Nov. 8, 1932. P. RUSSELL 1,887,328

DENTAL CHAIR

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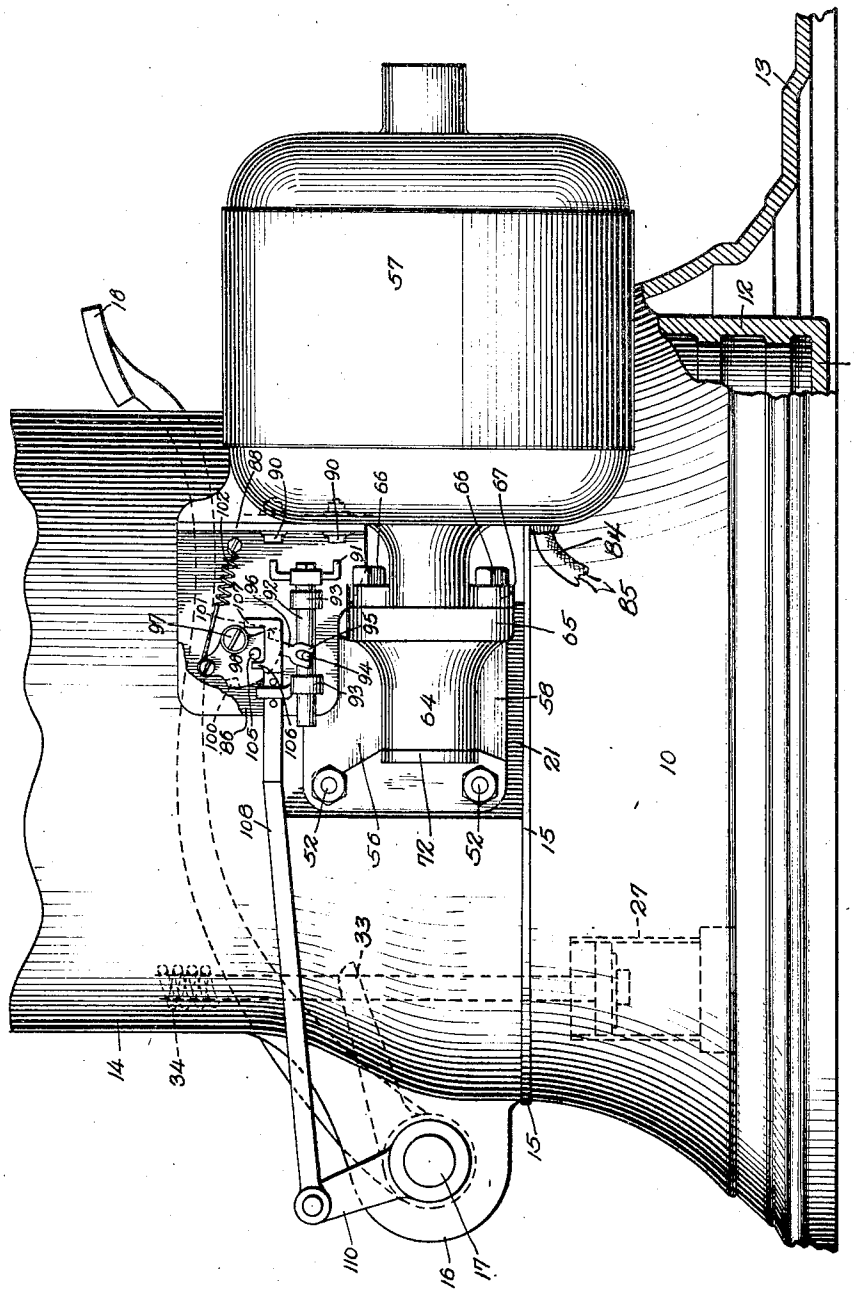


Fig. 1.

