

No. 884,347.

C. E. YETMAN.
TYPE WRITING MACHINE.
APPLICATION FILED SEPT. 26, 1900.

PATENTED APR. 7, 1908.

9 SHEETS—SHEET 1.

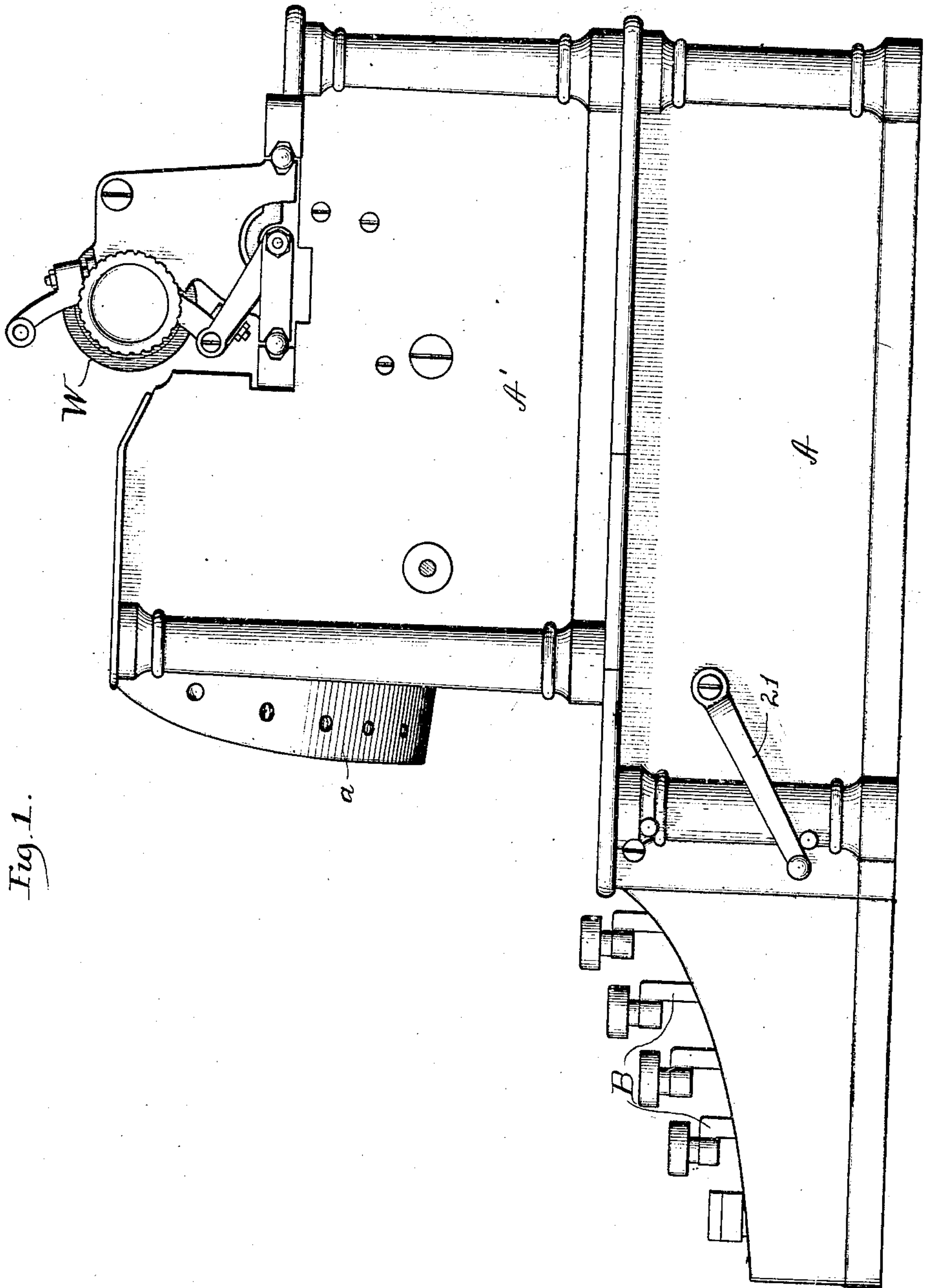


Fig. 1.

Witnesses:

Fred Gulack

Alberta Adamick

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Charles E. Yetman

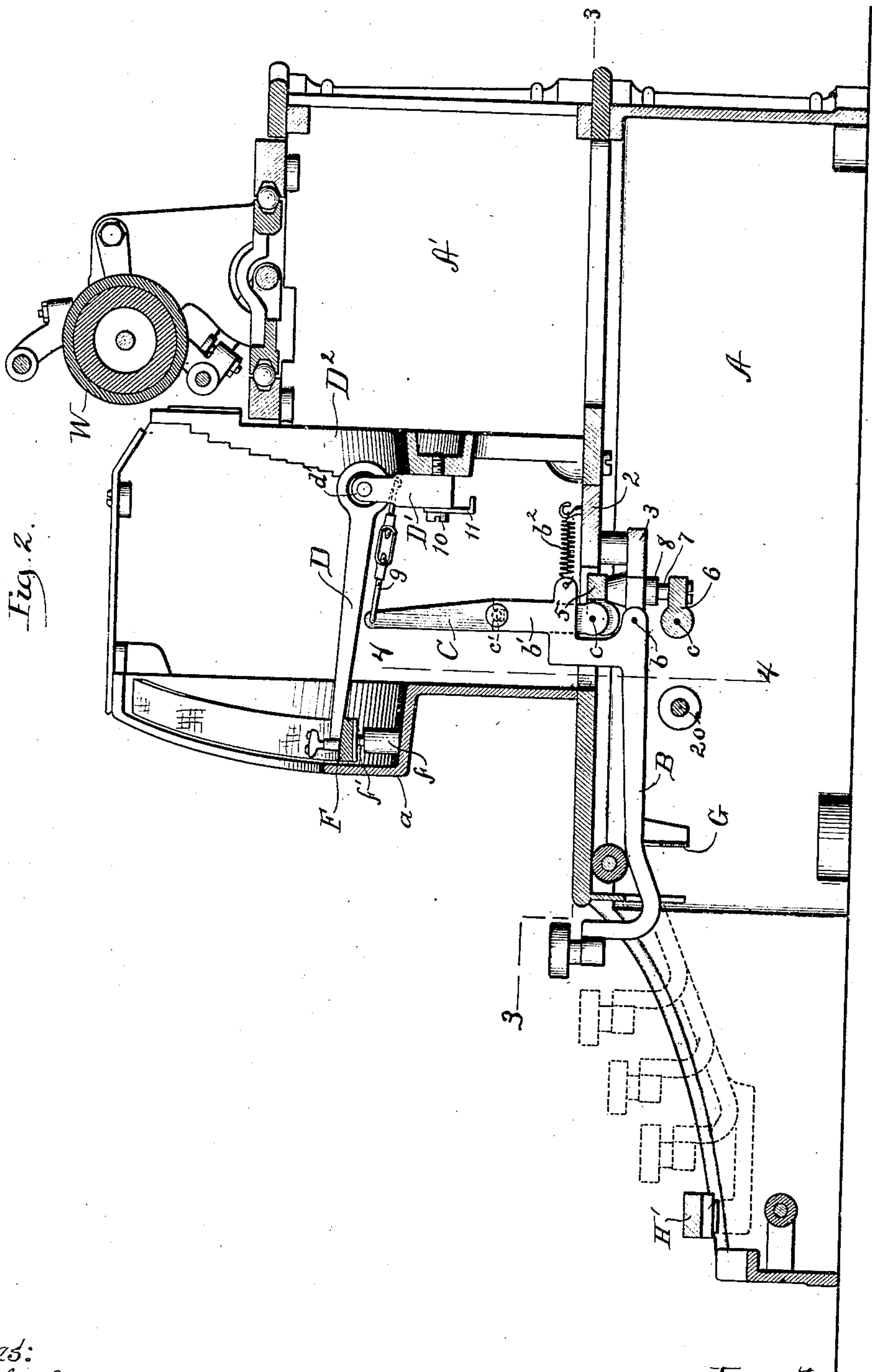
By Peirce & Fisher,
his Attorneys.

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9 SHEETS—SHEET 2.



Witnesses:
Fraser & Lauch
Alberta Adamick

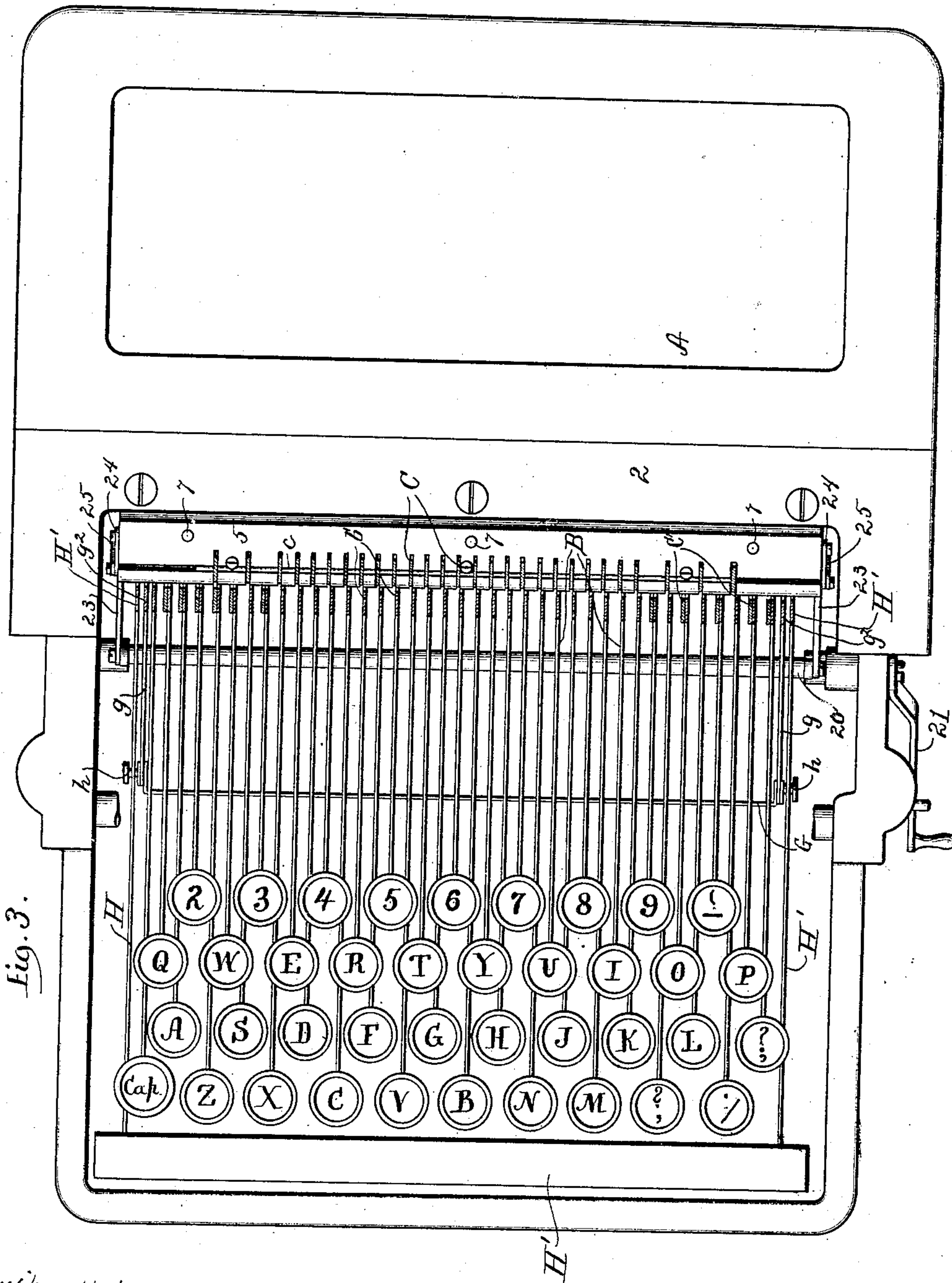
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9 SHEETS—SHEET 3.



