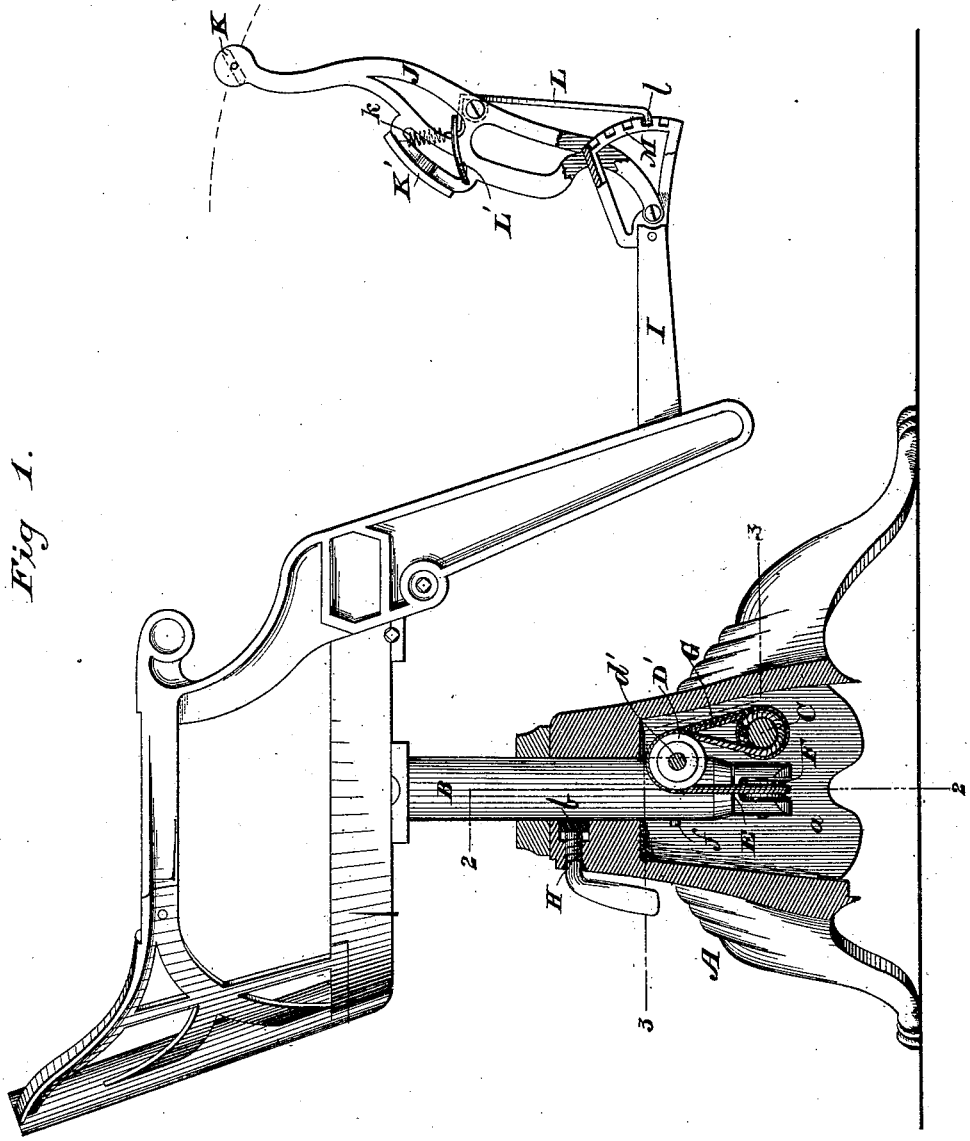
2 Sheets—Sheet 1.

E. T. STARR.
Dental-Chair.

No. 210,366. **Patented Nov. 26, 1878.**

Fig 1.



WITNESSES

Wm A Skinkle

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2 Sheets—Sheet 2.

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Fig 4.