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DENTAL CHAIR

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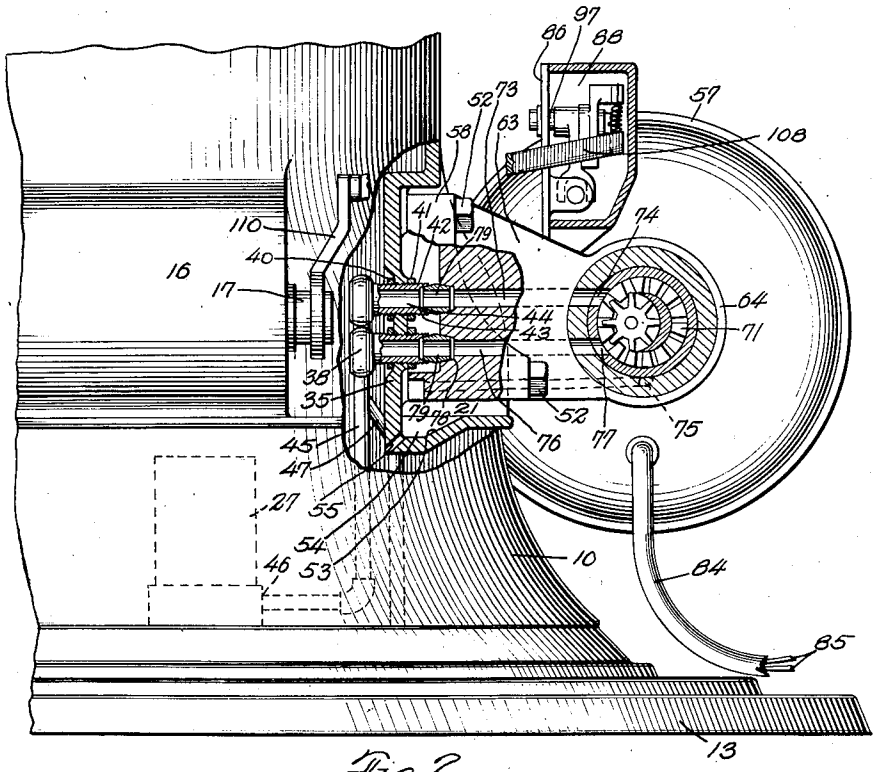


Fig. 2.

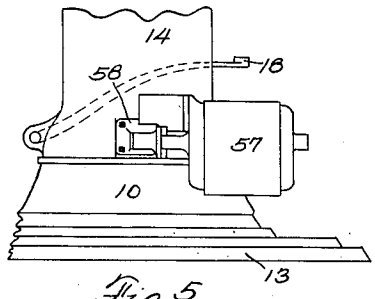


Fig. 5.

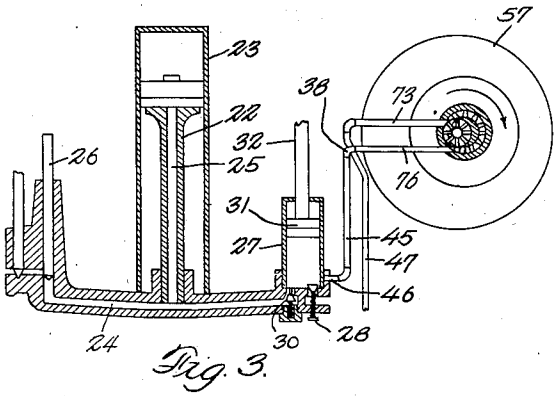


Fig. 3.

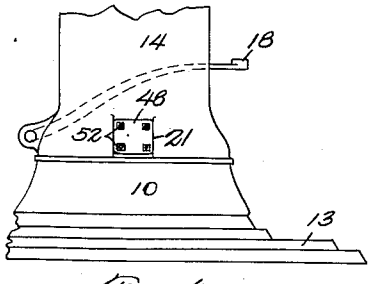


Fig. 4.