Witnesses:

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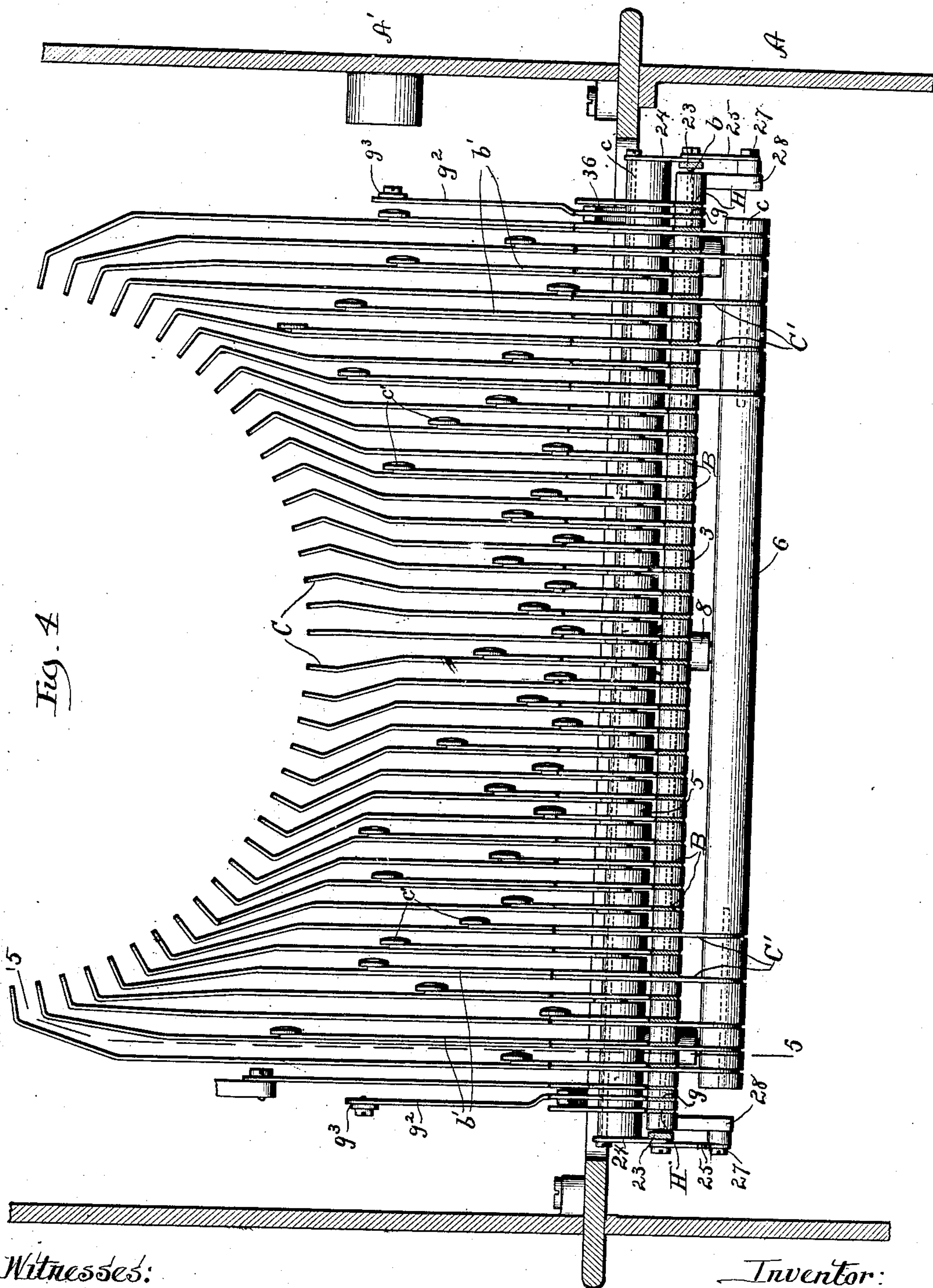


Fig. 4

Witnesses:
Fred [unclear]
Alberta Adamick

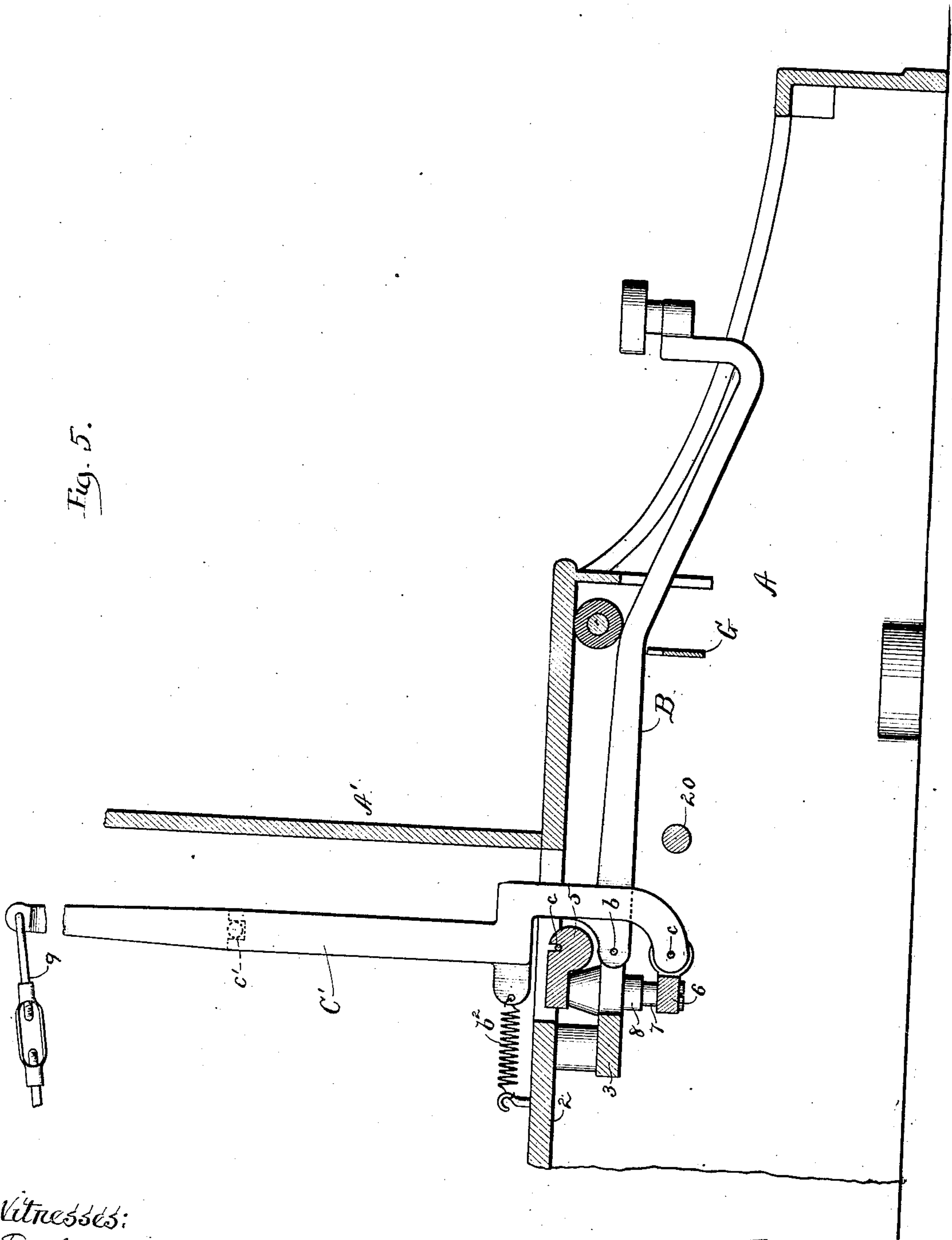
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9 SHEETS—SHEET 5.



