so that sufficient length of the arms 11 may be had without projecting them so high as to be objectionable; the links thus extending upwardly and forwardly from the levers to the type bars, and lying at easy working angles to both levers and type-bars, owing to the inclinations of the arms 11 and the arc of the type bar pivots.

The key levers may be parallel throughout, and the difference in the widths of the key system and type-bar system may be compensated by causing the links 18 to converge from the arms 11 to the type bars, as at Fig. 3; the extra length of the links permitting considerable difference between the forward and rear widths of the link system, without placing the outer links at harsh angles. As illustrated, the direction of pull of the outer links nearly coincides with the plane or planes in which the outer type bars vibrate, thus conducing to ease of action. The key-levers may, however, converge from the keyboard to their rear ends, as at Fig. 4, so as to enable the links to lie in more nearly parallel planes.

The key levers are provided with three sets of guiding or spacing means, viz., a pendent comb 20 secured by screws 21 to the machine framing and guiding the levers vertically in their movements at their forward or key ends; a comb 22 fixed to a horizontal transverse bar 23 supported at its ends upon the framing, the teeth of the comb 22 extending forwardly and rearwardly and guiding the lower portions of the pendent arms 11 near the line of pivotal connections 17; and a spacing comb 24 secured to the underside of a horizontal bar 25 which connects the upper ends of the standards 16, said comb 24 being close to the lever fulcrums. By the provision of the three sets of guides, thus related, the liability of binding of the levers in any one of the guides is overcome. By the provision of the guide 24, the lever arm 12 is prevented from twisting upon its longitudinal axis sufficiently to bind in the guide 20; while by the provision of the guide 20, the arm 11 is prevented from twisting upon its longitudinal axis in the guides 22 and 24. Thus the cramping action of levers usual in typewriting machines is entirely overcome. This feature of construction is of especial value in connection with the converging links, overcoming the tendency of the outer links to cramp the levers, and enabling the latter to vibrate with the requisite freedom.

In the preferred form of the invention the key-levers have keys at their forward lower ends and have elevated rear ends fulcrumed at the upper rear portions of the machine frame, the type-bar segment being arranged below the platen and the series of pull links directly connecting the type-bars to the key-levers, the fulcrum of each key-lever and the point of connection between it and its link being in a line substantially parallel with the segment, said line being about in the vertical plane of the link and about at right angles to said link. The main body of the links is preferably arranged and moves in a direction nearly at right angles to the plane of the segment.

In the claims where I mention the parts being at right angles to each other, I mean that they are substantially or nearly in this relation, and intend to include all structures which have substantially this arrangement and perform substantially the described function; and the same is true where I speak of parts being parallel to each other, or having other relations, as for instance, that the segment is parallel to the common plane in which lie all of the key-lever fulcrums and all of the pivotal points by which the links are connected to the key-levers, or where I speak of pull links extending in the directions of their respective type-bars when the latter are in normal idle positions, or that the main body of the links extends at right angles to the segment.

The fins 8 may be extended upon the forward side of the curved fulcrum wire 3, as at 30, so as to guide the type bars to the printing positions; the forward ends of the links 18 playing behind these fingers. Suitable returning springs 31 may be provided for the type actions.

In operation, the keys are depressed, swinging the bent key levers upon the fulcrum 15, and through the links 18 pulling the type bars up to print. Upon release of the keys, the parts are returned to normal position by the springs 31.

One of the important advantages, in a front strike machine, of bending up the key lever and fulcruming the same at a high elevation, as for instance above the top plate of the machine, arises from the backward-and-forward movement of the rear portion of the lever, whose forward portion moves down and up. It is common practice, and is generally necessary, to operate the type-bars of a front strike machine by devices which move backward and forward; and hence according to my invention, the type-bars may be connected, as by means of links 18, to the backward-and-forward moving portions of the key-bearing levers, thus conducing to simplicity of construction, as well as cheapness and ease of operation and absence of liability to get out of order. Usually, in key levers which extend rearwardly beneath the type bars in a front strike machine, all parts of the lever move down and up, and hence it becomes neces-

sary to introduce one or more sets of sub-levers in order to convert such motion into backward and forward motion. By my invention, the type-bar links or their equivalents may be connected directly to the key-bearing levers; while the latter, because of their great length, are sufficiently elastic and easy of action, and capable of being guided so as to avoid cramping in the guides. My invention, however, is not limited to the precise construction shown, so long as the backwardly and forwardly moving parts of the levers are utilized to give required backward and forward movements to other parts of the type actions.

