O. C. KAVLE.

CARRIAGE FOR TYPE WRITING MACHINES.

APPLICATION FILED APR. 14, 1906.

976,466.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

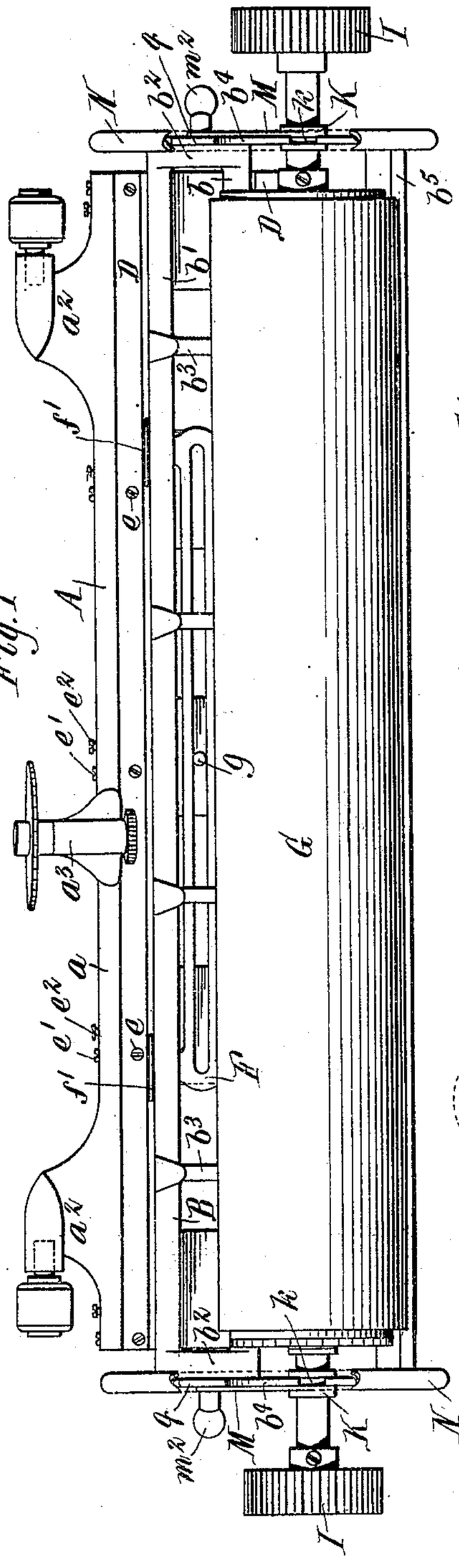


Fig. 3.

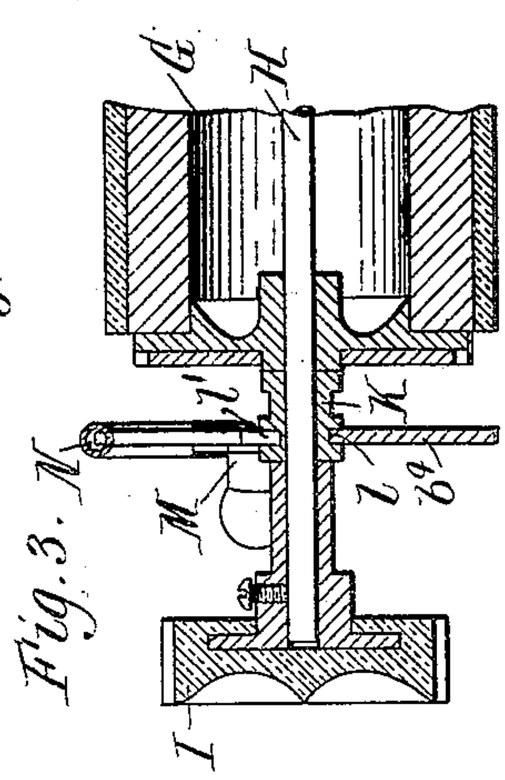


Fig. 4.