Witnesses:
Friedrich
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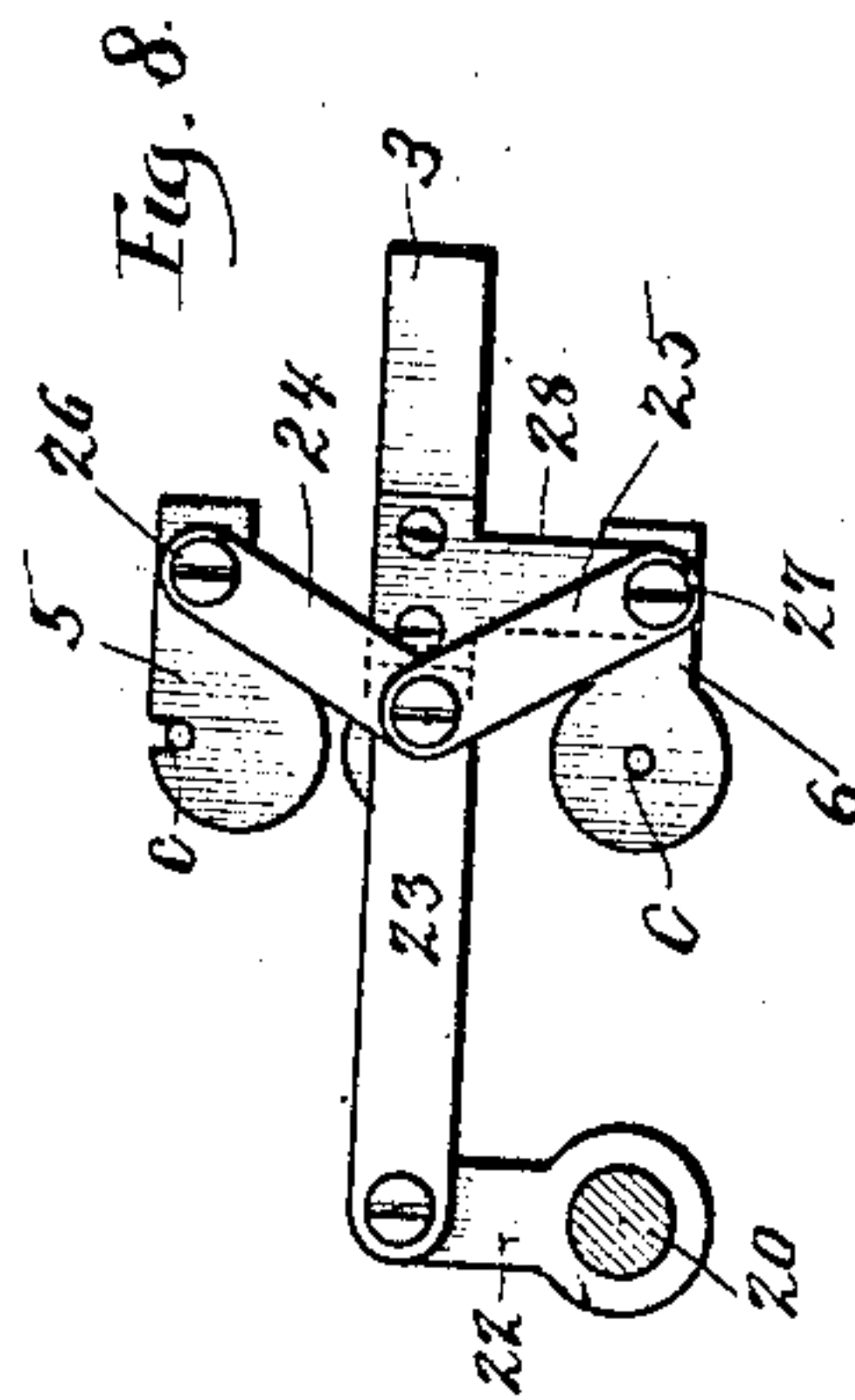
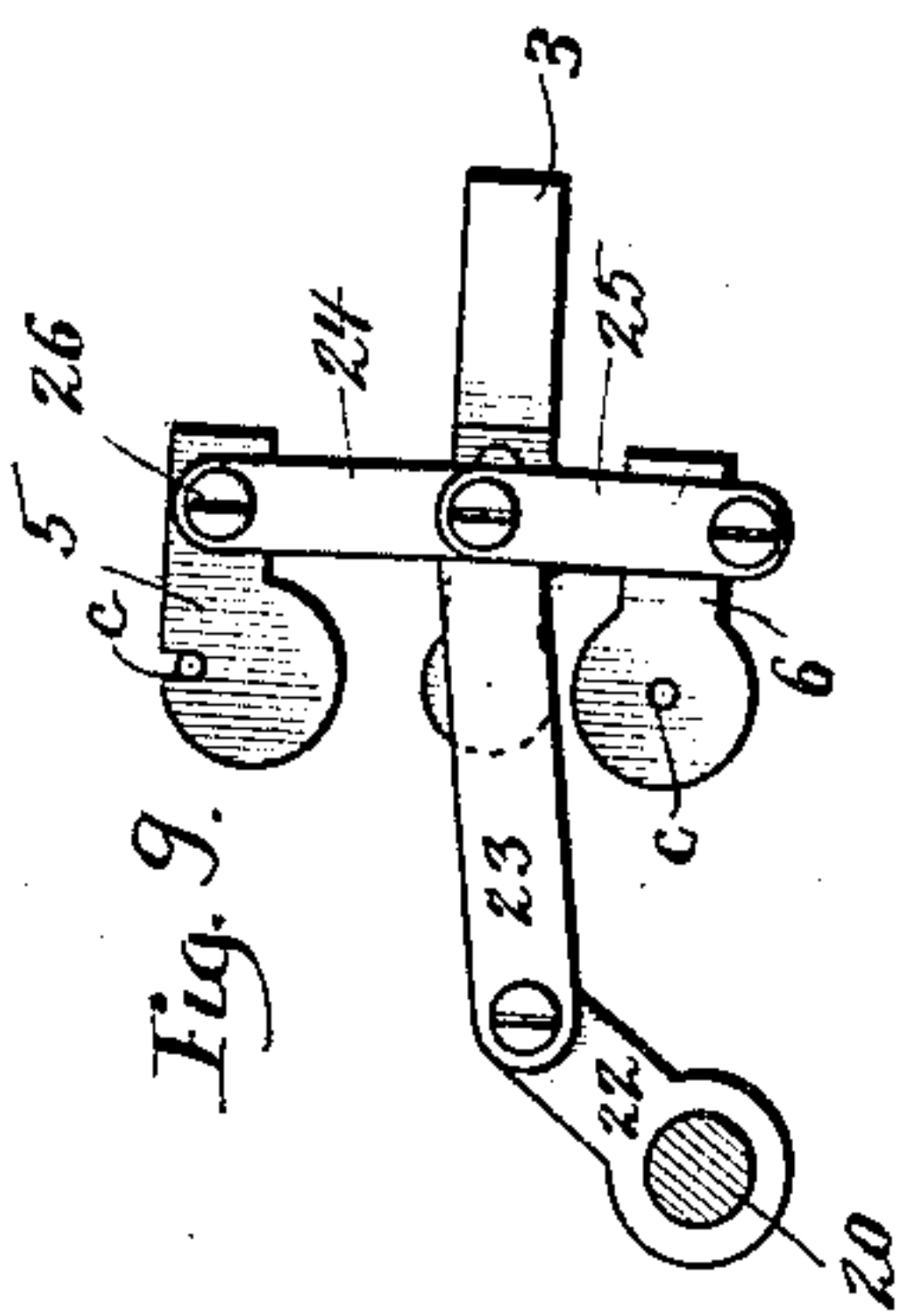
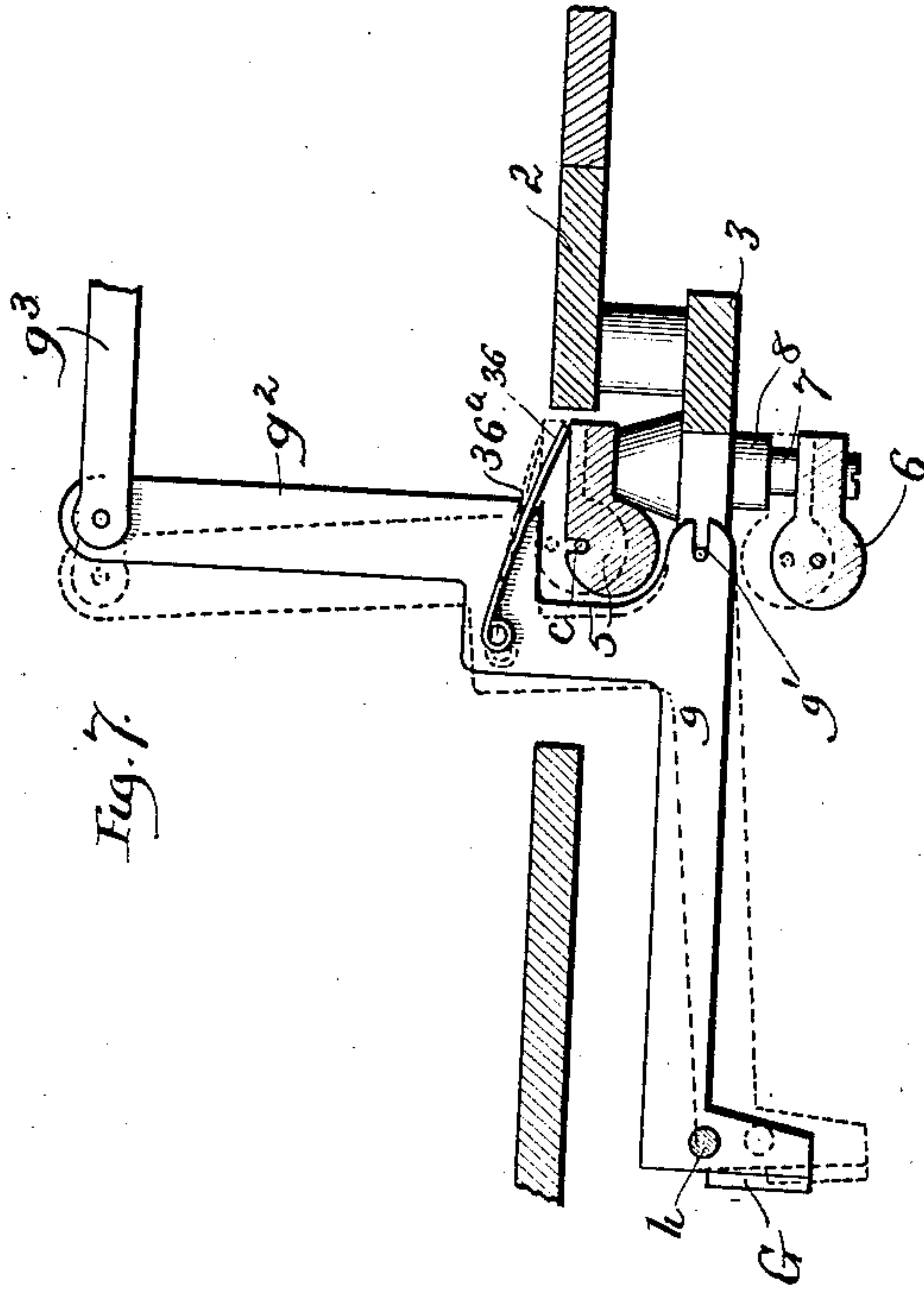
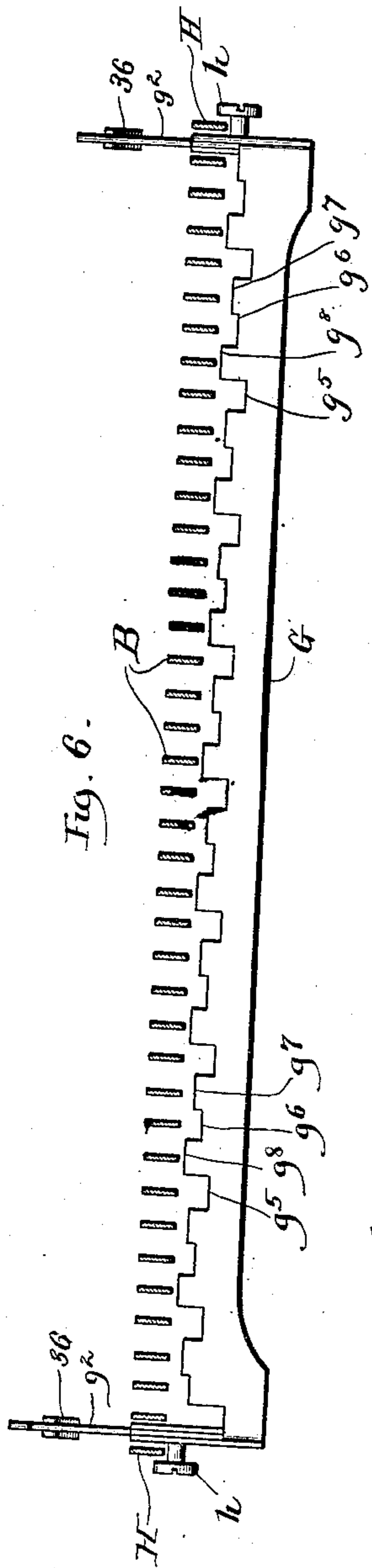
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9 SHEETS—SHEET 6.



Witnesses:

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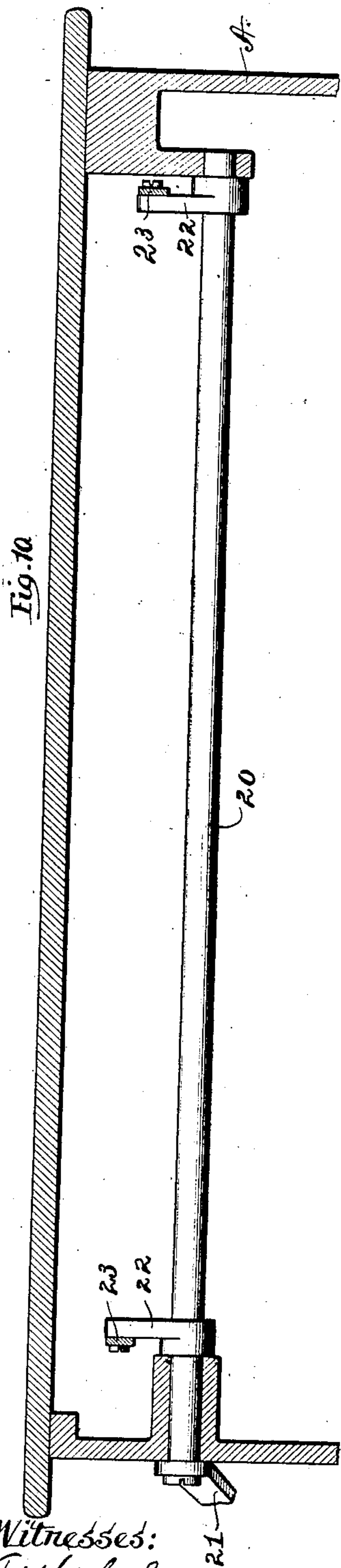
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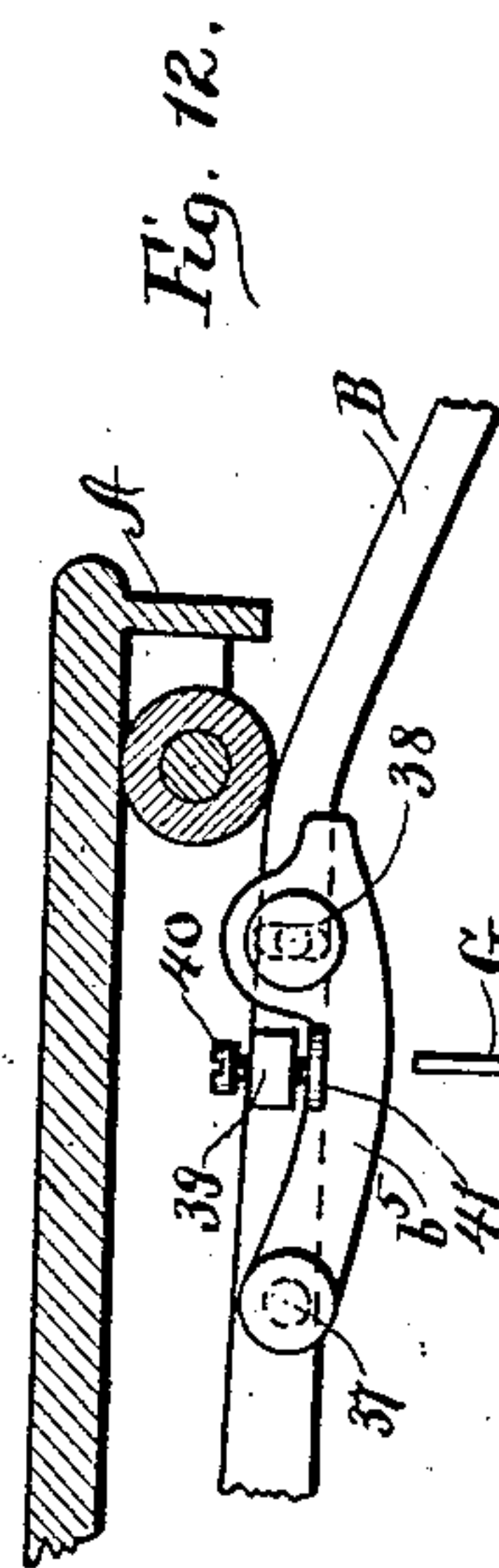
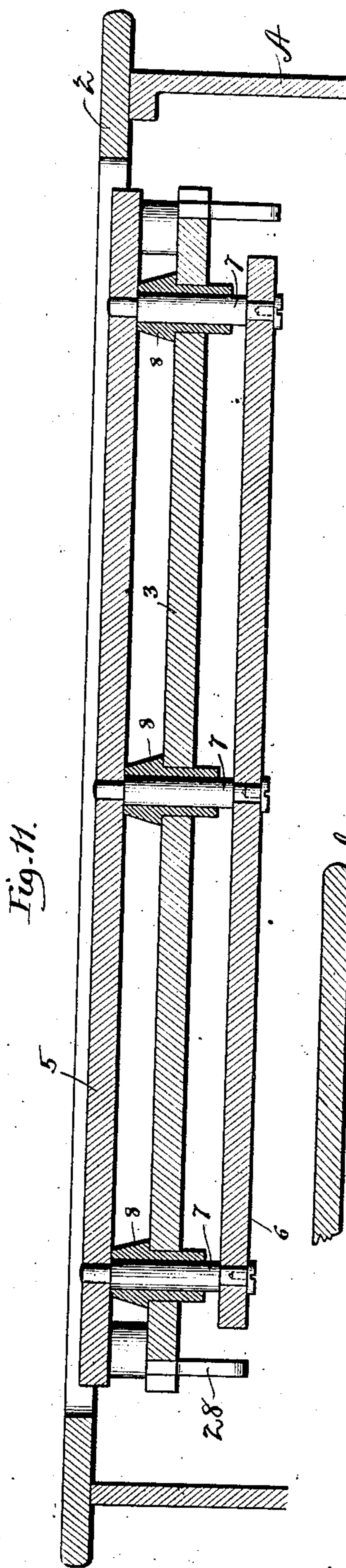
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APPLICATION FILED SEPT. 26, 1900.