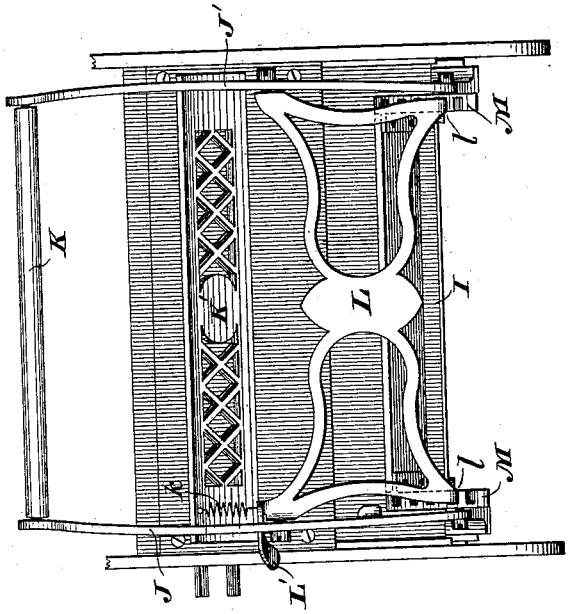


Fig 3.

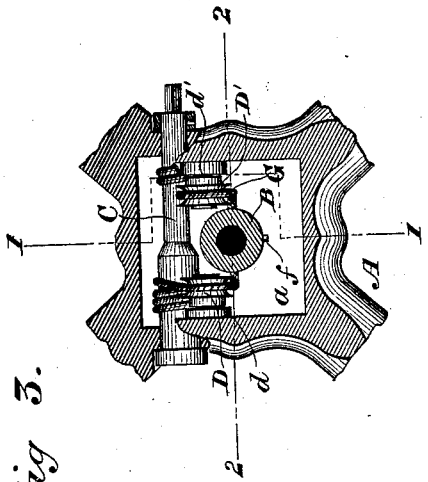
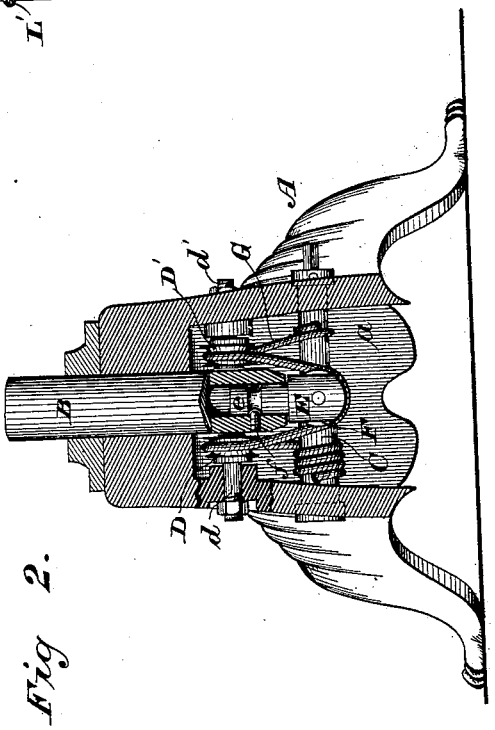


Fig 2.



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UNITED STATES PATENT OFFICE.

ELI T. STARR, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO SAMUEL S. WHITE, OF SAME PLACE.

IMPROVEMENT IN DENTAL CHAIRS.

Specification forming part of Letters Patent No. **210,366,** dated November 26, 1878; application filed June 6, 1878.

To all whom it may concern:

Be it known that I, ELI T. STARR, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Dental Chairs and Foot-Rests therefor, of which the following is a specification:

My invention relates to dental chairs of that class in which the body of the chair is vertically adjustable relatively to its supporting base or stand.