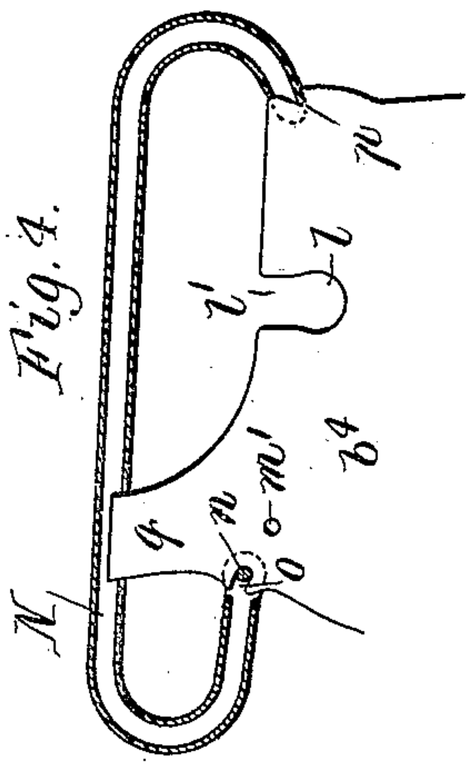


Fig. 3a

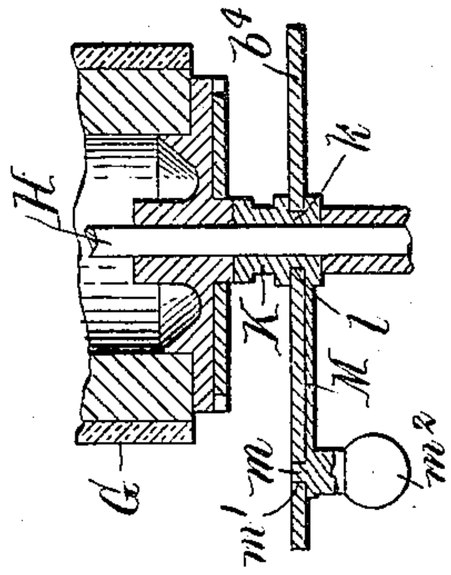
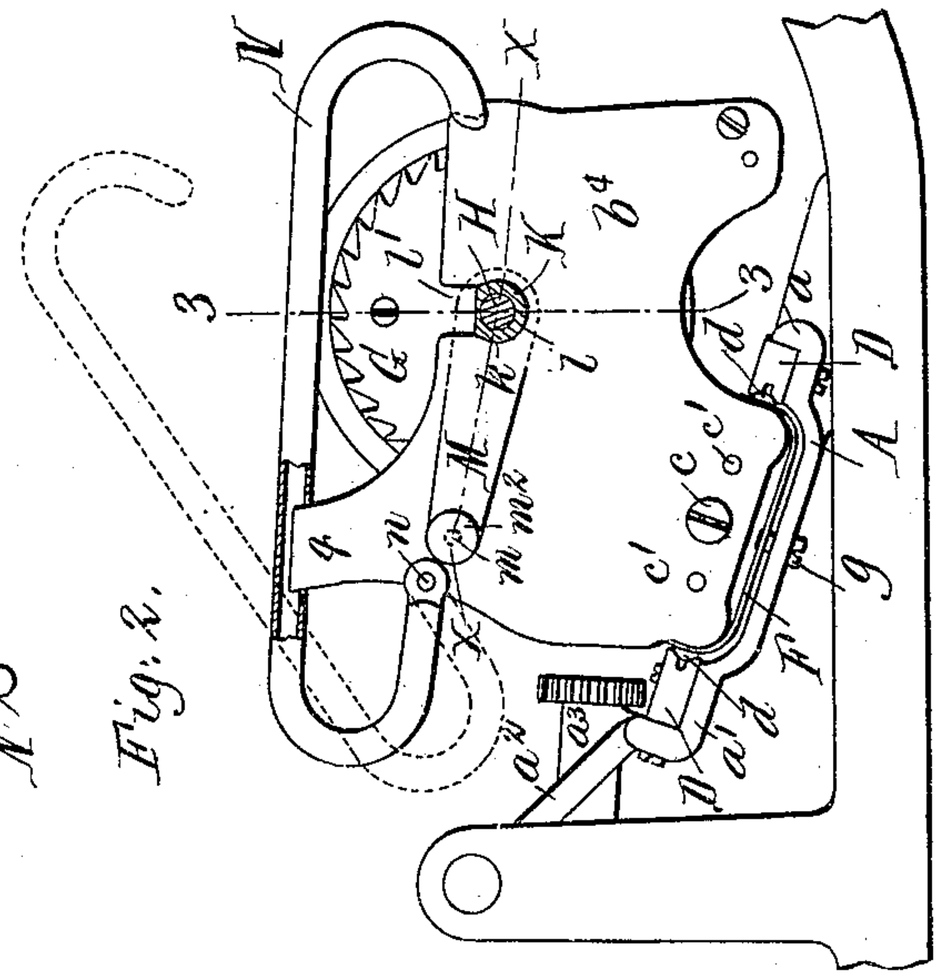


Fig. 2.



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2 SHEETS—SHEET 2.