PATENTED APR. 7, 1908.

9 SHEETS—SHEET 7.



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9 SHEETS—SHEET 8.

Fig. 14.

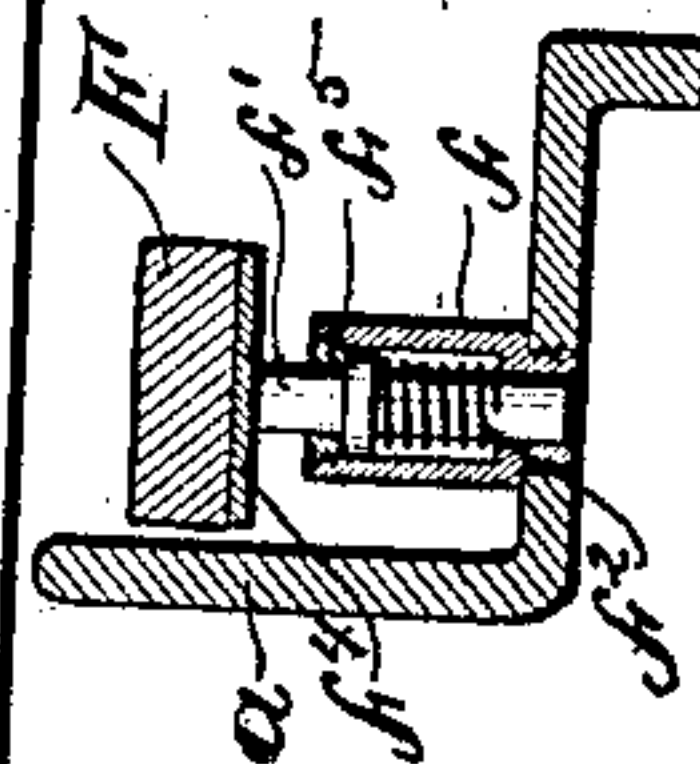
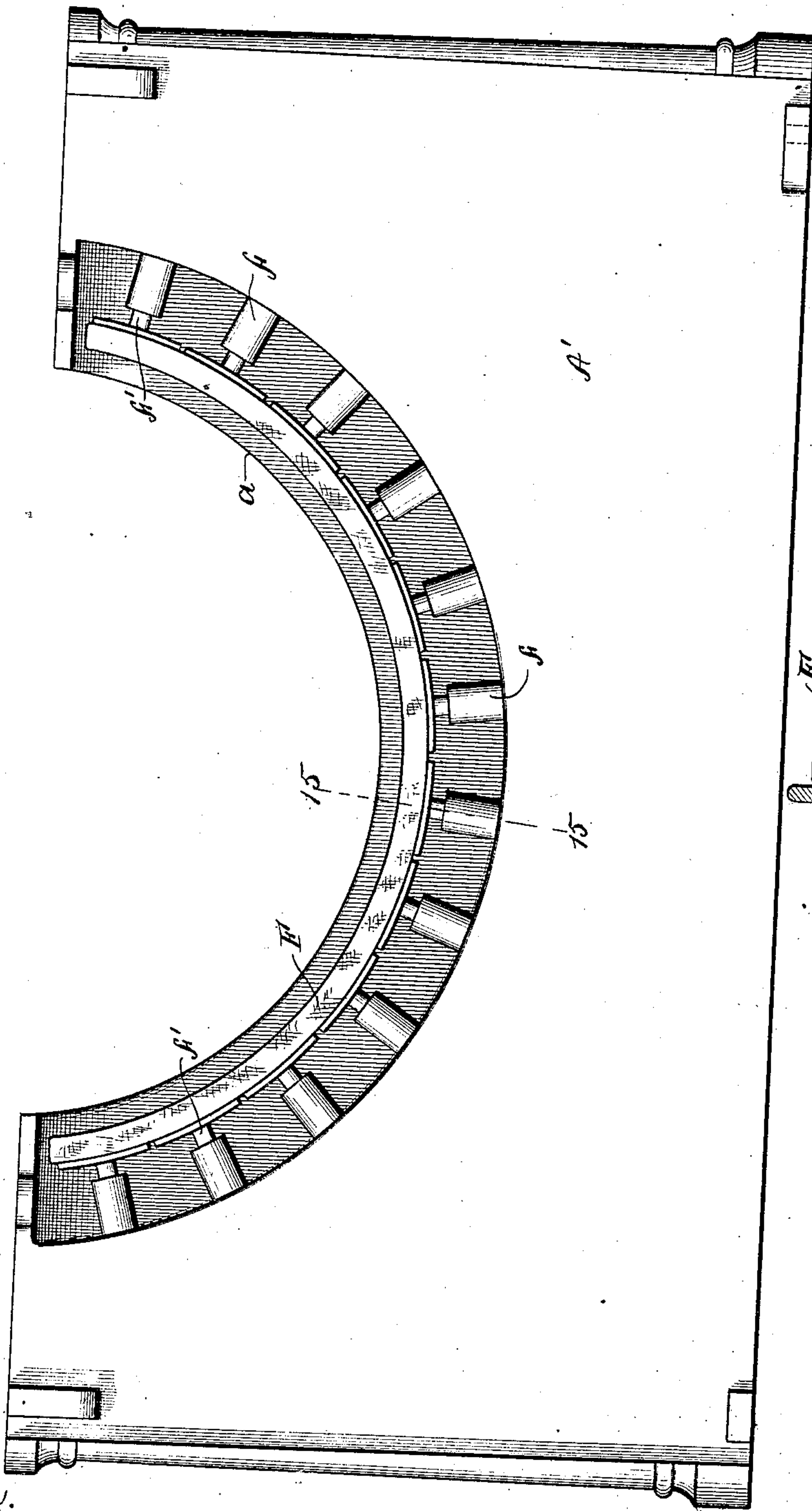


Fig. 15.

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PATENTED APR. 7, 1908.

9 SHEETS—SHEET 9.

Fig. 16.

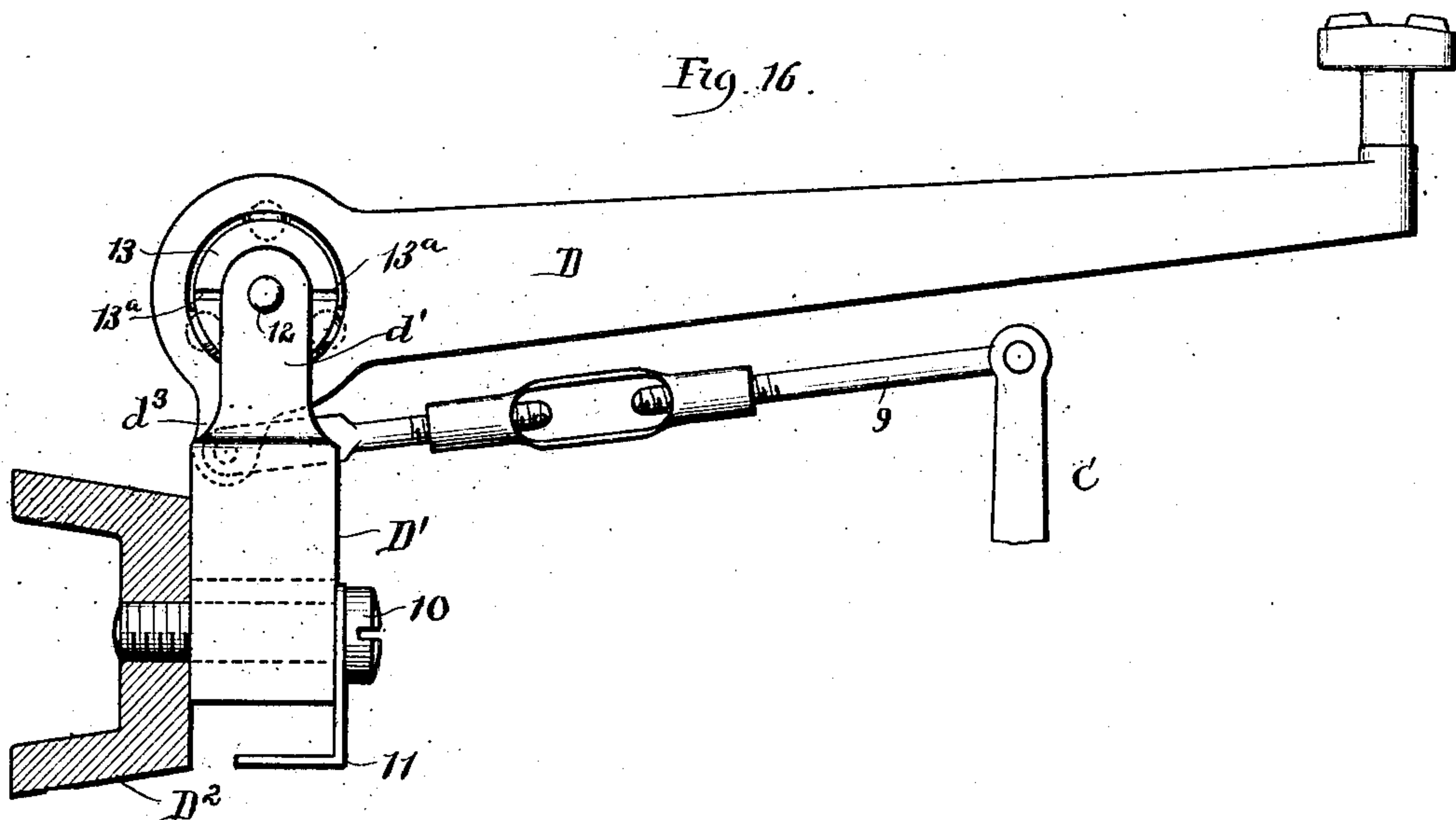


Fig. 18.