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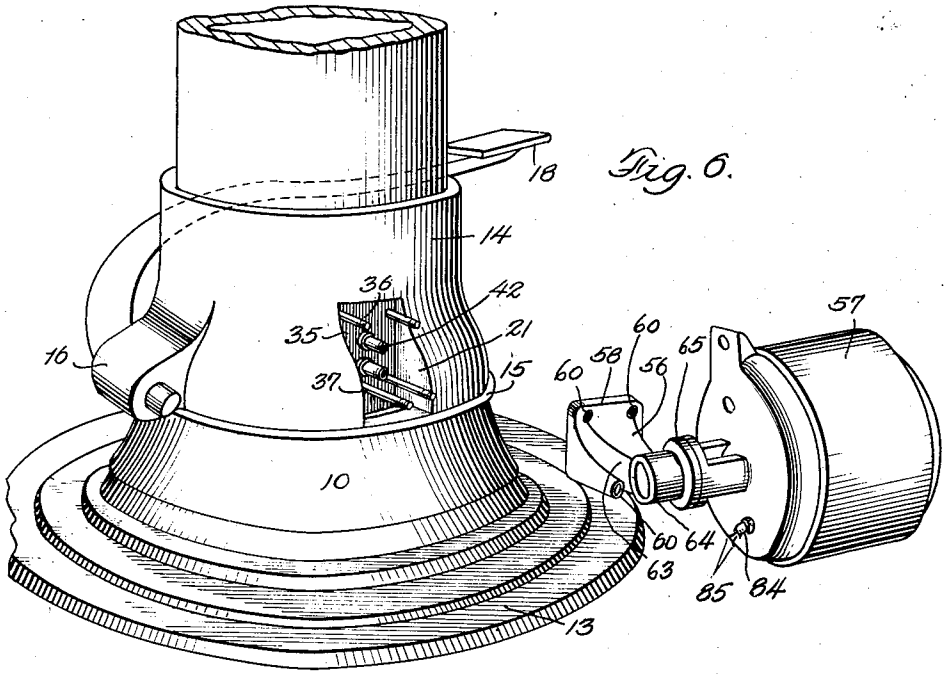


Fig. 6.

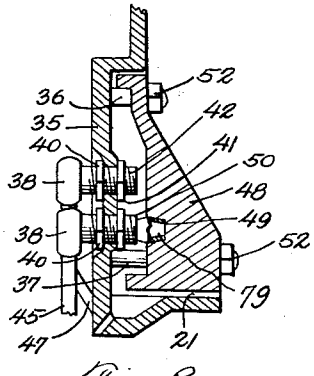


Fig. 8.

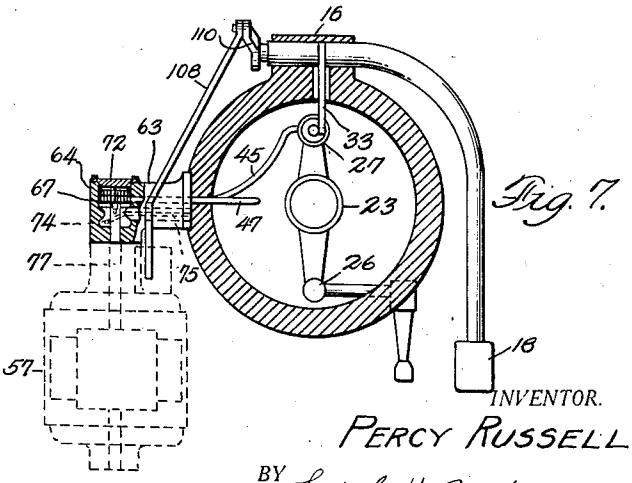


Fig. 7.

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1,887,328

UNITED STATES PATENT OFFICE

PERCY RUSSELL, OF SWARTHMORE, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO RITTER DENTAL MANUFACTURING COMPANY, INC., OF ROCHESTER, NEW YORK, A CORPORATION OF DELAWARE

DENTAL CHAIR

Application filed February 13, 1928. Serial No. 254,148.

This invention relates to dental chairs, pertaining particularly to improvements in hydraulic elevating systems thereof.

Among the objects of the invention are: to provide a dental chair in which the elevating mechanisms are actuated by either pedal or electric power; to provide in a dental chair a hydraulic system including a foot operated plunger but which is arranged to receive an electrically operated power source connecting with said system; to provide in a dental chair a plurality of power sources arranged for successive or alternate use; to improve the construction of dental chairs; to provide an improved power operated dental chair with a low construction cost; to provide a dental chair with a normally pedal operated hydraulic system to which an electrically operated power unit may be attached without disturbance to the original hydraulic system; to provide an electrically driven power unit as an attachment to a dental chair; to provide as an attachment to a normally pedal operated hydraulic chair a detachable, self-supported electrically driven power unit; to provide a pedal operated hydraulic chair with an electrically driven power unit controlled by movement of the pedal; to provide a dental chair with supplemental conduits leading to the hydraulic system to which a subsequently attached power unit may be operably connected for energizing the system; and many other objects and advantages as will be more apparent as the description proceeds.