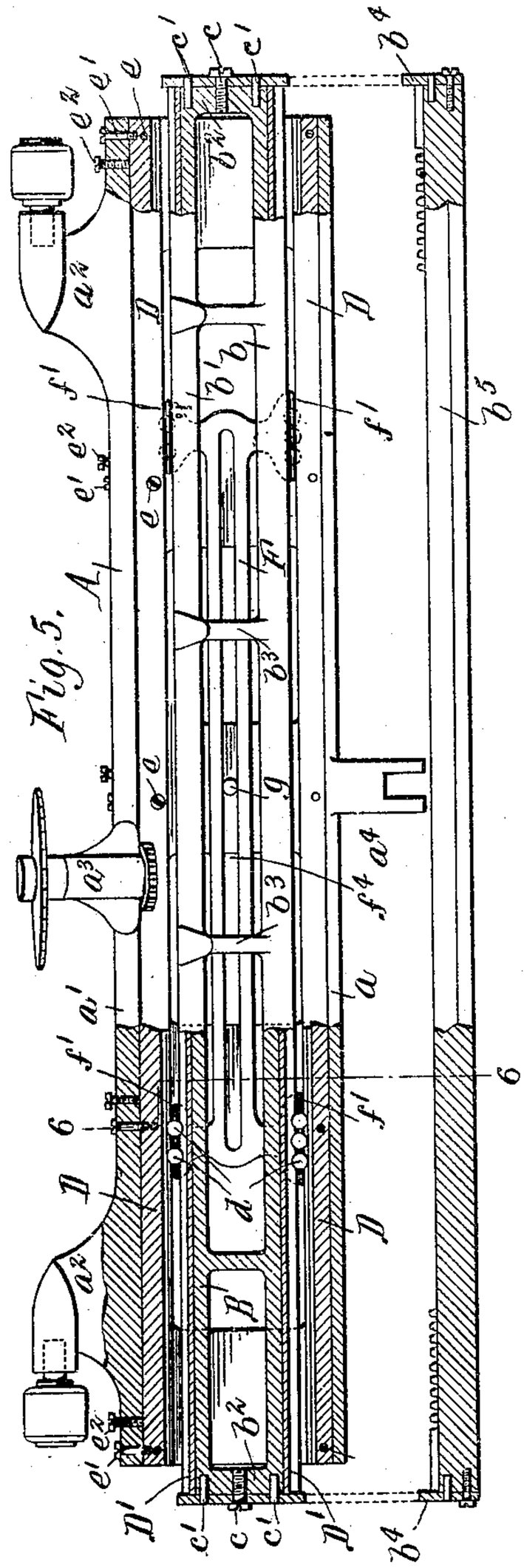

Fig. 5.

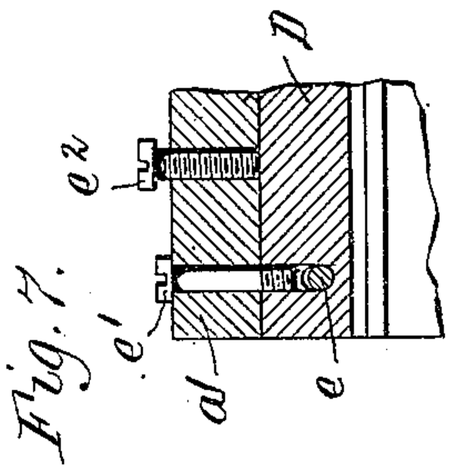

Fig. 7.

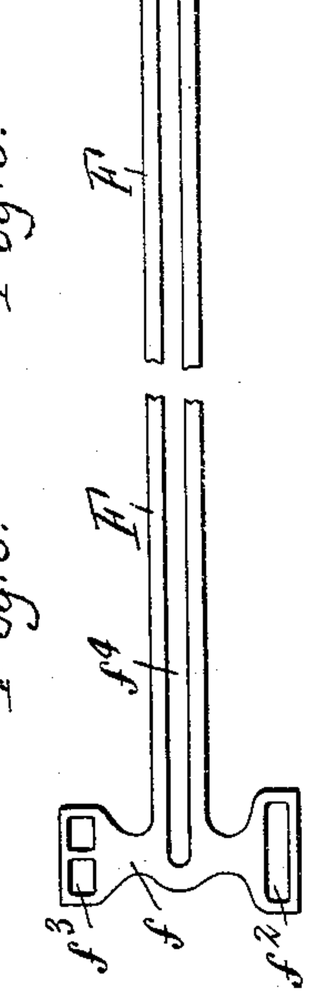

Fig. 9.

Fig. 8.