Variations may be resorted to within the scope of my invention, and portions of my improvements may be used without others; as for instance in some cases the pivot arc of the type bars may lie in a vertical plane.

Having thus described my invention, I claim:

1. In a typewriting machine, the combination with a platen, of a system of type-bars mounted in a segment or arc to strike rearwardly against the front of the platen, a system of pendent arms, each of said pendent arms being provided with a forwardly extending key-bearing arm, rigid therewith, and links extending from said type bar arc to said pendent arms to move endwise forwardly and rearwardly with the arms.

2. In a typewriting machine, the combination with a platen, of a system of type-bars mounted in a segment or arc to strike rearwardly against the front of the platen, a system of pendent arms in rear of said type bar arc, each of said pendent arms being provided with a forwardly extending key-bearing arm, rigid therewith, and links extending from said type bar arc to said pendent arms to move endwise forwardly and rearwardly with the arms.

3. In a typewriting machine, the combination of a platen, of a system of pivoted type bars mounted in a segment or arc to strike rearwardly against the front of the platen, a system of bent levers each comprising a pendent portion, and a portion extending forwardly beneath the type bars, keys fixed upon the forward ends of said forwardly extending portions, at least a portion of said keys being mounted upon stems rigid with said lever, and forwardly and rearwardly acting links extending from the type bars to said bent levers, being connected to the latter at points which move forwardly and rearwardly; said levers being fulcrumed at their upper ends at a higher elevation than any of said keys, so that all of said keys move downwardly and rearwardly.

4. In a typewriting machine, the combination with a platen, of a system of type bars mounted in an upstanding arc and striking rearwardly against the platen, a system of bent levers consisting of pendent arms fulcrumed at their upper ends, and forwardly extending key-bearing arms, and forwardly and rearwardly acting links connecting said type bars to the lower ends of said pendent arms; the pendent arms so mounted in relation to the links that a line extending from the fulcrum of each arm to the pivot of its associated link is in the vertical plane of the link and crosswise thereof.

5. In a typewriting machine, the combination with a platen, of a system of type bars mounted in an arc to strike upon the front of the platen, a system of pendent forwardly inclined arms in rear of the type bar arc, said arms forming portions of bent key-operated levers which extend forwardly beneath the type bars, and forwardly and rearwardly acting recumbent links extending from the lower portions of said pendent arms to forwardly and rearwardly moving portions of the type bars.

6. In a typewriting machine, the combination with a platen, of a system of type bars mounted in an arc to strike upon the front of the platen, a system of pendent arms in rear thereof, said arms forming portions of bent levers which extend forwardly beneath the type-bars, and forwardly and rearwardly acting recumbent links extending forwardly from said pendent arms to the type bars and inclining from the latter downwardly to the levers.

7. In a typewriting machine, the combination with a platen, of a system of type bars mounted in an arc to strike rearwardly against the front of the platen, a series of pendent arms in rear thereof, and inclining slightly forward from their upper ends, said arms forming portions of bent levers which extend forwardly beneath the type bars, and forwardly and rearwardly acting links extending forwardly from said pendent arms to the type bars and inclining from the latter downwardly to the levers.

8. In a typewriting machine, the combination with a platen, of a system of radial type bars mounted in an arc to strike rearwardly against the front of the platen, a system of keys; a system of bent levers carrying said keys at their forward ends; said levers extending rearwardly from the keyboard and upwardly in rear of the type bars and being fulcrumed at their upper ends; and a system of forwardly and rearwardly acting connections from the rear portions of said levers to said type bars; the system of keys being wider than the system of type bars, and at least one of said lever and connection systems converging so as to substantially compensate for difference in the width of the key and type bar systems.

9. In a typewriting machine, the combi-

nation with a platen, of a system of type bars mounted in an arc to strike rearwardly against the front of the platen; a system of keys; a system of bent levers carrying said keys at their forward ends; said levers extending rearwardly from the keyboard and upwardly in rear of the type bars and being fulcrumed at their upper ends; and a system of forwardly and rearwardly acting links connecting the rear portions of said levers to said type bars; said levers being parallel from front to rear, and said links converging from the levers to the type bars.