The object of the first part of my present invention is to furnish a dental chair the body or seat of which can be adjusted vertically and turned horizontally relatively to its base or stand, and automatically retained in such adjusted position in an easy, convenient, and noiseless manner, with but little exertion or expenditure of power on the part of the operator, and without communicating shocks, jars, or unpleasant feelings to the patient seated in the chair, the adjusting apparatus withal being extremely simple, cheap, and effective, and so organized in a compact manner within or upon the base of the chair as to be protected and unseen.

To these ends my invention consists, first, in mounting in the base of a dental chair a differential windlass, or one in which a cord or chain winds off one part of a shaft or barrel and onto another of different diameter, running said cord over pulleys mounted in the base above the windlass-shaft, and then under or around a pulley carried by an endwise-moving spindle or plunger supporting the chair body or seat; secondly, in combining the base or stand of a dental chair, a differential windlass mounted therein, pulleys also mounted in the base, over which the windlass cord passes, a plunger moving freely endwise in the base or stand and carrying the chair body or seat, and a pulley journaled in the inclosed end of the supporting-plunger, so that the plunger is permitted to turn freely irrespective of the pulley under or around which the windlass-cord passes from the intermediate pulleys above, whereby the plunger is supported by said cord, and the chair-body easily and noiselessly raised and lowered, while free to turn horizontally by the turning of the windlass-shaft.

The next part of my invention relates to the foot-rest; and its object is to give the chair the widest range of adaptability to adults and children, and to provide for and insure the comfort of patients of all sizes.

To these ends my invention consists, thirdly, in combining with the foot-board or platform of a dental chair a pivoted foot-rest, adapted to be adjusted or rocked on its pivots toward and from the seat, consisting of side arms, bars, or brackets, connected at their outer ends by a turning or swiveling bar, forming a foot or limb support; fourthly, in a foot-rest for dental chairs, consisting of side bars, arms, or brackets, a foot-supporting bar near the outer ends thereof, and an additional or intermediate bar or support mounted on said side arms between their ends, said foot-rest being mounted upon the chair and adapted to be moved or adjusted toward and from the seat; fifthly, in a foot-rest for dental chairs, consisting of side arms or brackets pivoted to the ordinary foot-board or platform, a cross-bar, forming a foot-support, connecting the arms or brackets, a curved segmental rack mounted on the foot-board, and a spring-detent carried by the pivoted foot-rest, adapted to engage the rack to lock the rest in any desired position within its range of movement.

The accompanying drawings represent all my improvements as embodied in one chair in the best way now known to me. Obviously, however, some of my improvements may be used without the others, and in chairs differing somewhat in their general construction.

Figure 1 is a side elevation of so much of a dental chair embodying my improvements as is necessary to illustrate the subject-matter herein claimed, the base or stand of the chair being shown in vertical central section on the line 1 1 of Fig. 3; Fig. 2, a similar section through the base or stand on the lines 2 2 of Figs. 1 and 3 at right angles to the plane of section in Fig. 1; Fig. 3, a horizontal section through the base or stand on the line 3 3 of Fig. 1; and Fig. 4, a view of the foot-rest and a portion of the chair as seen from the front thereof.

My improvements are designed more especially to be embodied in dental chairs having all the usual and preferred adjustments of

seat, back, and head-rest, such for instance as that shown in Letters Patent No. 187,573, granted to S. S. White, February 20, 1877; but as these portions of the chair constitute no part of my present invention it is deemed unnecessary to show them in the drawings or describe them herein.

The base or stand A is preferably cast of metal in a single piece, consisting of a central column supported by the proper number of legs; or it may be constructed in other ways, if preferred, and is hollowed out or provided with an interior chamber or space, *a*, for the reception of the elevating apparatus, which the base envelops and protects. A central opening is formed or provided in the upper end of the column or base for the reception, bearing, and support of an accurately-fitting cylindrical plunger, spindle, or support, B, moving freely endwise, as well as capable of turning horizontally, and carrying upon its upper end the body or seat of the chair. This chair body or seat is preferably pivoted upon the supporting-plunger, so as to be capable of variable inclination relatively to the base, and is locked in position by suitable mechanism in well-known ways.