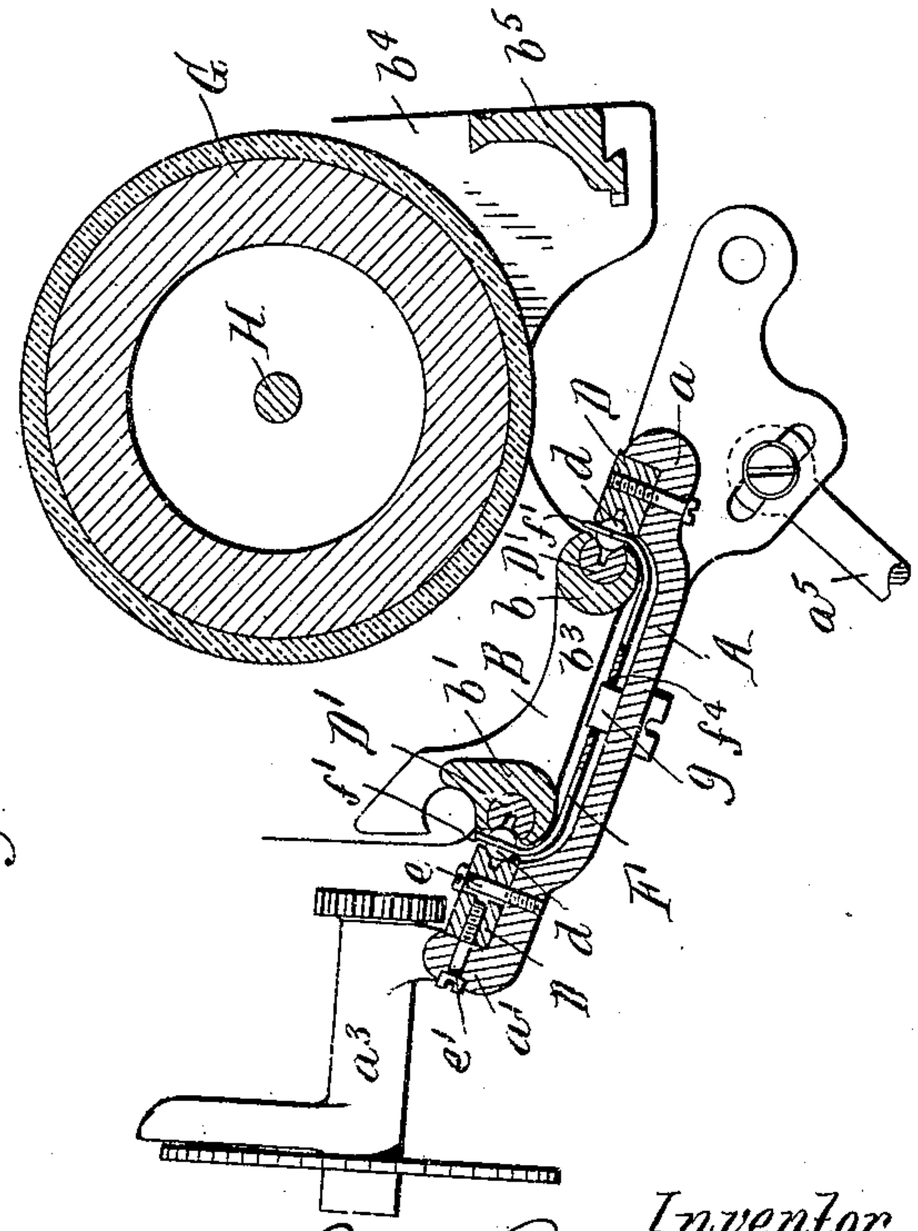

Fig. 6.

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UNITED STATES PATENT OFFICE.

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CARRIAGE FOR TYPE-WRITING MACHINES.

976,466. Specification of Letters Patent. Patented Nov. 22, 1910.

Application filed April 14, 1906. Serial No. 311,758.

To all whom it may concern:

Be it known that I, OSCAR C. KAVLE, a citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented a new and useful Improvement in Carriages for Type-Writing Machines, of which the following is a specification.

This invention relates to platen carriages for typewriting machines, and has for its primary object to produce a desirable, rigid, strong and durable carriage of the minimum weight which is very light running and adapted to produce accurate work.

More specific objects of the invention are to provide supporting and guiding ball bearings for the carriage of simple and inexpensive but durable construction, capable of ready adjustment to insure the perfect alinement of the writing and to compensate for wear; to provide detachable journal bearings of inexpensive construction for the platen which afford a steady journal support for the platen and allow the quick and easy removal and replacing of the platen; and to provide the carriage with guard rails so located over the parts of the carriage mechanism at the ends of the carriage, as to prevent the operator's hands from striking such parts of the mechanism.