10. In a typewriting machine, the combintion with a platen, of a system of type bars mounted in an arc to strike rearwardly against the front of the platen, a system of keys; a system of bent levers carrying said keys at their forward ends; said levers extending upwardly in parallelism and being fulcrumed at their upper ends; and a system of forwardly and rearwardly acting links converging forwardly from the rear portions of the levers of the type bars.

11. In a typewriting machine, the combination with a platen, of a system of type bars mounted in an arc to strike rearwardly against the front of the platen; a system of keys; a system of bent levers carrying said keys at their forward ends; said levers extending rearwardly from the keyboard and upwardly at their rear portions and being fulcrumed at their upper ends; and forwardly and rearwardly acting links converging from said levers forwardly to said type bars.

12. In a typewriting machine, the combination with a platen, of a system of type bars mounted in an arc to strike rearwardly against the front of the platen; a system of bent levers consisting of pendent arms fulcrumed in line at their upper ends in rear of the type bars and forwardly extending key-bearing arms, and forwardly and rearwardly acting links converging from the lower ends of said pendent arms forwardly to the type bars; said links extending forwardly approximately at right angles to said pendent arms.

13. In a typewriting machine, the combination with a platen, of a system of type bars mounted in an arc to strike rearwardly against the front of the platen; a system of pendent arms in rear thereof, said arms forming portions of bent levers which extend forwardly beneath the type bars, and forwardly and rearwardly acting links converging forwardly and upwardly from said pendent arms to the type bars.

14. In a typewriting machine, the combination with a platen, of a system of type bars mounted in an arc to strike rearwardly against the front of the platen, a system of pendent forwardly inclined arms in rear of the type bars, said arms forming portions of bent levers which extend forwardly in substantial parallelism beneath the type bars, and forwardly and rearwardly acting links pivoted to the lower portions of said pendent arms and converging forwardly and upwardly to the typebars.

15. In a typewriting machine, the combination of a platen, a system of type bars pivoted below the platen in an arc which inclines downwardly and forwardly from the platen to strike rearwardly against the front of the platen, a series of bent levers consisting of pendent arms fulcrumed at their upper ends in rear of the type bars and key-bearing arms extending forwardly beneath the type bars, and forwardly and rearwardly acting links extending forwardly from said pendent arms to the type bars.

16. In a typewriting machine, the combination of a platen, a system of type bars pivoted below the platen in an arc which inclines downwardly and forwardly from the platen, the inclination of said arc being materially less than forty-five degrees from perpendicular, a system of bent levers consisting of key-bearing arms extending beneath the type bars and upwardly and rearwardly inclined arms fulcrumed at their upper ends in rear of the type bars, the inclination of said upwardly inclined arms being substantially the same as that of said arc, and forwardly and rearwardly acting links extending forwardly from said inclined arms to the type bars.

17. In a typewriting machine, the combination of a platen, a system of rearwardly striking type bars pivoted below the platen in an arc which inclines downwardly and forwardly from the platen to strike upon the front of the platen, a series of pendent forwardly inclined arms in rear of the type bars, said arms forming portions of bent levers which extend forwardly beneath the type bars, and forwardly and rearwardly acting links extending forwardly and upwardly from said pendent arms to the type bars.

18. In a typewriting machine, the combination of a platen, a series of rearwardly striking type bars pivoted below the platen in an arc which inclines downwardly and forwardly from the platen to strike against the front of the platen, a series of pendent arms in rear of the platen, said arms forming portions of bent levers which extend forwardly beneath the type bars, and forwardly and rearwardly acting links converging forwardly and upwardly from said pendent arms to the type bars.

19. In a typewriting machine, the combination with a platen, of a system of type bars mounted to strike rearwardly against the front of the platen, a system of bent levers comprising pendent arms and for-

wardly extending arms, forwardly and rearwardly acting connections from said pendent arms to said type bars, and three sets of lateral guiding means for said levers, one set near their forward positions, one set near the portions to which said connections are connected, and one set near their fulcrum portions.

20. In a typewriting machine, the combination of a series of rearwardly striking type bars, a segment having radial slots upon its concave or upper side, wherein said type bars work, a curved fulcrum wire seated in a slot cut in the upper edges of the fins between said slots, said fins being extended toward the printing point materially beyond said fulcrum wire upon the front side thereof, forwardly and rearwardly acting links connected to the type bars in rear of said fin projections and extending rearwardly from the type bars, pendent arms to which said links are attached at their rear ends, and key-bearing arms rigid with said pendent arms and extending forwardly beneath the type bars.