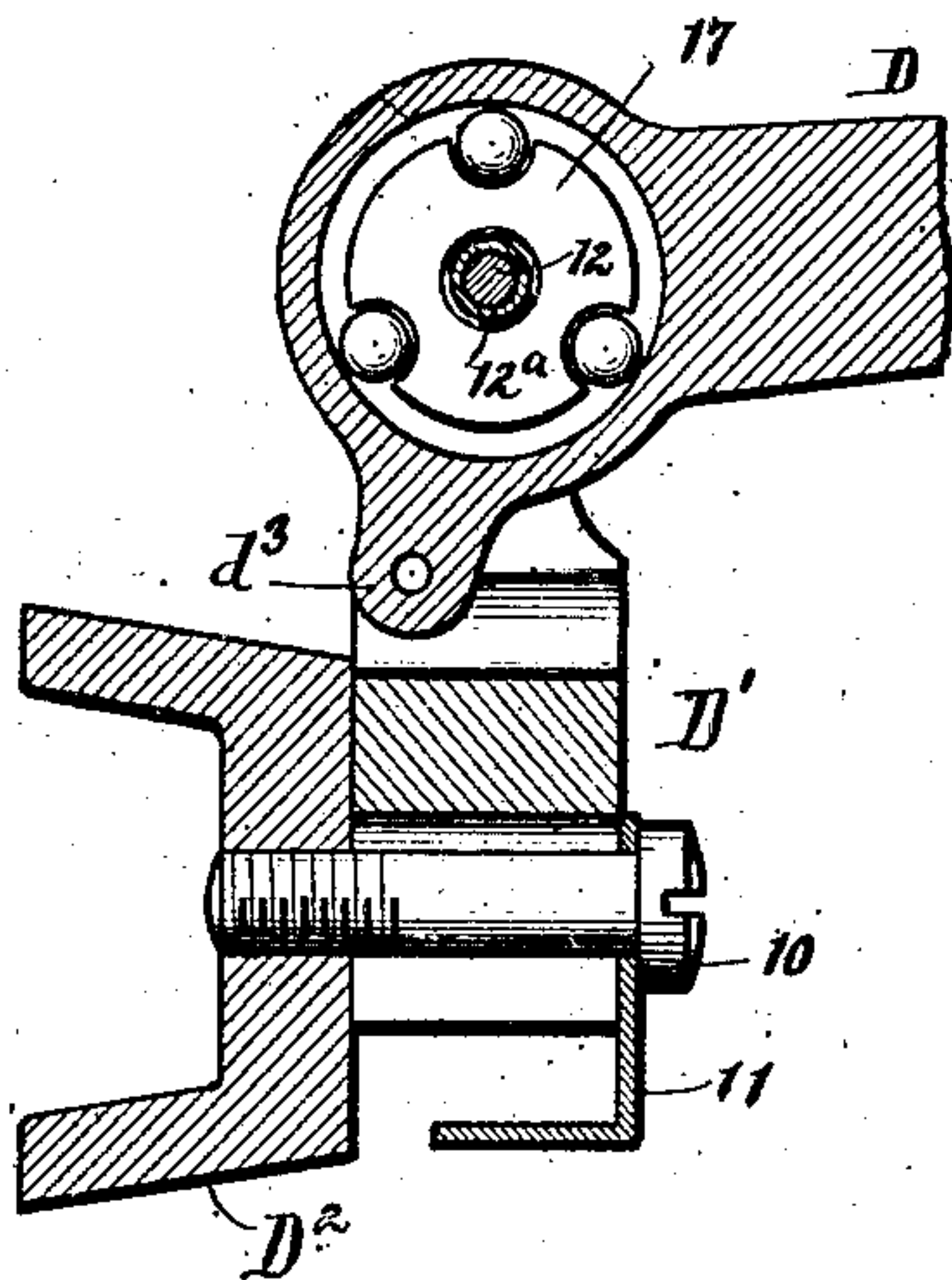
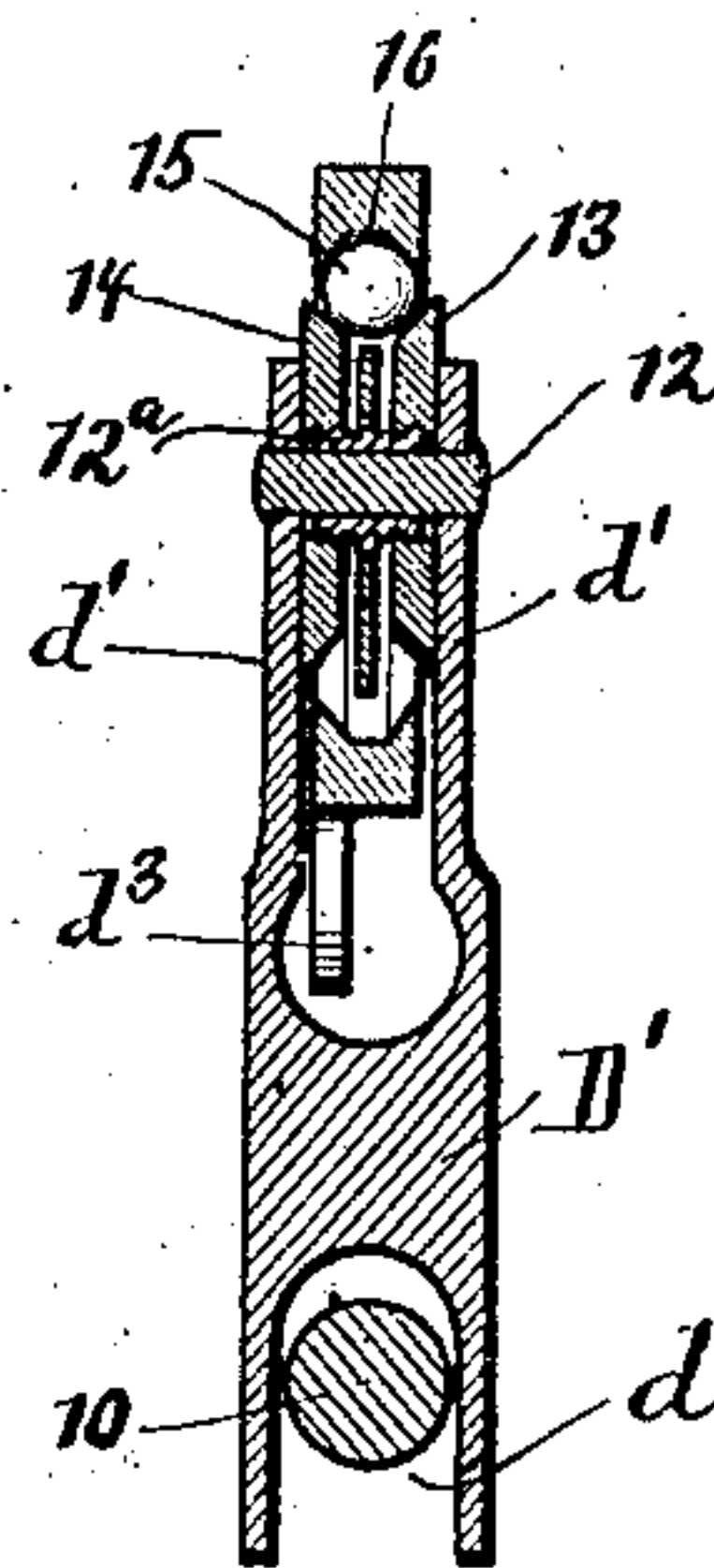


Fig. 17.



Witnesses

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UNITED STATES PATENT OFFICE.

CHARLES E. YETMAN, OF OAK PARK, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
YETMAN TYPEWRITER-TRANSMITTER COMPANY, OF NEW YORK, N. Y., A CORPORATION
OF NEW YORK.

TYPE-WRITING MACHINE.

Patented April 7, 1908.

No. 884,347.

Specification of Letters Patent.

Application filed September 26, 1900. Serial No. 31,198.

To all whom it may concern:

Be it known that I, CHARLES E. YETMAN, a resident of Oak Park, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a full, clear, and exact description.

This invention has relation more particularly to that class of typewriting machines in which the paper to be written upon is carried upon a cylindrical platen that is mounted on a traveling carriage adapted to have a step-by-step movement imparted thereto by suitable escapement mechanism and in which the printing type are carried by pivoted type-bars actuated by suitable key-levers having finger pieces arranged in banks at the front of the machine.

The invention is shown as embodied in a machine of the style known as a "visible" typewriter, as the platen, type-bars, etc., are arranged in such position that the printed line is exposed to the operator's view; but it will be understood that the invention is not restricted to this particular class of typewriting machine.

The invention consists in the various novel features of construction hereinafter described, illustrated in the accompanying drawings, and particularly defined in the claims at the end of this specification.

Figure 1 is a view in elevation of the right-hand end of the machine. Fig. 2 is a view in central longitudinal section (from front to rear) of the machine, one key lever only being completely shown. Fig. 3 is a view in horizontal section on line 3—3 of Fig. 2. Fig. 4 is a view in vertical section on line 4—4 of Fig. 2 with parts removed. Fig. 5 is a view in vertical section on line 5—5 of Fig. 4. Fig. 6 is a detail front view of the universal bar, the key levers being shown in cross-section. Fig. 7 is a detail side view of one of the end portions of the universal bar, parts adjacent thereto being shown in vertical section. Fig. 8 is a detail view in side elevation of the mechanism for throwing the type-bars out of action. Fig. 9 is a view similar to Fig. 8, but with the parts in different position. Fig. 10 is a detail rear view (looking towards the front) of the throw-out shaft and adjacent parts, whereby the type-bars are thrown out of action. Fig. 11 is a

detail sectional view in vertical longitudinal section through the comb-plates that support the key-levers and through the guides therefor. Fig. 12 is a detail side view of a portion of one key lever showing means whereby the extent of movement imparted thereby to the universal bar may be adjusted. Fig. 13 is a detail plan view of the parts shown in Fig. 12. Fig. 14 is a back view of the front plate showing the type-bar cushion in position thereon. Fig. 15 is a view in vertical cross-section on line 15—15 of Fig. 14. Fig. 16 is an enlarged detail view in side elevation of one of the type bars, its hanger and connected parts, the hanger frame being shown in cross-section. Fig. 17 is a view in central vertical section through the type-bar hanger and parts carried thereby. Fig. 18 is a view in vertical longitudinal section through the type-bar, its hanger and the hanger frame.

The main frame of the machine may be of any suitable construction, the frame shown comprising a base portion A and an upper portion A', the upper portion having the semi-circular opening at its front where it is provided with the extension a. From side to side of the base of the machine and near the front part of the upper portion A' extends a cross-bar 2 (see Fig. 3), beneath which is sustained by suitable studs, the central comb-bar 3, to the front edge of which are pivotally connected as at b, the inner ends of the various key-levers B, each of these key-levers B being formed with an upwardly extending portion b' that is connected by a suitable spring b² to the cross-bar 2, this spring serving to hold the key-levers in normal position. The forward ends of the key levers B are upturned and provided with suitable finger pieces that are grouped together in the key-board in banks in the usual manner. Above and below the comb-bar 3 and parallel therewith extend the upper and lower pivot bars 5 and 6, these pivot bars being connected together (see Fig. 11) by suitable bolts 7 that pass through guide sleeves 8 mounted in the central comb-bar 3. The upper and lower pivot bars 5 and 6 have comb-shaped front portions and through the forwardly projecting teeth of these bars extend the pivot rods c of the supplemental key-levers C and C'. By reference more particularly to Figs. 2,

4 and 5 of the drawings, it will be seen that each of the supplemental levers C and C' is provided with a laterally projecting headed pin c' adapted to rest normally within a preferably open slot or seat formed in the upwardly extending portion b' of the corresponding key-lever B. The upper end of each of the supplemental key-levers C and C' is connected by a suitable link 9 with its corresponding type bar D, these type bars D being preferably pivotally mounted in semi-circular arrangement at the front of the machine and in the rear of the pivots for the key levers and supplemental levers and at a uniform distance from the printing point on the platen W whereon the paper to be printed will be placed. By this arrangement, short key-levers and operating connections of like weight may be employed. Each of the type bars D is sustained by a type-bar hanger D' (see Figs. 16, 17 and 18) that is mounted upon a semi-circular hanger frame D² bolted to the main frame of the machine. This hanger frame D² is preferably a channel casting having its outer face stepped and formed with threaded holes through which pass the screws 10 whereby the hangers D' will be retained in place. Preferably a bent plate 11 is interposed between the heads of the screws 10 and the hangers D' although this is not essential to my invention. As shown, each of the type bar hangers D' comprises a block having its lower or outer end formed with a slot d' through which passes the retaining screw 10. By this construction, the type-bar hanger can be raised or lowered or set at any desired position, being held in such position by the screw. The opposite end of each of the hangers D' is cleft or bifurcated to form the arms d' between which is mounted the inner end of the corresponding type-bar D. Preferably the arms d' of the hanger are formed in piece therewith and through these arms pass the ends of the pin or rivet 12, carrying the threaded stud 12^a upon which are mounted the correspondingly threaded bearing plates 13 and 14, and preferably the outer face of each of these plates is formed with one or more notches 13^a adapted to receive a pointed instrument or wrench to permit the adjustment of the plates to be readily effected.

By reference more particularly to Fig. 17 of the drawings it will be seen that the peripheries of the plates 13 and 14 are beveled inwardly and form a channel or ball-race to receive anti-friction balls 15 and preferably also the circular opening or eye 16 that is formed at the inner end of the type bars D which is mounted to swing in the plane of the ball-race of the hanger mid-way between the hanger-arms is similarly beveled or channeled to form a suitable bearing surface or ball-race for the balls. By preference, three balls 15 are used and held at

equal distances apart by a space plate 17 that is mounted loosely upon the stud 12^a. By this means, I obtain a three-point rest for the type-bars; and the bearing may be finely adjusted to more accurately pivot the type-bars, than would be the case if more balls were used. The offset lug d³ at the inner end of each of the type-bars is adapted to swing in the space between the arms of the type-bar hanger and to this lug is connected the corresponding coupling link 9 that unites the type-bar to its appropriate supplemental key lever C or C'.

From the construction of parts as thus far defined it will be seen that when the operator depresses one of the key-levers B (for example the key-lever most completely shown in Fig. 2 of the drawings), such lever will be rocked about its pivot point b, thereby causing its upper portion b' by reason of its engagement with the pin c', to swing forwardly the correspondingly supplemental key-lever C and as this supplemental key-lever is coupled to its type-bar D, it is manifest that the type-bar will have its free type-bearing end swung towards the platen W so as to cause the type carried by said bar, to make its impression at the common printing point. The balls 15 afford an anti-friction support for their corresponding type-bar so that the swinging movement of each type-bar can be effected with but slight exertion, the type-bars thus responding to the lightest touch of the operator and the wear of the parts being reduced to a minimum.

In placing the parts together for use, the bearing plates 13 and 14 and the space plate 17 with the balls 15 in the position shown, will be set within the opening or eye 16 at the inner end of the type bar, the threaded stud 12^a being inserted through the plates 13 and 14 and 17, and the parts being adjusted so as to allow an easy but accurate movement of the type-bar with respect to the bearing plates, and these parts will then be placed between the arms d' of the corresponding type-bar hanger D' and held in position by the rivet 12 which passes through the stud 12^a. The rivet 12 and the stud 12^a extending between the arms of the bifurcated hangers thus form a support for the bearing plates 13 and 14 and the type-bar. The ends of the rivet 12 will be upset slightly with a hammer, causing the arms of the hanger to bear against the plates 13 and 14, and thus retain these plates against accidental movement. Should it become desirable to re-adjust the bearing plates 13 and 14 to compensate for any slight wear that may occur, this can be done by the use of a pointed instrument or wrench engaging the notches in the outer faces of the bearing plates 13 and 14, and after the plates are moved towards each other the required distance, the ends of the rivet 12 can be further upset to

bring the hanger arms in bearing against the outer faces of the plates, it being understood of course that these arms of the hanger are more or less resilient. It will be observed that the threaded stud 12^a is just short enough not to come in contact with the side arms *d'* of the hanger *D'*. It will also be observed that the plates 13 and 14 are held apart by the threaded stud 12^a independently of the bearing-balls themselves.