Other objects are to improve the construction of the carriage in the respects hereinafter particularly pointed out and set forth in the claims.

In the accompanying drawings, consisting of two sheets: Figure 1 is a plan view, partly broken away, of a typewriting machine carriage embodying the invention, and the supporting shift frame therefor. Fig. 2 is an end elevation thereof, partly in section, on an enlarged scale. Fig. 3 is a sectional elevation, on an enlarged scale, of one end of the carriage in line 3—3, Fig. 2. Fig. 3^a is a detail section of one of the bearing sleeves for the platen shaft and its holding arm in line x—x, Fig. 2. Fig. 4 is a fragmentary sectional elevation, on an enlarged scale, of one of the carriage end frames and the guard rail. Fig. 5 is a plan view, partly in horizontal section, of the carriage and shift frame, the platen being omitted. Fig. 6 is a transverse sectional elevation of the carriage and shift frame, on an enlarged scale, in line 6—6, Fig. 5. Fig. 7 is a detail section showing one pair of the adjusting screws for the ball race bars. Figs. 8 and 9 are plan views of the opposite ends of the blank for the ball retainer, and the completed retainer, respectively.

Like letters of reference refer to like parts in the several figures.

The carriage, as usual, travels crosswise of the machine on a supporting and guiding frame or part and carries the rotary platen. This supporting frame A, in the construction illustrated, is movable vertically to shift the platen for printing upper and lower case characters and consists of a skeleton rectangular casting having parallel front and rear bars a a' connected by end and intermediate cross bars or plates. The shift frame is provided with rearwardly extending end lugs or projections a^2 pivoted in any suitable manner to the main frame of the machine to allow the vertical pivotal movements of the shift frame. The shift frame also has a central rearwardly extending bearing a^3 for the carriage escapement wheel, and a central front projection a^4 to which a rod or device a^5 is connected. This rod, or device, is a part of the supporting and operating means for the shift frame.

The carriage B preferably consists of a main body casting of rectangular skeleton form having parallel front and rear bars b b' connected by end cross bars b^2 and intermediate struts b^3, and two end plates b^4 secure the ends of the casting. The end plates extend forwardly from the casting and their front ends are rigidly connected by a front or scale bar b^5. Each end plate is conveniently secured to the casting by a screw c and two dowels c' and is similarly secured to the scale bar by a screw and dowel. The end plates are similar except that the holes formed in the plates for supporting the carriage mechanism are arranged in each plate as required for the parts supported by that plate.

The body casting of the carriage is narrower than the shift frame and is located between the front and rear bars of the shift frame, and ball bearing guides for the carriage are arranged between the front and rear bars of said body casting and the front and rear bars of the shift frame. These bearings are preferably constructed as follows: Parallel seats are planed in the front

and rear bars of the shift frame, and narrow steel race bars D are secured in these seats, and opposable steel race bars D′ are secured in grooves planed in the front and rear bars of the carriage casting. These race bars are grooved to form races for bearing balls *d*, or other rolling bearings. The race bars D on the shift frame are first machined to approximate form, then tempered, and finally ground true before being secured in the shift frame. The other race bars D′ are likewise machined to form and tempered but are then driven tightly into their seats in the carriage and are ground after seating, thus insuring the two races of the carriage being perfectly true and parallel. The grooves in the carriage for the race bars D′ have open sides narrower than the race bars and the bars are driven endwise into the grooves, the grooves being of such size as to very firmly embrace the bars and permanently secure them in the grooves. The grooves of the bars D′ are made deeper than is required to receive the balls, and permit the bars to contract slightly when being driven into their seats. The casting is so light that the walls of the seats for the bars D′ also yield or spring when the bars are driven in and the elasticity or tendency of the parts to resume their natural condition effectually binds them together. Preferably the front race bar D of the shift frame is braced by the straight bottom and upright face of its seat and is rigidly secured in place by screws or other means, while the rear race bar D is secured in its seat in the shift frame so as to be adjustable laterally on the flat bottom of the seat by screws *e* passing through slots in the race bar. This race bar is adjusted by screws e' and e^2 passing through holes in the upright flange of the rear bar of the shift frame. There are several pairs of these screws, one screw e' of each pair passing through a smooth hole in the shift frame flange and screwing into a threaded hole in the race bar, while the other screw of each pair works in a threaded hole in the shift-frame flange and bears at its end against the race bar. By the adjusting screws e' e^2 the race bar can be moved in its seat toward or from the opposing race bar on the carriage to secure an exact adjustment of the bearings. The securing screws *e* are, of course, loosened before adjusting the race bar and are thereafter again tightened up to firmly hold the race bar in place after adjustment. The race bar being narrow is more or less flexible and the portion thereof adjacent to either pair of adjusting screws can be sprung in or out with respect to other portions of the bar to secure a perfectly true race when assembling the parts and to take up wear. The race bar could be adjusted by a pair of screws e' e^2 at each end only, but such arrangement would require a heavier race bar to resist the strain it is subjected to in use, and would not enable the adjustment of different portions of the race to compensate for unequal wear. Another advantage of the described arrangement is that when the race bar is warped so in hardening that it cannot be ground true, it can be sprung perfectly straight by the adjusting screws.