In suitable bearings in the walls of the column or base, and preferably extending across the space or chamber therein at one side of its center, as shown in Figs. 1 and 3, is mounted or journaled the ends of a winch-shaft or windlass, C, and above this windlass are mounted pulleys D D′, turning on or with stud-axles *d d′*, projecting from the walls or sides of the base inwardly.

The pulleys and their axles are preferably arranged in the same axial plane as the winch-shaft or windlass, but nearer the center of the base, leaving, however, a space between them for the unobstructed passage and free endwise play and turning movements of the plunger B, which passes down vertically and centrally through the base or column between the pulleys.

The lower end of the plunger is tubular, or suitably bored axially, for the reception of a cylindrical shank or pivot, E, carrying upon its lower end a pulley, F. This shank is provided with a circumferential groove, *e*, with which engages a pin, screw, or lug, *f*, projecting into the bore of the plunger, whereby the plunger is free to turn or swivel on or around the shank or pivot, and irrespective thereof, to allow of the chair body or seat being turned, revolved, or adjusted horizontally without disturbing the proper working position of the pulley F, by which the plunger is supported, as will be presently explained.

The winch shaft or barrel is cylindrical; but, preferably on each side of its center, or nearly so, its diameter is different. The ends of a cord or belt, G, are attached or secured to this shaft in such manner as to wind thereon in opposite directions and upon its different diameters, thereby constituting a differential windlass, or one in which the cord winds off one part of the shaft onto another of different diameter. This is, in fact, the old Chinese windlass, the principle, function, and operation of which are familiar.

The cord from its point of attachment to the windlass passes up over the pulleys D D′, and the loop thus formed passes under or around the pulley F on the end of the endwise moving and turning plunger B, as clearly shown in the drawings, thereby supporting said plunger, and consequently the seat or chair-body mounted thereon, and also regulating the vertical movements or adjustments thereof.

It will be obvious that by rotating the windlass or shaft by a suitable winch, crank, or handle, so as to wind the cord upon the larger and from the smaller diameter, the plunger and chair will be elevated, owing to the taking up of the cord, and that when suitable material is employed for the cord the movements will be easy, noiseless, and free from shocks or jars. By reversing the movement, and winding the cord from the larger to the smaller diameter of the shaft, the descent of the chair is permitted, owing to the letting out of the cord, the descending movements of the chair being gradual, easy, noiseless, and free from communicating unpleasant feelings to the patient.

As the rope or cord passes from opposite sides of the windlass or shaft, the strain upon both sides is equal, or nearly so. Consequently when the rotation of the shaft or windlass by the operator ceases, the chair will automatically remain in whatever elevated position it may be in, thereby obviating the necessity of catches, pawls, or other auxiliary mechanism to retain the chair in its adjusted position.

The differential diameters of the windlass or shaft may, of course, be varied relatively to each other as desired, so as to gain more power and less speed, or vice versa, as is well understood.

As the supporting-plunger is free to turn on the shank of the pulley F, the chair is free to be revolved or adjusted horizontally; and in order to lock it in any desired position, I employ in this instance a screw, H, working through the base, which screw, when turned in the proper direction, will abut or impinge against the supporting-plunger through the intervention of a friction-pad, *b*, locking the plunger and base together. The outer end of this screw terminates in a bent flattened end, to adapt it to be controlled by the foot of the operator, and without necessitating his stooping for the purpose.