I am aware that it has been heretofore proposed to employ ball bearings intermediate the type bars and their hangers, the hangers being formed of sections, but I believe that my present construction is materially better than any that has preceded it, since the bearing plates can be accurately adjusted to each type bar before it is placed within its hanger and there is no danger of disturbing the adjustment of the parts when the hanger is placed in position upon its frame. That is to say, the adjustment of the ball bearing is independent of and in no way affected by the means for supporting the type-bar within the hanger, nor is it affected by the means for securing the hangers to the typewriter frame, thus curing defects found to exist in prior structures.

In type writing machines of the general construction shown, the upright levers are necessarily of varying lengths. Those at the center of the machine are short and those at the right and left gradually increase in length toward the extreme sides of the machine, (see Fig. 4). Moreover, the horizontal key levers, as shown in Fig. 2, vary in length from the short levers in the highest bank of keys to the long levers in the lowest bank. It is also evident that some of the short horizontal levers are necessarily united with some of the long upright levers and that some of the longer of the former are necessarily united to some of the shorter of the latter. If therefore the key levers were formed of single pieces or if the points of connection between the upper portions of the key levers and the supplementary levers were all at the same distances from the pivots of the latter, it is obvious that such construction would result in an uneven depression of the keys and an uneven touch as well. To obviate this difficulty, I make use of compound key levers, that is the key levers *B* and the supplemental key levers *C* and *C'*, mount certain of the supplemental levers on the lower pivot plate 6, and vary the lengths of the separate companion abutments or parts *b'* of the key levers and thereby vary the distances of the points of connections between such upper portions and the pivots of the supplementary levers. By this construction a uniformity in the action of the key levers is insured so that the amount of depression and the force necessary to depress them will be alike for all. In accomplishing this object I prefer to use the

following rule or formula for determining the position and points of connection of the key levers *B* and the supplemental levers *C* and *C'*.

The well known rule for forces acting on a balanced lever is that the product of such forces multiplied by the distances of their points of application from the fulcrum are equal. So that if *T* equal the operator's touch, and *S*, the force applied at pin *c'*, we have $B \times T = b' \times S$, where *B* and *b'* equal the distances of the key and point *c'* from the pivot *b*. And if *S'* equals the force applied at the end of lever *C* to the link 9, we have $C \times S' = C' \times S$, where *C* and *C'* equal the distance of link 9 and point *c'* from fulcrum *c*. The force necessary to operate the various links 9 and type bars *D* are all equal since they are all of equal length; therefore we may assume that the operator's touch equals this force or $T = S'$. Further, if pivot *c* is located in bar 5, $\frac{1}{2}$ a unit of length above the fulcrum *b*, then $C' \times b' = \frac{1}{2} B$. If we substitute these values in the above given equations and solve we will find that $b' = \frac{\frac{1}{2} B}{B - C}$. From this

formula we may determine the necessary length of the upper portion *b'* and the position of the point *c'* for any length of lever *B* and of supplemental lever *C*, to secure a perfect uniformity of touch. And since a similar relation exists between the distances through which any portion of a pivoted lever is moved and its distance from the fulcrum, and since the distance through which the end of the supplemental levers is moved is uniform, then a uniform depression of all the keys is also secured.

It is evident that for mechanical reasons, the point *c'* can not be brought too near or below the pivot *c*, nor can it be extended beyond the end of the supplemental key lever. But the solution of the above formula will sometimes so locate the point *c'*, and I have found it necessary to pivot some of the supplemental key levers as *C'* on bar 6 below the fulcrum *b*. In such case $C' = b' + \frac{1}{2}$, which will change the formula to $b' = \frac{\frac{1}{2} B}{C - B}$. By

the use of this equation I can get the length of the upper portions *b'* and the position of the point *c'* for the supplemental levers *C'* which are pivoted on bar *b*, below the fulcrum bar of the key levers *B*. It is obvious that this feature of my invention is applicable to typewriters of various types and that connections of varying lengths between the finger keys and the type bars may be substituted for the preferred construction which I have illustrated and described. Similar formulas for the lengths of such connections could be readily deduced. I believe that I am the first to vary the lengths of such connections in accordance with such a formula or rule, by which means I am enabled to se-

cure perfect uniformity of touch and equal depression for all the finger keys. I do not wish therefore to be limited to the details of this preferred construction.

5 It is frequently desirable (as for example when an operator temporarily leaves his work,) to throw the type bars of the machine out of action so that they shall not respond to any accidental or mischievous operation of the key levers. Inasmuch as the type bars 10 are operated by the key levers through the medium of the supplemental levers C and C', it will be seen that if these supplemental levers be raised so as to lift their pins *c'* from out the slots or seats in the upper ends *b'* of 15 the key levers, then the depression of the key levers will produce no movement of the supplemental levers or of the type bars. In order to effect this raising of the supplemental levers C and C', to throw the type bars out of 20 action, I prefer to employ the mechanism next to be described, reference being had more particularly to Figs. 1, 4, 8, 9 and 10 of the drawings.

25 Through the base of the main frame A extends a shaft 20 that carries upon its outer end a crank handle 21 whereby the shaft may be turned by the operator. Upon this shaft 20 are fixed the cranks 22 that are pivotally 30 connected by links 23 to the pairs of toggle levers 24 and 25 at the opposite ends of the comb-bar 3 and pivot bars 5 and 6. The upper ends of the toggle levers 24 are pivotally connected as at 26 to the upper pivot bar 5, 35 while the lower ends of the toggle levers 25 are pivotally connected as at 27 to the hanger plates 28 that are secured to and depend from the ends of the comb-bar 3. In Fig. 8, the 40 toggle levers are shown in normal position and at such time the pivot pins *c'* of the supplemental levers C, C' will be in engagement with the upper portion *b'* of the key levers B. If now, however, the operator turn the crank- 45 handle 21 (see Fig. 1) in upward direction, the shaft 20 will be rocked, thereby causing its cranks 22 through the medium of the links 23, to shift the toggle levers 24 and 25 50 from the position shown in Fig. 8 to the position shown in Fig. 9, and this shift of the toggle levers will raise the pivot bars 5 and 6 and the supplemental key levers C and C' until the pins *c'* pass from engagement with the upper portion *b'* of the key levers; hence 55 the depression of the forward ends of the key levers will have no effect upon the supplemental levers C and C' or the type bars D. By reference to Fig. 9, it will be seen that when the toggle levers 24 and 25 are shifted 60 to the position there shown, they will be upon or slightly beyond the vertical center, so that they serve to temporarily hold the pivot bars and levers C and C' in raised position. This feature of throwing the type bars out of ac- 65 tion will also be found particularly advan-

tageous when the key levers are to be used not merely for operating the type bars, but also for operating certain electric signal transmitting mechanism such as shown in an application Serial No. 46,580 filed by me February 8, 1901, but it is not deemed necessary to show herein the connection between the key levers and such transmitter mechanism.

In the very rapid operation of typewriting 75 machines in which the type are carried upon pivoted bars, it is often found that if two type bars lying in juxtaposition be operated in quick succession, there is danger of the interference of the bars, this interference being 80 due to the fact that as the type bar first struck falls upon the cushion pad, it rebounds some distance therefrom and oftentimes into the upward path of the adjacent type bar. A further object of this invention is to pro- 85 vide a pad or cushion for the free ends of the type bars that will so lessen or prevent the rebound of the type bars as to avoid all danger of their interference in rapid operation 90 and this object is preferably accomplished by the construction of pad or cushion more particularly shown in Figs. 2, 14 and 15 of the drawings. Upon the semi-circular flange 95 *a* on the front plate of the main frame (or in other convenient position) is mounted a series of chambers *f* through which pass the plungers *f'*, and within each chamber is placed a coil spring *f*², the lower end of which bears against the base of the chamber *f* while its upper end bears against an annular shoulder 100 *f*³ of the plunger *f'*. Each chamber *f* is furnished with a cap *f*³ to retain the plunger in position within the chamber, and the base of each chamber is perforated to permit a slight sliding movement of the plunger. The outer 105 end of each plunger *f'* carries a plate *f*⁴ and upon the several plates rests a cushion F, preferably of felt or like material, by which the free ends of the type bars D will be supported when these bars are in their normal 110 or idle position.

In practice I have found that a spring supported cushion such as just described, will prevent any serious rebound of the type bars 115 as they fall to normal position after the key levers are released. However I regard the construction shown as the most effective one known to me for the purpose, and it is obvious that it may be varied within wide limits without departing from my invention, 120 which presents, I believe, the first instance of a type bar cushion or rest having a springy or yielding support that will avoid the serious rebound of the type bars.

Beneath the various key levers B extends 125 the front rod or plate G of the universal bar, the side arms of this universal bar being formed of rearwardly and upwardly extending portions *g* and *g*². The side arms *g* of the universal bar are pivoted as at *g'* (see Fig. 7) 130

to the comb-bar 3 adjacent its ends and to the upper ends of the extension g^2 of the universal bar are pivotally attached the forward ends of the links g^3 , the rear ends of which are connected with the escapement mechanism whereby the movement of the paper carriage is controlled. By reference to Fig. 6 of the drawings it will be seen that the front plate of the universal bar G has its upper edge of irregular outline, that is to say, this edge is formed with a series of elevations and depressions adapted to come beneath different type levers B of the series. The object in thus shaping the front plate of the universal bar is to compensate for the differences in the lengths of the front portions of the several key levers B. Thus by reference to Fig. 3 of the drawings, it will be observed that the front portions of the key levers B are of four different lengths and from Fig. 6 it will be seen that the front plate of the universal bar is formed throughout its length with four bearing points g^5 , g^6 , g^7 and g^8 of different relative heights. The key levers B having the longest forwardly extending portions will rest upon the highest bearing points g^5 , while the key levers B having the shortest forwardly extending portions will rest upon the lowest bearing points g^8 of the universal bar; and it will be understood that the intermediate key levers will rest upon the corresponding bearing points g^6 and g^7 of the universal bar. It will thus be seen that the arrangement of the bearing points upon the upper edge of the front of the universal bar will allow the same extent of downward movement to the keys of each key-lever regardless of their length, thus insuring uniformity of touch. It is obvious that the same object may be obtained by providing the key-levers with projections of varying length to engage the universal bar, it being only necessary that the normal distance between the universal bar and each key-lever, technically called the "drop," shall vary in accordance with the length of each lever.

Inasmuch as it is desirable to throw the universal bar out of action at the same time that the type bars are thrown out of action by the mechanism hereinbefore described, and more particularly illustrated in Figs. 8 and 9 of the drawings, I prefer to provide the side arms of the universal bar with the rearward extensions 36 that project over and in proximity to or against the top of the upper pivot bar 5. Hence it will be seen that when the upper pivot bar is lifted by shifting the toggle mechanism from the position shown in Fig. 8 to the position shown in Fig. 9 as hereinbefore described, the pivot bar 5 by its contact with the extensions 36, will cause the universal bar to be rocked from the position shown by full lines to the position shown by dotted lines in Fig. 7; and when the universal bar is in the position shown by

dotted lines it will not be affected by the downward movement of the key levers. Preferably, each of the extensions 36 is a spring metal plate or bar that is pivotally connected to the universal bar as shown in the drawings, and engaging a notch 36^a therein, although any other suitable device may be used for this purpose.

Outside the side arms of the universal bar G and at each side of the machine extend the space levers H, the rear ends of which are pivoted to the comb-bar 3 and the forward ends of which are connected by the space bar H'. The space levers H rest above headed extensions h (see Fig. 6) projecting laterally from the universal bar so that as the space bar is moved downward, a corresponding depression of the universal bar will occur in order to actuate the escapement mechanism of the machine.

In order to allow very accurate adjustment of the key levers with respect to the universal bar so that uniformity of touch will be insured, I prefer to provide each key lever with an adjustable bearing plate b^5 that is pivoted to the side of the key lever as at 37 (see Figs. 12 and 13), the forward end of the bearing plate b^5 being provided with a slot through which passes a headed pin 38 that projects from the side of the key lever. A lug 39 projecting laterally from the key lever has a threaded hole to receive a set-screw 40 that bears upon a laterally projecting lug 41 at the top of the plate b^5 and by adjusting the screw 40, the plate b^5 may be brought to the proper distance from the universal bar to insure uniformity of depression for the various finger-keys.

The details of the carriage-mechanism and of the ribbon mechanism are not herein shown and described, but are set forth in companion applications of even date herewith.