21. In a typewriting machine, the combination with a platen, of a system of type bars mounted in an arc to strike rearwardly against the platen; a system of keys; a system of bent levers carrying said keys at their forward ends; said levers extending rearwardly from the keyboard and upwardly in rear of the type bars and being fulcrumed at their upper ends; and a system of forwardly and rearwardly acting links connecting the rear portions of said levers to said type bars; said links converging from the levers to the type bars; and a fulcrum rod common to said levers.

22. In a typewriting machine, the combination with a platen, of a system of type bars mounted in an arc to strike rearwardly against the platen, a system of pendent arms forming portions of bent levers which extend forwardly beneath the type bars, and links pivoted to the lower portions of said pendent arms and converging to the type bars.

23. A front strike writing machine comprising a platen, a system of type bars mounted in an arc to strike against the front side of the platen, a system of key levers pivoted behind the platen and at about the same height as the platen and extending downwardly so as to vibrate forwardly and backwardly, and also having forwardly extending key-bearing portions, and forwardly and backwardly acting links connected to the forwardly and backwardly vibrating portions of said levers and to parts of the type bars which vibrate forwardly and backwardly.

24. A front strike writing machine comprising a platen and a system of type bars and having bent levers each comprising two arm portions, one of which at its end is pivoted and the other of which at its end bears a key, and forwardly and rearwardly acting links connecting said pivoted arms to the type bars; said type bars mounted in an arc to strike upon the front side of the platen.

25. A front strike writing machine comprising a platen, type bars striking rearwardly against the front of the platen and having backwardly and forwardly moving portions, a set of up and down movable keys, bent levers on which said keys are mounted, and forwardly and backwardly acting links connecting forwardly and backwardly moving portions of said type bars to forwardly and backwardly moving portions of said bent levers below the fulcrums thereof.

26. A front strike writing machine comprising a platen and type bars mounted in an arc to strike against the front of the platen and having bent levers comprising forwardly extending arms, and forwardly and rearwardly acting links extending along said arms and connected at their front ends to the type bars.

27. In a typewriting machine, the combination with a platen and a system of type bars mounted in an arc to strike upon the front of the platen, of key-levers comprising fulcrum-portions which are pendent from fulcrums so that their lower parts swing in a general rearward and forward direction, portions extending forwardly from said pendent portions, stems extending up from said forwardly extending portions, and forwardly and rearwardly acting connections between said pendent portions and the system of type bars.

28. In a typewriting machine, the combination with a platen and a system of type bars mounted in an arc to strike rearwardly against the platen, of key-levers comprising portions pendent from fulcrums to have forward and rearward movements, portions extending forwardly from the lower parts of the fulcrum portions and bearing stems, the type-bars being connected by forwardly and rearwardly acting connections to portions of the key levers which move forwardly and backwardly.

29. In combination, a platen, a system of type-bars mounted in an arc to strike upon the front of the platen, a system of forwardly and rearwardly acting links extending rearwardly from points on the type-bars which move rearwardly and forwardly, pendent arms to which the rear ends of the links are connected at points which move backwardly and forwardly, and downwardly and upwardly moving keys upon said arms.

30. The combination with a platen, of key-levers comprising depressible stem portions, portions extending rearwardly from the stems, and pendent portions erected upon the rear ends of said rearwardly extending por-

tions, forwardly and rearwardly acting connections attached to said levers at points thereof which swing forwardly and backwardly, and type-bars connected at forwardly and backwardly moving points thereof with said connections, and mounted in an arc to strike upon the front of the platen.

31. A system of type-bars, a platen, said type-bars mounted to strike against the front of the platen, key-bearing levers having arms extending forwardly and rearwardly and extending upwardly to the lever fulcrums, and links attached to said levers below the fulcrums thereof and connecting said levers directly to said type-bars; the general direction of movement of said links being forwardly and rearwardly.

32. The combination with a platen, of keys which move downwardly and slightly to the rear, links extending from devices which the keys are on, and pulling in a general rearward direction to pull the type-bars upwardly and then rearwardly against the front of the platen.