Heretofore it has been customary to machine the races for ball bearing carriages in the castings because this is cheaper and because steel warps in hardening, unless unduly heavy. It has been proposed to make the races of sheet steel but these were not satisfactory as it was found difficult to harden them without distortion. The cast races are short-lived and therefore undesirable. By the construction described employing the light hardened steel race bars braced and stiffened by the light castings, a bearing of great durability and rigidity is secured, and one that, on account of the hardened steel races, can be made for smaller balls, so that the structure, as a whole, is more compact and lighter. Another important advantage of this construction is that by reason of the hardened surfaces and perfect adjustment permitted, the carriage will move with greater freedom and a lighter driving spring can be used with consequently greater ease of operation and less wear and noise in the escapement.

The front race bar D is rigidly secured and the rear one made adjustable because the front bearings sustain the greater part of the weight of the carriage, but manifestly the front race bar instead of the rear one could be made adjustable. The construction of the carriage and bearing races, as described, is not limited to use with a pivoted or movable shift frame, and manifestly tempered race bars could be secured in the manner described in carriage and supporting frame castings of different form from those described.

It has been found that the ball races of typewriter carriages wear unevenly, or that the balls tend to cut or indent the races at intervals corresponding with the letter space movements of the carriage. Presumably this is due to the bearing being subjected to greater strains at the instant the carriage stops after each letter space movement. To overcome this the balls *d* are arranged in groups, instead of singly, and so that their centers are spaced a different distance from the distance traveled by the carriage for each letter space. For instance, the carriage moves one-tenth of an inch for each letter, and the balls are made one-eighth of an inch in diameter and arranged with their centers one-eighth of an inch apart, as shown, in the front race, or three-sixteenths of an inch apart, as shown in the rear race.

The balls move laterally in the races one-half the distance the carriage moves, or one-twentieth of an inch for each letter space movement of the carriage, and as the distance between the centers of the balls is greater than the length of a letter space movement of the carriage, no two balls in a group will stop at the same points along the race and the wear is distributed over as many points along the race for each letter space movement as there are balls in each group. The essential point is to use more than one ball in each group, and to arrange them so that the distance between their centers relative to the letter spaces shall not be the one a multiple of the other. Another advantage of the arrangement of the balls in groups is that in case of a flaw, or soft part in one of the races, one or more balls bearing on a perfect portion or portions of the race will support the carriage in passing such part of the race and the imperfection will not be noticed, whereas a single ball would not properly support the carriage. As the greatest weight is carried by the front bearing, as above stated, the balls are preferably arranged in groups of three in the front race, and in groups of two in the rear race.

The balls are held in the desired relation by a suitable cage or retainer F. The retainer preferably employed is shown in Figs. 5, 6, 8 and 9 and consists of a sheet metal strip having cross arms f at opposite ends with upturned extremities f' provided with retaining holes for the balls. Fig. 8 shows one end of the blank from which the retainer is made before the ends of its arms are bent up. The balls of a group can be located in a single hole f^2, as shown in Fig. 8, for the front group, or in separate holes f^3, as shown in said figure, for the rear group. The body of the retainer has a longitudinal slot f^4 into which projects the point of a screw or stud g, Figs. 5 and 6, secured to the shift frame to prevent the lateral displacement of the retainer.

The platen G, Figs. 1 and 3, which may be of any usual construction, is fixed to a shaft H provided at its ends with the usual finger wheels I. The platen shaft is journaled in bearing sleeves or bushings K, Figs. 1, 2 and 3, which have grooved or reduced segmental circular portions k seated in correspondingly shaped holes l in the carriage end plates. The bushings are placed in and removed from their retaining holes l through open-ended slots l' leading to the holes from the upper edges of the end plates, but the slots are narrower than the diameters of the seats and the bearing sleeves can only be passed through the slots when turned with the flat faces of their reduced parts parallel to the sides of the slots. When the sleeve has been inserted into the seat it is turned with its flat face crosswise of the slot l', as shown in Fig. 2, and is thus held in the seat. To hold the sleeve in this position, it is preferably provided at its outer end with a spring arm M, Figs. 1–3^a, provided at its free end with an inwardly projecting pin m adapted to enter a hole m' in the end plate of the carriage, and with an outwardly projecting operating knob or handle m^2. To remove the platen from the carriage, the arms M of the bearing sleeves are sprung outwardly to disengage their pins from the holes in the carriage end plates and are turned to place the flat faces of the sleeves parallel with the sides of the slots l', when the platen with the bearing sleeves can be lifted out of the carriage. The bearing sleeves extend from the ends of the platen to the hubs of the finger wheels I and, being held from longitudinal movement in their seats in the carriage, act to hold the platen from endwise movement in the carriage.