From the foregoing description it will be observed that the upwardly directed supplemental levers C and C' constitute upright and upwardly directed sub-levers that vibrate fore and aft of the machine and are distinguished from bell cranks, or angle levers; that such bends as exist in said sub-levers are lateral or side-wise bends; that the sub-levers at the sides of the system are bent inwardly or diverge from the system of type bars towards the system of independent key levers B, to compensate for the difference in width between the system of type bars and system of key levers; that the fixed fulcrum, load point and power point, (or point c' where power is applied) of each sub-lever C is in the same or substantially the same vertical plane and that such plane extends transversely of the machine; that the power points, load points and fulcrums of all of the sub-levers are in this same plane; that the member b' on each key lever or key actuated lever B constitutes an upwardly extending rigid projec-

tion that makes direct operative connection with its associated sub-lever C at *c'*, and at a portion of the sub-lever that swings fore and aft of the machine in a horizontal or substantially horizontal arc; that the connecting links 9 constitute draw or pull links between the series of sub-levers and the series of segmentally arranged type bars, which are pivoted to swing upwardly and rearwardly, and that the stud pins *c'* on the sub-levers C constitute laterally extending projections that enter slots in the upwardly extending projections *b'* on the key levers B, so that one set of said levers (B and C) have laterally extending projections that enter slots in the other set of said levers.

It is obvious that numerous changes may be made in the details of structure without departure from the essentials of the invention.

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

1. In a typewriting machine, the combination with a series of key-levers and with type-bars operated thereby, of mechanism intermediate the key-levers and type-bars comprising a series of supplemental levers and suitable connections therefor with the key-levers and type-bars, and means common to separate companion parts of said intermediate mechanism to throw the same in unison, whereby the key-levers and type-bars are engaged or disengaged from action.

2. In a typewriting machine, the combination with a series of key-levers and with type-bars operated thereby, of a series of supplemental levers suitably connected with the key-levers and type-bars, and means common to said supplemental levers to throw the same in unison, whereby said key-levers and type-bars are engaged or disengaged from action.

3. In a typewriting machine, the combination with a series of key-levers and with type-bars operated thereby, of mechanism intermediate the type-bars and key-levers comprising a series of supplemental levers and suitable connections therefor with the key-levers and type-bars, and means common to separate companion parts of said intermediate mechanism for throwing the same in unison, said means comprising toggle levers shiftable on either side of a central position, whereby the intermediate mechanism may be disengaged and locked in the disengaged position.

4. In typewriting machine, the combination with a series of key-levers and with type-bars operated thereby, of mechanism intermediate the type-bars and key-levers, and means common to separate companion parts of said intermediate mechanism for throwing the same in unison, said means comprising toggle levers shiftable on either side of a central position, whereby the inter-

mediate mechanism may be disengaged and locked in the disengaged position.

5. In a typewriting machine, the combination with the type-bars and with their corresponding key-levers, of a series of pivoted supplemental levers provided with laterally projecting pins, notched off-sets on said key-levers engaging said pins, a movable support for the fulcrum of said supplemental levers and suitable means for shifting said support for disengaging said pins from said notched off-sets.

6. In typewriting machines, the combination with the type-bars and with their corresponding key-levers, of plural sets of pivoted supplemental levers normally engaged by said key-levers and operatively connected to said type-bars, movably connected supports for the fulcrum of said supplemental levers and suitable means for shifting said supports for disengaging said supplemental levers from said key-levers.

7. In typewriting machines, the combination with the type-bars and with their corresponding key-levers, of a series of supplemental levers normally engaged by said key-levers and operatively connected to said type-bars, a movable support for the fulcrum of said supplemental levers, guides for said support and suitable means for shifting said support comprising toggle levers interposed between said support and a fixed part.

8. In a typewriting machine, the combination with the type-bars and their key-levers, of supplemental levers provided with pins or offsets adapted to engage with the key-levers and means for disengaging said key-levers from said supplemental levers to throw the type-bars out of action.

9. In a typewriting machine, the combination with the type-bars and with their pivoted key-levers, of pivoted supplemental levers in normal engagement with said key-levers and means for shifting said supplemental levers to disengage them from said key-levers.

10. In a typewriting machine, the combination with the type-bars, of pivoted key-levers provided with slots, supplemental levers provided with pins or offsets to engage said slots and means for shifting said supplemental levers to disengage their ends or off-sets from the key levers.

11. In a typewriting machine, the combination with the type-bars and their pivoted key-levers, of supplemental levers in normal connection with said key levers, a movable support for said supplemental levers and means for shifting said support extending outside the main frame and suitably connected to said support.

12. In a typewriting machine, the combination with the type-bars and their pivoted key levers, of supplemental levers in normal connection with said key levers, a movable

support for said supplemental levers and means for shifting said support comprising toggle lever mechanism connected therewith and a rock shaft connected to said toggle mechanism and extending outside the main frame.

13. In a typewriting machine, the combination with the type-bars and with their key levers, of plural sets of supplemental levers normally connected with said key levers, movable supports for said supplemental levers and toggle lever mechanism whereby said supports may be shifted in order to disconnect the supplemental levers from the key levers.

14. In a typewriting machine, the combination with the type-bars and with their corresponding key-levers, of a series of pivoted supplemental levers normally engaged by said key levers, means for shifting the fulcrum of the supplemental levers to disengage said supplemental levers from the key levers, and links connecting said type-bars and said supplemental levers.

15. In a "front strike" typewriter, the combination with a series of horizontal key-levers pivoted near the front of the machine, of a series of horizontal type-bars pivoted in the rear of and above the pivot-points for said key-levers, a series of vertically disposed supplemental levers pivoted adjacent the pivot-points of said key-levers, abutments fixed to said key-levers, pin-and-slot connections between said abutments and said supplemental levers and a series of horizontally disposed links pivotally connected to the upper ends of said supplemental levers and to the rear ends of said type-bars.

16. In a typewriting machine, the combination with the individual finger-keys having a common fulcrum and with the type-bars corresponding thereto, of a series of connections interposed between said keys and bars, the length of which connections are definitely varied by rule to insure a uniform depression and touch for said finger-keys.

17. The combination with the individual finger-key levers and with the type-bars corresponding thereto, of a series of pivoted connections between said key-levers and bars, the lengths of which connections are definitely varied by rule to insure a uniform depression and touch for the finger-keys.

18. The combination with the individual finger-key levers and with the type bars corresponding thereto, of a series of supplemental levers, links connecting said supplemental levers and said bars, a series of connections between said key levers and said supplemental levers, the lengths of which connections are definitely varied by rule to insure a uniform depression of the finger-keys.

19. In a typewriting machine, the combination with the individual finger-key levers

of varying lengths and with the type bars corresponding thereto, of a series of supplemental levers of varying lengths, links connecting said supplemental levers and said bars, of a series of connections between said key-levers and said supplemental levers, the length of each of which connections is definitely varied by rule relatively to the lengths of the corresponding key lever and supplemental lever to insure a uniform depression and touch for the finger-keys.

20. In a "visible" typewriting machine, the combination with the individual finger-key levers of varying lengths and with the type bar corresponding thereto, of a series of pivoted supplemental levers of varying lengths, links connecting said supplemental levers and said bars, of a series of offsets on said key levers, pivotally engaging said supplemental levers, the lengths of which offsets are definitely varied by rule to insure a uniform depression and touch for the finger-keys.

21. In a typewriting machine, the combination with a series of individual finger-keys and with a series of type-bars corresponding thereto, of operating mechanism intermediate said keys and bars, the lengths of the separate companion parts of said intermediate mechanism being definitely varied by rule to insure a uniform depression and touch for said finger-keys.

22. In typewriting machines, the combination with the series of key-levers and with the series of type-bars operated thereby, of intermediate mechanism operatively connecting said levers and type-bars, the lengths of the separate companion parts of said mechanism being definitely varied by rule to insure a uniform depression and touch for the finger-keys.

23. The combination with the series of key-levers and with the series of type-bars operated thereby, of mechanism intermediate said key-levers and type-bars comprising supplemental levers operatively connected to said type-bars and said key-levers, the lengths of the separate companion parts of said intermediate mechanism being definitely varied by rule to insure a uniform depression and touch for the finger-keys.

24. In typewriting machines, the combination with a series of key-levers of varying lengths and with a series of type-bars corresponding thereto, of operating mechanism intermediate said key-levers and bars, the lengths of the separate companion parts of said mechanism being varied relatively to the lengths of the corresponding key-levers to insure a uniform depression and touch for the finger-keys.

25. The combination with a set of type-bars, of a set of operating compound levers therefor, each comprising a pivoted supplemental lever and a pivoted key-lever directly

engaging said supplemental lever, the position of the points of engagement between said key and supplemental levers being definitely varied by rule to insure a uniform depression and touch for the finger-keys.

26. The combination with a set of type-bars, of a set of operating compound levers therefor, each comprising a pivoted supplemental lever and a pivoted key-lever having a direct pin-and-slot connection with said supplemental lever, the position of said connecting pins being definitely varied by rule to insure a uniform depression and touch for the finger-keys.

27. In a typewriting machine, the combination with the series of key-levers and with the series of type-bars operated therefrom, of the series of supplemental levers operatively connected to said key-levers and type-bars, a universal space-bar in operative relation to said key-levers, and suitable means common to said supplemental levers and said space-bar for shifting the same in unison.

28. In a typewriting machine, the combination with the type-bars, the key levers and the universal bar, of supplemental levers intermediate the type-bars and key-levers, a movable support for shifting said supplemental levers in order to effect the disengagement of the key-levers and the type-bars and an arm or part extending from said universal bar into position to be engaged by said movable support in order to throw the universal bar out of operative position.

29. In a typewriting machine, a rest for the free end of a type-bar comprising a spring-supported cushion.

30. In a typewriting machine, the combination with a series of type-bars, of a series of vibratory devices against which the type-bars strike upon returning to normal position, and which are set in vibration by the type-bars and absorb energy therefrom.

31. In a typewriting machine, a rest for the free ends of the type-bars comprising a cushion or support and a plurality of springs arranged at different points back of said cushion or support.

32. In a typewriting machine, a rest for the free ends of the type-bars comprising a cushion or support, a plurality of springs arranged back of said cushion or support and individual plates intermediate said springs and said cushion or support.

33. In a typewriting machine, a rest for the free ends of the type-bars comprising a cushion or support, and a plurality of spring-actuated rods or plungers provided with individual plates bearing against said cushion or support.

34. The combination of a type-bar provided with an annular ball-race, anti-friction balls, an adjustable plate for retaining said balls within said race, means independent of the bearing-balls for holding said plate in ad-

justed position, a hanger and a pin passing freely through said adjustable plate for supporting said type-bar upon said hanger.

35. The combination of a type-bar provided with an annular ball-race, anti-friction balls, a plate adjustably held in position for retaining said balls within said race, means independent of the balls for holding said plate in adjusted position, a hanger and means independent of said plate and of its adjustment for supporting said type-bar upon said hanger.

36. The combination of a type-bar provided with an annular ball-race, anti-friction balls, an adjustable plate for retaining said balls within said race, means independent of the balls for holding said plate in adjusted position, a hanger provided with arms separate from said plate and means independent of said adjustable plate for supporting said type-bar between said arms.

37. The combination of a type-bar provided with an annular ball-race, anti-friction balls, an adjustable plate for retaining said balls within said race, a hanger provided with arms separate from said plate and a pin passing freely through said adjustable plate for supporting said type-bar between said arms.

38. The combination with a hanger or support provided with arms, of a type-bar having at its pivotal end a ball-race, anti-friction balls, an adjustable plate separate from said hanger arms for retaining said balls within said race means independent of said balls for holding said plate in adjusted position and means for supporting said plate and said type-bar between said arms.

39. The combination with a hanger or support provided with arms, of a type-bar having at its pivotal end an interior ball-race, anti-friction balls, relatively adjustable plates separate from said hanger arms for retaining said balls in position means independent of said balls for holding said adjustable plates apart and means for supporting said plates and type-bar between said arms.

40. The combination with a hanger or support provided with arms, of a type-bar having at its pivotal end a ball-race, anti-friction balls, a plate for holding said balls in position within said race, a stud whereon said plate is adjustably threaded and a pin passing freely through said stud for supporting the type-bar in position between said arms.

41. The combination with a hanger or support provided with arms, of a type-bar having at its pivotal end an interior ball-race, anti-friction balls, relatively adjustable plates whereon said plates are threaded and a pin passing freely through said stud to support the type-bar in position between said arms.

42. The combination of a type-bar provided with a ball chamber at its inner end having a groove or channel to receive anti-

friction balls, a plurality of balls within said chamber, screw-threaded bearing plates having peripheral bearing surfaces to engage said balls, a pin passing through said bearing plates, a hanger for supporting said pin, and a stud on said pin upon which said bearing plates are threaded.

43. The combination with a suitable hanger or support, of a type-bar provided at its inner end with a ball chamber, anti-friction balls within said chamber, adjustable bearing plates having peripheral surfaces to engage said balls, a stud whereon said bearing plates are adjustably mounted and a space plate arranged between said bearing plates and engaging said balls to retain them at distances apart.

44. The combination of a type-bar provided at its inner end with a ball chamber, balls within said chamber, a space plate engaging said balls to hold them at distances apart, bearing plates arranged at opposite sides of said space-plate, and having peripheral bearing surfaces for said balls; a type-bar hanger provided with arms between which said bearing plates and said space plate are held, means independent of said balls for holding said bearing plates apart and a pin passing through said hanger arms and through said bearing plates and space plate.