33. The combination with front-strike radial type-bars, of links extending backwardly and downwardly therefrom and fanning out to the key-levers in planes approximately coincident with the respective type-bar planes, said levers having keys and backwardly and forwardly moving parts to which the links are attached.

34. In a front strike writing machine, the combination with a series of rearwardly-striking type-bars, of a series of key-bearing levers having arms which extend back from the keyboard under and to the rear of the type-bars and in substantial parallelism, and type-bar operating links extending forwardly and rearwardly and at one set of their ends connected to said levers and at the other set of their ends converging.

35. In a typewriting machine, the combination with a system of type bars mounted to strike upwardly and rearwardly against the front of the platen, of a system of pendent arms in rear of the type bars and pivoted at their upper ends, means connecting the lower portions of said arms to the type bars, a system of keys, and means extending from said keys to said arms to operate them.

36. In a typewriting machine, the combination with the machine frame and platen mounted thereon, of a series of key-levers having keys at their forward, lower ends and having elevated rear ends fulcrumed at the upper rear portion of the machine frame, a type-bar segment arranged below the platen, a series of type-bars pivoted on said segment to strike at a common printing point at the front of the platen, and a series of pull links directly connecting said type-bars and key-levers, the fulcrum of each key-lever and the point of connection between it and its link being in a line substantially parallel to said segment and said line being about in the vertical plane of the link, and about at right angles to the axis of said link.

37. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of a series of key-levers pivoted at the upper rear portion of the frame and having a series of finger keys at the lower front portion thereof, a series of type-bars pivoted on a curved line and having a common printing point between the front and top of said platen, an inclined segment whereon said type-bars are mounted and a series of links directly connecting said type-bars and said key-levers, the main body of said links being arranged and moving in directions nearly at right angles to the plane of said segment.

38. In a typewriting machine, the combination with the machine frame and the platen carried thereby, a series of type-bars pivoted on a curved line and having a common printing point at the front of the platen, said type-bars being normally inclined to the horizontal and a series of key-levers having upwardly inclined rear portions that are substantially at right angles to the normal position of the type-bars and a series of inclined links directly connecting said type-bars and key-levers, the rear portions of said key-levers being so mounted in relation to the links that a line extending from the fulcrum of each key lever to the pivot of its connected link is in the vertical plane of the link and about at right angles thereto.

39. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of an inclined type-bar segment in front of and below the platen, a series of type-bars pivoted on said segment and having a common printing point at the front and above the center of the platen, said type-bars in normal position being at right angles to said segment, a series of key-levers having keys at their forward free ends extending beneath said type-bars and having elevated rear fulcrumed ends, pull links directly connecting said type-bars and key-levers, the fulcrums of said key-levers and the points of connections between said key-levers and links lying in a plane substantially parallel to the plane of said segment and said pull links being inclined and arranged substantially in line with said type-bars, said elevated rear ends and said links being so disposed that a line extending from the fulcrum of each key-lever to the pivot of its connected link is in the vertical plane of the link and at right angles thereto.

40. In a typewriting machine, the combination with the machine frame and platen

mounted thereon, of a type-bar pivoted in front of and below the platen, said type-bar being upwardly and forwardly inclined in idle position and rearwardly inclined in striking position, a key-lever having an upwardly extended rear end pivoted to the upper, rear portion of the machine frame and having a finger-key at the lower, front portion of the machine frame and a link directly connecting said type-bar and said key-lever, the pivot of said key-lever and the point of connection between said lever and said link being in a line substantially parallel to the striking position of said type-bar and about at right angles to the idle position thereof, and said line being about in the vertical plane of said link, and about at right angles to the axis of said link.

41. In a typewriting machine, the combination with the machine frame and platen mounted thereon, of a series of type-bars having a common printing point at the front of the platen, a segment parallel to a tangent to the printing point whereon said type-bars are mounted, a series of key-levers having keys at the lower, forward portion of the machine frame and having elevated rear portions fulcrumed at the upper, rear portion of the frame, links directly connecting said type-bars and said key-levers, the fulcrums of said key-levers and the points of connection between said key-levers and links lying substantially in a common plane parallel to said segment and the main body of said links being arranged and moving in directions nearly at right angles to said plane and to the plane of said segment.

42. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of an upwardly and rearwardly inclined segment arranged in front of and below said platen, a series of type-bars pivoted on said segment and having a common printing point at the front and above the center of said platen, a series of key-levers having upwardly extending rear ends fulcrumed at the upper rear portion of the machine frame, the upwardly extended rear end portions of said key-levers being substantially parallel with said inclined segment, and a series of pull-links directly connecting said type-bars to the upwardly-extended portions of said key-levers.

43. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of an upwardly and rearwardly inclined segment arranged in front of and below said platen, a series of type-bars pivoted on said segment and having a common printing point at the front and above the center of said platen, a series of key-levers having keys at the front, lower portion of the machine frame and having elevated fulcrumed ends at the rear of the machine frame and pull links directly connecting said type-bars and key-levers, the point of connection of said links with said key-levers and the fulcrums of said key-levers lying in a plane substantially parallel to said inclined segment.

44. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of an upwardly and rearwardly inclined segment arranged in front of and below said platen, a series of type-bars pivoted on said segment and having a common printing point at the front and above the center of said platen, said type-bars being upwardly and forwardly inclined in idle position and upwardly and rearwardly inclined in striking position and a series of key-levers having keys at the lower front portion of the machine frame and extending rearwardly beneath said type-bars, the rear fulcrumed ends of said key-levers being elevated above the forward ends thereof and a series of pull links directly connecting said type-bars and key-levers, a plane through the points of connection of said links with said key-levers and through the fulcrums of said key-levers being substantially parallel to said inclined segment and the main body of said links extending nearly at right angles to said plane.

45. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of an upwardly and rearwardly inclined segment arranged in front of and below said platen, a series of type-bars pivoted on said segment and having a common printing point at the front and above the center of said platen, a series of key-levers having keys at the lower front portion of the machine frame and having upwardly and rearwardly inclined rear portions extending to an elevated fulcrum at the rear upper portion of the machine frame and links directly connecting said type-bars and key-levers, the rear inclined portions of said key-levers being substantially parallel to said inclined segment.

46. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of an upwardly and rearwardly inclined segment arranged in front of and below said platen, a series of type-bars pivoted on said segment and having a common printing point at the front and above the center of said platen. a series of key-levers having keys at the front, lower portion of the machine frame and having upwardly and rearwardly inclined rear portions extending to an elevated fulcrum at the upper, rear portion of the machine frame, the rear portions of said key-levers being about parallel to said inclined segment, and pull links directly connecting

said type-bars and said key-levers; said pull links extending about in the directions of their respective type-bars when in normal idle positions, and the inclined portions of said key-levers being so arranged relatively to said links that a line extending from the fulcrum of each key-lever to the pivot of its connected link is in the vertical plane of the link and about at right angles thereto.

47. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of a series of type-bars having a common printing point at the front and above the center of the platen, an inclined segment parallel to a tangent through the printing point whereon said type-bars are mounted, a series of key-levers having keys at the forward lower portion of the machine frame and having elevated rear portions extending to a common fulcrum at the upper rear portion of the main frame and a series of pull links directly connecting said type-bars and the key-levers, the main body of said pull links being arranged nearly at right angles to the plane of said inclined segment and to a plane extending through the fulcrums of said key-levers and the points of connection between said key-levers and links.

48. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of a series of type-bars having a common printing point at the front and above the center of the platen, an inclined segment parallel to a tangent through the printing point whereon said type-bars are mounted, a series of key-levers having keys at the forward lower portion of the machine frame and having elevated rear portions extending to a common fulcrum at the upper rear portion of the main frame, the upper rear portions of said key-levers being about parallel to said inclined segment and a series of links directly connecting said type-bars and said key-levers, the main body of said links being arranged nearly at right angles to the plane of said segment, and the rear portions of said key-levers being so arranged with respect to said links that a line joining the fulcrum of each key-lever to the pivot of its connected link is in the vertical plane of the link.

49. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of a series of type-bars having a common printing point at the front and above the center of the platen, an inclined segment parallel to a tangent through the printing point whereon said type-bars are mounted, a series of key-levers having keys at the forward lower portion of the machine frame and having elevated rear portions extending to a common fulcrum at the upper rear portion of the main frame, said type-bars being upwardly and forwardly inclined in idle position and upwardly and rearwardly inclined in striking position and a series of pull links, the main body of said links extending in line with said type-bars and directly connecting the same to said key-levers, said main body of links being arranged nearly at right angles to a common plane extending through the fulcrums of said key-levers and the points of connection of said key-levers with said links.

50. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of a series of type-bars having a common printing point at the front and above the center of the platen, an inclined segment parallel to a tangent through the printing point whereon said type-bars are mounted, a series of key-levers having keys at the forward lower portion of the machine frame and having elevated rear portions extending to a common fulcrum at the upper rear portion of the main frame, the rear portions of said key-levers being arranged substantially parallel to said inclined segment and said type-bars being upwardly and forwardly inclined in idle position at right angles to the plane of said segment and a series of pull links, the main body of said links extending about in line with the idle positions of said type-bars and directly connecting the same with said key-levers.

51. In a typewriting machine the combination with the machine frame and the platen mounted thereon, of a series of type-bars having a common printing point at the front and above the center of the platen, an inclined segment parallel to a tangent through the printing point whereon said type-bars are mounted, a series of key-levers having keys at the forward, lower portion of the machine frame and having elevated rear portions fulcrumed at the upper, rear portion of the frame, said type-bars being upwardly and forwardly inclined in idle position at right angles to the plane of said segment, and a series of pull links, the main body of said pull links extending nearly in line with the idle positions of said type-bars, and directly connecting the same with said key-levers, the fulcrums of said key-levers and the points of connection thereof with said links lying in a common plane substantially parallel with said segment and about at right angles to said pull-links when viewed in side elevation.

52. In a typewriting machine, the combination with the machine frame and the platen mounted thereon, of a series of type-bars having a common printing point at the front and above the center of the platen, an upwardly and rearwardly-inclined segment parallel to a tangent through the printing point whereon said type-bars are mounted, a

series of key-levers having keys at the forward, lower portion of the machine frame and having elevated rear portions fulcrumed at the upper, rear portion of the frame, the rear portions of said key-levers being arranged substantially parallel to said inclined segment and said type-bars being upwardly and forwardly inclined in idle position at right angles to the plane of said segment, and a series of pull links, the main body of said pull links extending nearly in line with the idle positions of said type-bars, and directly connecting the same with the upwardly-inclined rear portions of said key-levers.

53. In a typewriting machine, the combination with the machine frame and a platen mounted thereon, of an upwardly and rearwardly inclined segment arranged in front of and below the platen, a series of type-bars pivoted on said segment and having a common printing point at the front and above the center of said platen, a series of key-levers having keys at the lower, forward portion of the machine frame and having elevated rear portions fulcrumed at the upper rear portion of the frame, and links directly connecting said type-bars and key-levers, the fulcrums of said key-levers and the points of connection between said key-levers and links lying substantially in a common plane parallel to a tangent through the printing point, and the main body of said links being arranged and moving in directions nearly at right angles to said plane, when said links are viewed in side elevation.

54. In a front strike writing machine, the combination with a system of keys, a system of U shaped key levers each comprising a key-bearing stem, a forwardly and rearwardly extending portion and a member extending upwardly from the latter and pivoted or fulcrumed at its upper end, of a curved system of rearwardly striking type bars having forwardly and rearwardly moving portions fulcrumed in rear of said keys, and means connecting said forwardly and rearwardly moving portions to the lowermost rear portions of said key levers.

55. In a typewriting machine, the combination of a series of keys, a series of key-bearing levers extending rearwardly from the key board and fulcrumed at their rear ends, the fulcrums being at least as high as the front bank of keys, said levers extending downwardly from their fulcrums and then forwardly to their key ends; movement-transmitting devices connected to said levers immediately below said fulcrums, and a system of rearwardly striking type bars fulcrumed in rear of said keys and having forwardly and rearwardly moving arms operable by said transmitting devices.

56. In a typewriting machine, the combination with a system of type bars and a system of levers connected thereto, each lever comprising a pendent arm and a key bearing arm extending forwardly therefrom, of guides for the upper and lower ends of the pendent arms, and guides for the key bearing arms.

57. In a typewriting machine, the combination with a platen, of a system of type bars mounted in an upstanding arc to strike rearwardly against the front of the platen, a set of pendent arms arranged in rear of the type bars and fulcrumed at their upper ends in the upper part of the machine, two sets of members extending forwardly from the lower ends of said arms, one set of said members above the other set thereof, said upper set comprising links and being connected to said type bars, and keys to which the members in the lower set are connected.

BURNHAM C. STICKNEY.

Witnesses:
S. R. OGDEN,
JULIA ROSS.