Portions of the platen and carriage operating mechanism not shown, are, as usual, located at the ends of the carriage, and to shield such parts and prevent the hands of the operator from striking the same, a guard rail N, Figs. 1, 2 and 4, is employed at each end of the carriage. Each guard rail preferably consists of a tube having a substantially horizontal main portion located at about, or slightly above, the height of the top of the platen, and curved ends which are attached to the front and rear edges of the end plate of the carriage. It will be understood that the operative parts of the carriage will be below this guard rail. The guard rail is preferably detachably secured to the carriage as follows:—Its ends are slit vertically to straddle the front and rear edges of the end plate, and a pin n connecting the sides of the split rear end of the rail rests in an open-ended slot o, Fig. 4, in the rear edge of the end plate, while the front end of the rail between the sides of the split extremity engages in a notch p in the front edge of the end plate. An upwardly extending part q of the end plate enters a slot in the underside of the guard rail and holds the same rigid. The pin at the rear end of the rail is engaged in its notch o while the rail is inclined, as shown by dotted lines in Fig. 2, and the front of the rear rail is then turned down and snapped into its notch p. The rail can be detached by a reversal of these movements when it is desired to remove the platen, or when the guard rail is not required on the carriage. These guard rails being located as stated, at about the height of the top of the platen, also afford a desirable support for a ruler or flat strip for erasing when producing manifold work. By laying the ruler on the horizontal tops of the guard rails and successively turning the written sheets back over the same with the carbon sheets below the

ruler, the erasures can be made in the sheets without disturbing the alinement or smearing the backs of the sheets by contact with the carbon sheets.

I claim as my invention:

1. In a typewriting machine, the combination of a platen carriage, and a support therefor, each comprising in its construction a rigid metal frame and a race bar of harder metal which is itself capable of flexure but is rigidly connected at various points along its length to said frame, said frame having a part constituting a rigid backing for said race bar on the side thereof opposite to its bearing face so as to positively hold the race bar from deflection, said race bars forming between them a race, and rolling bearings in said race, substantially as set forth.

2. In a typewriting machine, the combination of a platen carriage frame, and a supporting frame therefor, interposed rolling bearings, and races for said rolling bearings each formed by a pair of opposite narrow bars of hardened steel one rigidly secured at the ends and intermediate portions thereof to each of said frames, said frames having portions constituting rigid backings for said race bars on the sides thereof opposite to their bearing faces so as to positively hold the bars from deflection, substantially as set forth.

3. In a typewriting machine, the combination of a platen carriage frame, and a supporting frame therefor, interposed rolling bearings, and races for said rolling bearings each formed by narrow bars of hardened steel one rigidly secured in a seat formed in each of said frames, said race bars being backed and reinforced at the end and intermediate portions thereof at the sides thereof opposite to their bearing faces by the walls of said seats so as to be held rigid thereby, substantially as set forth.

4. In a typewriting machine, the combination of a platen carriage, and a support therefor, each comprising a rigid metal frame, interposed rolling bearings, a hardened steel race bar for said rolling bearings on one of said frames, said race bar being flexible, and means connecting said race bar at different points along its length to its frame for springing one or another portion of said race bar toward or from the opposite frame, substantially as set forth.

5. In a typewriting machine, the combination of a platen carriage, and a support therefor, each comprising a rigid metal frame, interposed rolling bearings, a hardened steel race bar for said rolling bearings secured to one of said frames, said race bar being flexible, and a series of pairs of oppositely acting screws for forcing different portions of said flexible race bar toward or from the opposing frame, substantially as set forth.

6. In a typewriting machine, the combination of a platen carriage, and a support therefor, each comprising a single metal casting and separate hardened race bars, one of said castings having spaced parallel bars between which the other casting is located, the race bars of said first mentioned casting being secured in seats at the inner sides of said spaced bars, and the race bars of said other casting being secured in seats at the outer edges of said casting and located between the race bars on the first mentioned casting, and rolling bearings between the adjacent race bars of the two castings, substantially as set forth.