45. The combination of a type bar provided at its inner end with a ball chamber, balls within said chamber, bearing plates having peripheral surfaces to engage said balls, a type-bar hanger having arms between which said bearing plates and said type bar are mounted means independent of said balls for holding said bearing plates apart and a pin extending through the arms of said hanger and through said bearing plates.

46. The combination with a hanger frame, of a type-bar hanger having a slotted end, an adjusting screw passing through the slotted end of the type-bar hanger and into the hanger frame, the opposite end of said type-bar hanger being provided with arms, a type-bar journaled between the arms of the hanger and having a ball-bearing surface, bearing plates interposed between said hanger arms and balls between said bearing plates and the type-bar.

47. The combination with a one-piece type-bar hanger having a pair of integral arms, of a type-bar journaled between said arms and having a ball-bearing chamber, bearing plates separable from but interposed between said hanger arms means independent of said balls for holding said bearing plates apart and anti-friction balls located in said ball chamber between said bearing plates.

48. An anti-friction bearing for type bars comprising a hanger provided with an annu-

lar ball-race, and a type bar pivoted to swing in the median plane of said ball-race and provided with an annular ball-race arranged opposite the ball-race of the hanger, the side wall of one of said ball races being formed of a plate separate from the body of said hanger or of said type-bar and adjustable to different planes parallel to the plane of the ball-race and means independent of the balls for holding said plate in adjusted position.

49. The combination of a type-bar hanger, a type-bar, one of said members having an interiorly grooved eye and the other of said members being cleft or bifurcated and embracing said eye, an exteriorly grooved hub within said eye, a series of bearing balls in the race formed by said grooves, one of said hub-and-eye elements having an adjustable section formed separate from the body of either of said members and constituting one of the side walls of the ball-race, means independent of said balls for holding said section in adjusted position and a pin supporting said hub between the arms of said bifurcated member.

50. The combination of a type-bar hanger, a type bar, one of said members having an eye, a hub within said eye, a support for securing said hub upon the other of said members, a ball-race intermediate said eye and hub, anti-friction balls in said race, one of said hub and eye elements having a separable plate section adjustably mounted for holding said balls within said race, the adjustment of said plate section being independent of said support and means independent of said bearing balls for holding said plate section in adjusted position.

51. The combination of a type-bar hanger, a type bar, one of said members having an eye and the other of said members being cleft or bifurcated to embrace said eye, a hub arranged within said eye, a ball-race and balls intermediate said eye and hub, a pin or support extending between the arms of said cleft or bifurcated member and uniting said arms to said hub, an adjustable plate forming a part of one of said hub-and-eye elements and constituting a wall of said ball-race, said plate being arranged between the arms of the bifurcated member and being adjustable independently thereof and means independent of said balls for holding said plate in adjusted position.

52. The combination with a type-bar hanger, a type bar, one of said members having an interiorly grooved eye and the other of said members being cleft or bifurcated and embracing said eye, an exteriorly grooved hub within said eye, a series of bearing-balls in the race formed by said grooves, one of said hub-and-eye elements having an adjustable section formed separate from the body of either of said members and constituting

one of the side walls of the ball-race and a mount whereon said section is adjustably threaded.

53. An anti-friction bearing for type-bars comprising a hanger provided with an annular ball-race, a type-bar pivoted to swing in the median plane of said ball-race and provided with an annular ball-race arranged opposite the ball-race of the hanger, the side wall of one of said ball-races being formed of an adjustable plate and a mount whereon said plate is adjustably threaded.

54. The combination with a type-bar hanger having a pair of arms, of a type-bar having at its pivotal end a ball-race, anti-friction balls, a plate for holding said balls in position within said race, a mount whereon said plate is adjustably threaded and means for supporting said type-bar and said plate between the arms of said hanger.

55. The combination with a hanger or support provided with a pair of arms, of a type-bar having at its pivotal end a ball-race, anti-friction balls, a pair of oppositely disposed plates for holding said balls in position within said race, a stud whereon said plates are adjustably threaded and means for supporting said plates between said hanger-arms and for holding said arms into frictional engagement with the outer arms of said plates to lock the latter into adjusted position.

56. The combination of a type-bar hanger, a type bar, one of said members having an interiorly grooved eye forming a ball-race and the other of said members being cleft or bifurcated to embrace said eye, a support extending between and through the arms of said cleft or bifurcated member, bearing balls within said race and a pair of oppositely disposed plates arranged within said eye and upon said support to hold said balls in place, one of said plates being adjustably threaded upon said support and said support being headed over against the outer face of one of said arms to hold the same in frictional engagement with said adjustable plate, whereby the latter is locked in adjusted position.

57. The combination of a type-bar hanger, a type-bar, one of said members having an interiorly grooved eye forming a ball-race and the other of said members being cleft or bifurcated to embrace said eye, a support extending between and through the arms of said cleft or bifurcated member, bearing balls within said race and a pair of oppositely disposed plates arranged within said eye and adjustably threaded on said support, the ends of said support being headed over on the outer faces of said arms to hold the latter in frictional engagement with said adjustable plates, whereby said plates are locked in adjusted position.

58. The combination of a type-bar hanger, a type-bar, one of said members having an eye and the other of said members being

cleft or bifurcated to embrace said eye, a hub arranged within said eye, a ball-race and bearing balls intermediate said eye and hub, a support extending between the arms of said cleft or bifurcated member and uniting said arms to said hub, a plate forming a part of one of said hub and eye elements and adjustably threaded in position and means for locking said plate in adjusted position.

59. In a front strike writing machine, the combination with a platen, of a series of rearwardly striking type bars, a series of key bearing levers having upwardly directed arms, a series of sub-levers with which said arms engage, and a series of links or connecting rods between the type bars and the upper ends of said sub-levers.

60. In a front strike writing machine, the combination with a platen, of a series of rearwardly striking type bars, a series of upright sub-levers, draw-links connecting said sub-lever and type bars, and a series of key levers provided with upwardly directed members which engage and actuate said sub-levers.

61. In a front strike writing machine, the combination with a platen, of a series of rearwardly striking type bars, a series of upwardly directed sub-levers having an arc-shaped arrangement at their upper ends and connected by links to the type bars, and a series of key levers provided with upright members arranged to engage and directly actuate said sub-levers.

62. In a front strike writing machine, the combination with a platen, of a series of rearwardly striking type bars, a series of upright sub-levers of graduated lengths, a series of draw links connecting said sub-levers and said type bars, and a series of key levers having upright portions to connect with said sub-levers.

63. In a front strike writing machine, the combination of a type bar, an upright sub-lever, a link connecting said sub-lever to the type bar, and a key lever having an upright projection to engage said upright sub-lever.

64. In a typewriting machine, the combination with a type bar arranged to swing upwardly and rearwardly, of a substantially straight upright sub-lever, a link connecting the upper end of the sub-lever with the type bar, and a key lever having a projection engaging the said sub-lever.

65. In a typewriting machine, the combination with a type bar arranged to swing upwardly and rearwardly, an upright sub-lever, a link connecting the upper end of the sub-lever with the type bar, and a key lever having a pin-and-slot connection with the said sub-lever.

66. In a typewriting machine, the combination of a platen, a segment below the platen, a series of front strike type bars pivoted on said segment, a series of upright sub-levers extending from their respective type

bars to their respective key levers, and a series of key levers having pin-and-slot connections with said sub-levers.

67. In a typewriting machine, the combination of a series of type bars, a series of upright pivoted sub-levers, the series being shortest in the middle and gradually increasing in length towards the sides of the series, a series of links between the type bars and the sub-levers, and a series of key levers directly engaged with said series of sub-levers.

68. In a typewriting machine, the combination of a series of upwardly and rearwardly striking type bars, a series of operating links connected thereto, and a series of substantially upright sub-levers also connected to said links at their upper ends, and a series of key levers directly engaging said series of sub-levers, the said series of sub-levers at their lower ends being substantially co-extensive in width with the series of key levers and at their upper ends substantially co-extensive in width with the pivotal ends of the system of type bars.

69. In a typewriting machine, the combination of a segment, a series of type bars pivotally mounted in an arc shaped arrangement about said segment, a series of upright pivoted sub-levers, the upper ends of which are arranged in an arc and in substantial alignment fore and aft of the machine with the series of type bars, connecting links between the upper ends of the sub-levers and the type bars, a series of key levers having projections to engage the said series of sub-levers, the series of sub-levers at their lower ends being substantially co-extensive in width with the series of key levers.

70. In a typewriting machine, the combination with a platen, of a type bar arranged to swing upwardly and rearwardly, a connecting rod, an upright sub-lever, a lateral pin or projection thereon, and a key lever provided with an upwardly directed device which engages said pin or projection.

71. In a front strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking pivoted type bars, a series of upright sub-levers that swing fore and aft of the machine, and a series of independent key levers that have upwardly extending projections which cooperate directly with the sub-levers and make operative connection therewith at points on the sub-levers that swing fore and aft of the machine in substantially horizontal arcs.

72. In a front-strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking pivoted type bars, a series of upright sub-levers that swing fore and aft of the machine, link connections from said type bars to said sub-levers, and a series of independent key

levers that have upwardly extending rigid projections which cooperate directly with the sub-levers and make operative connections therewith at points in the sub-levers that swing fore and aft of the machine in arcs whose chords are substantially horizontal.

73. In a front strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of sub-levers pivoted on fixed centers, and a series of independent key-actuated levers operatively connected to said sub-levers, the load points, fulcrums and power points of said sub-levers being substantially in a single plane and in a substantially vertical plane extending transversely of the machine.

74. In a front-strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of sub-levers pivoted on fixed centers, a series of links between said type bars and sub-levers, and a series of independent key-actuated levers operatively connected to said sub-levers, the load points, fulcrums and power points of said sub-levers being substantially in a single plane and in a substantially vertical plane extending transversely of the machine.

75. In a front strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of sub-levers pivoted on fixed centers, and a series of independent key levers which have upwardly extending projections that make operative connection with said sub-levers, the load points, fulcrums and power points of said sub-levers being substantially in a single plane and in a substantially vertical plane extending transversely of the machine.

76. In a front strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of sub-levers pivoted on fixed centers, a series of draw links between said type bars and sub-levers, and a series of independent key levers which have upwardly extending projections that make operative connection with said sub-levers, the load points, fulcrum and power points of said sub-levers being substantially in a single plane and in a substantially vertical plane extending transversely of the machine.

77. In a front strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of sub-levers pivoted on fixed centers, and a series of independent key-actuated levers operatively connected to said sub-levers, the load points, fulcrums and power points of said sub-levers being substantially in a single plane and in a substantially vertical plane extending transversely

of the machine, the load points and power points of the sub-levers vibrating in arcs whose chords are substantially horizontal.

78. In a front strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of sub-levers pivoted on fixed centers, a series of draw links between said type bars and sub-levers, and a series of independent key levers which have upwardly extending rigid projections that make operative connection with said sub-levers, the load points, fulcrums and power points of said sub-levers being substantially in a single plane and in a substantially vertical plane transversely of the machine, the load points and power points of the sub-levers vibrating in arcs whose chords are substantially horizontal.

79. In a front strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of key levers, a series of independent upwardly directed sub-levers that converge at the sides of the system from the system of key levers to the width of the type bar system, and which are operatively connected to the type bars and key levers, the load points, fulcrums and power points of the sub-levers being substantially in a single plane and in a substantially vertical plane that extends transversely of the machine.

80. In a front strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of sub-levers that vibrate fore and aft of the machine and which are operatively connected to said type bars, a series of independent key-actuated levers operatively connected to the sub-levers, the connections between the key-actuated levers and sub-levers being effected by projections on one set of said levers entering slots in the other set of said levers, and the load points, fulcrums and power points of the sub-levers being substantially in a single transverse substantially vertical plane.

81. In a front strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of sub-levers that vibrate fore and aft of the machine and which are operatively connected to said type bars and have laterally extending projections, a series of independent key levers that are slotted to receive the laterally extending projections on the sub-levers, the load points, fulcrums and power points of the sub-levers being substantially in a single transverse substantially vertical plane.

82. In a front strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of sub-levers that vibrate fore and aft of the machine and which are operatively connected to said type bars and have laterally extending projections, a series of independent key-actuated levers having upwardly extending slotted projections, the said laterally extending projections on the sub-levers being seated in the slots of the upwardly extending projections on the key levers, and the load points, fulcrums and power points of the sub-levers being substantially in a single substantially vertical plane extending transversely of the machine.

83. In a front strike typewriting machine, the combination of a series of segmentally arranged upwardly and rearwardly striking type bars, a series of substantially straight sub-levers pivoted to vibrate on fixed centers and having their load points, fulcrums and power points substantially in a single transverse substantially vertical plane, link connections from said sub-levers to said type bars, and a series of key levers with upwardly extending projections operatively connected to said sub-levers, one set of said levers having lateral projections and the other set being slotted to receive said projections.

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Witnesses:

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