The chair is preferably provided with the usual foot-board or platform I, and to the outer end thereof, upon opposite sides, are pivoted arms, bars, or brackets J J′, constituting the side arms of a supplementary foot-rest. These side arms, near their outer ends, are connected by a revolving or swiveling cross-bar, K, forming a foot or limb support, which adjusts itself to the comfort of the patient. A second foot-support or intermediate cross-bar, K′, is mount-

ed upon the pivoted side arms of the supplementary rest, between the support K and the pivots of the said arms. This supplementary foot-rest is capable of being moved or rocked upon its pivots toward and from the body or seat of the chair to accommodate patients or persons of varying size; and in order that the rest may be locked at any desired point in its range of movement, I pivot upon or between the side arms a bar, L, provided with projections, lugs, or detents *l*, adapted to engage a curved segmental rack, M, one on each side, secured upon the front of the foot-board or platform of the chair, a spring, *k*, acting upon the detent-bar, tending to hold it normally in engagement with the racks.

The spring is shown in the present instance as of a spiral form, one end being connected to the under surface of the intermediate foot-support K′, and the other to the outer end of an extension or bent arm, *l*, of the detent-bar, the tension of the spring being exerted to raise this arm, and consequently rock the detent-bar upon its pivots inward into engagement with the racks.

A trip-lever, L′, is mounted upon the detent-bar, in this instance upon the bent arm *l*, upon which the spiral spring acts, and is adapted to be operated by the foot to disengage the detent and carry forward the supplementary rest, which detent, as soon as the pressure of the foot is removed, immediately locks the rest in its adjusted position.

The operation and advantages of my improvements will be obvious without further description.

The details of construction of the various parts hereinbefore described may be varied somewhat without departing from the spirit of my invention, though I wish it to be understood that I do not broadly claim the application of a differential windlass to control the height of a dental chair, as that is not new. I am not aware, however, that prior to my invention a differential windlass or its equivalent pulleys, from which a cord or belt passes under or around a pulley carried on an endwise moving turning support or plunger has been mounted in the chair-base, as hereinbefore described.

I also wish it to be understood that I do not broadly claim a swinging or an adjustable supplementary foot-rest, as that is very old in chairs of various kinds.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of the base, the differential windlass, pulleys mounted in the base above the windlass, a pulley carried by an endwise-moving chair-supporting plunger, and a cord passing from the windlass or shaft over the intermediate pulleys and around or under the pulley on the plunger.

2. The combination, substantially as hereinbefore set forth, of the base or stand, a differential windlass mounted therein, pulleys also mounted in the base, over which the windlass-cord passes, a plunger moving freely endwise in the base and carrying the chair body or seat, and a pulley carried by the lower or inclosed end of the supporting-plunger, on the shank of which the plunger is free to turn or swivel, and around which pulley the windlass-cord passes from the intermediate pulleys, whereby the plunger is supported and controlled in its endwise movements by the differential windlass-cord while free to turn horizontally.

3. The combination, substantially as hereinbefore set forth, with the foot-board or platform of a dental chair, of a pivoted supplementary foot-rest consisting of side arms or bars, connected at or near their outer ends by a turning or swiveling bar, forming a foot or limb support, said supplementary foot-rest being adapted to be adjusted or rocked on its pivots toward and from the chair-seat.

4. A supplementary foot-rest for dental chairs, constructed substantially as hereinbefore set forth, consisting of pivoted or adjustable side arms or bars provided with a foot or limb support near the outer ends thereof, and with an additional bar or foot-support intermediate of the limb-support and the pivots or points of attachment of the side arms to the chair-frame, the said foot-rest being adapted to be moved or adjusted toward and from the seat and be secured in its adjusted position.

5. A foot-rest for dental chairs, substantially as hereinbefore set forth, consisting of side arms or brackets pivoted to the ordinary foot-board or platform, a cross-bar forming a foot or limb support connecting the arms or brackets, a curved segmental rack mounted on the foot-board, and a spring-detent carried by the pivoted foot-rest, adapted to engage the rack to lock the rest in any desired position within its range of movement.

In testimony whereof I have hereunto subscribed my name.

ELI T. STARR.

Witnesses:

FRANK L. HISE,

JAS. B. WILLIAMS.