7. In a typewriting machine, the combination of a platen carriage, and a support therefor, each comprising a single metal casting and separate hardened race bars, one of said castings having spaced parallel bars between which the other casting is located, the race bars for said first mentioned casting being secured in seats at the inner sides of said spaced bars, and the race bars for said other casting being secured in seats at the outer edges of said casting and located between the race bars on the first mentioned casting, rolling bearings between the adjacent race bars of the two castings, and means for laterally adjusting one of said race bars, substantially as set forth.

8. In a typewriting machine, the combination of a platen carriage, and a support therefor, one of which consists of a casting having a longitudinal groove with a narrow side opening, and a hardened steel race bar of normally greater width than said groove and which is forced into said groove and is held therein by the elasticity of the parts, and antifriction bearings against which said race bar bears, substantially as set forth.

9. In a typewriting machine, the combination of a rigid platen carriage frame provided with parallel seats in its opposite side edges, and hardened race bars fixed in said seats, a rigid supporting frame therefor provided with opposite parallel raised portions between which said carriage frame is located, and hardened race bars fixed in seats in the sides of said raised portions next to the carriage frame, said raised portions constituting backings for said race bars to hold the same rigid, and rolling bearings between the complementary race bars, substantially as set forth.

10. In a typewriting machine, the combination of a rigid platen carriage frame provided with parallel seats in its opposite side edges, and hardened race bars fixed in said seats, a supporting frame therefor provided with opposite raised portions between which said carriage frame is located, slender hardened race bars located in seats in the sides of said raised portions next to the carriage frame, said raised portions constituting

backings for said race bars to hold the same rigid, means connecting one of said raised portions and the adjacent race bar at different points along its length for independently adjusting different portions of said race bar, and rolling bearings between the complementary race bars, substantially as set forth.

11. In a typewriting machine, the combination of a platen, a platen shaft, bearing sleeves on said shaft, a carriage having open seats in which said bearing sleeves rest, said bearing sleeves being held from removal from said seats in one position thereof and being removable sidewise from said seats by being turned to another position, substantially as set forth.

12. In a typewriting machine, the combination of a platen, a platen shaft, bearing sleeves on said shaft, and a carriage having segmental circular openings in which said bearing sleeves are seated, and open-ended slots connecting with said seats, said bearing sleeves having segmental circular portions adapted to fit in said seats and to be removed sidewise therefrom through said slots, by turning said sleeves to a predetermined position, substantially as set forth.

13. In a typewriting machine, the combination of a platen, a platen shaft, bearing sleeves on said shaft having reduced segmental circular portions, a carriage having segmental circular seats for said reduced portions of the bearing sleeves, and open-ended slots connecting with said seats, said sleeves being removable sidewise from said seats by turning the flat sides of the reduced portions thereof parallel with the edges of said slots, substantially as set forth.

14. In a typewriting machine, the combination of a platen, a platen shaft, bearing sleeves on said platen shaft, a carriage having open seats in which said bearing sleeves rest, said bearing sleeves being held from removal from said seats in one position thereof and being removable sidewise from said seats by being turned to another position, and arms secured to said bearing sleeves and engaging parts on said carriage to hold said bearing sleeves from turning in said seats, substantially as set forth.

15. In a typewriting machine, the combination of a carriage, a platen supported thereby, and guard rails for the mechanism at the ends of the carriage supported by the carriage with portions thereof above the ends of the carriage transversely to the platen, substantially as set forth.

16. In a typewriting machine, the combination of a carriage, a platen removably journaled thereon, and guard rails for the mechanism at the ends of the carriage which are located above the ends of the carriage transversely over the platen journals, are attached to the carriage, and are movable to allow the removal of the platen from the carriage, substantially as set forth.

17. In a typewriting machine, the combination of a carriage, a platen removably journaled thereon, and guard rails for the mechanism at the ends of the carriage which are located above the ends of the carriage transversely over the platen journals and are detachably secured to the carriage to allow the removal of the platen from the carriage, substantially as set forth.

18. In a typewriting machine, the combination of a carriage, a platen supported thereby, and guard rails for the mechanism at the ends of the carriage supported by the ends of the carriage and having substantially horizontal portions located at substantially the height of the top of the platen, substantially as set forth.

19. In a typewriting machine, the combination of a carriage, a platen supported thereby, and guard rails supported by the ends of the carriage, said guard rails having curved ends adapted to spring into and out of holding engagement with the carriage, substantially as set forth.

Witness my hand, this 4th day of April, 1906.

OSCAR C. KAVLE.

Witnesses:

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FRANK E. REID.