The invention contemplates the construction of a dental chair with a permanent pedal operated hydraulic system, but so arranged that the chair may be modernized by the subsequent addition of an electrically driven power unit coupling with the original hydraulic system to provide an electrically driven hydraulic chair.

The dentists heretofore, in fitting out their offices might procure either a foot pedal operated chair, with the disadvantages of pulsations and vibrations incident to the use of the foot pedal, or a much more expensive electrically driven geared chair. From a financial standpoint foot pedal operated chairs have formed items in the equipment of dental offices to a greater extent than any other type, despite the known advantages of the motor driven chair. Any subsequent electrification of the chair as provided heretofore required the scrapping of practically the entire chair, nothing being available for use with the motorized gear operated chair except possibly the top, and the installation of an entirely new base and operating mechanism. With the invention herein the practitioner may purchase a standard hydraulic chair in all essential parts operated by a foot lever or pedal, as is conventional, but to which he may subsequently add a motorized unit of such simplicity that its attachment by the unskilled is possible, and of such reasonable cost as to be well within his purchasing power. The quietness, certainty, and smoothness of the assembled chair according to the invention will be apparent, but will be mentioned and explained below.

In the accompanying drawings:

Fig. 1 represents a side elevation of the chair base, partially broken away, with the motorized pump unit in operative position thereon,

Fig. 2 represents a front elevation of the same, also broken away, and with the pump unit shown in section,

Fig. 3 represents a diagrammatic elevation of the hydraulic system of the invention,

Fig. 4 represents a fragmentary elevation of the chair base, showing the cover plate normally covering the attaching point of the motorized pump unit,

Fig. 5 is a similar view with the motorized pump unit mounted on the chair base at its attachment point,

Fig. 6 represents a detached perspective of a portion of the chair base, and the detachable motorized pump unit,

Fig. 7 represents a diagrammatic horizontal section through the chair jack, and the attached motorized unit, and

Fig. 8 represents a fragmentary vertical section through the cover plate.

As the invention involves the elevating mechanism and the associated hydraulic systems actuating the elevating mechanism, the

complete chair will not be shown, as it will be clear that a chair top of any desired sort may be mounted on the lower portion of the chair, referred to generally herein as chair jack or base.

The base comprises an oil reservoir 10, having a lower plate 11, and an annular side wall 12, which may be provided with a flaring skirt 13 for an improved appearance and to furnish a floor contacting portion. The oil reservoir may be and is preferably a single casting, within which the elevating mechanism may rotate upon the upper edge of the side wall 12, and forms an oil sump or reservoir from which the oil or other hydraulic fluid is drawn and to which it is exhausted, in the elevating and lowering operations.

A jack or base casting 14 of generally cylindrical construction is slidably disposed within the oil reservoir and has a peripheral flange 15 arranged to seat upon the upper edge of the side wall 12 thereof, and to maintain a desired clearance between the lower edge of the base casting and the plate 11 of the reservoir. The flared flange 15 is enlarged at a desired point to form a journal 16 within which a shaft 17 connecting with a foot lever or pedal 18 is rotatably or oscillatably disposed. The flare of the flange is cut away at desired points on its periphery to receive the wedge lever locking the jack housing against undesired rotation in the oil pot or reservoir in a manner that is well known, and also at 21 to receive the motorized pump unit to be described. The recess 21 is substantially at 90° peripherally from the journal, and is at substantially the same level, just above the bearing point of the flange 15 on the oil pot or reservoir wall. The jack of the invention may be of any desired conventional construction, and as indicated in Fig. 3 includes a hollow piston 22, cylinder 23, and such other elements, guides, etc as may be desired.

The hydraulic system of the chair jack is in large measure conventional as well, including the conduit 24 opening in the center upon the axial bore 25 of the hollow piston, at one end closed by a relief valve 26 operable in any desired manner to vent the oil to the sump of the reservoir in the oil pot, and at the other end connecting with the foot pump cylinder 27. The pump cylinder, and the entire hydraulic system as well, is carried by the jack housing, preferably, and has an intake valve 28, and an exhaust or check valve 30 beyond which the oil passes under pressure from the piston 31 on its working stroke. The piston 31 is carried by a rod 32, vertically actuated by an arm 33 carried by the shaft 17, against the resistance of a spring 34 adjustably anchored to a desired point on the jack housing.

A novel element in the hydraulic system and in the chair jack housing is a web 35, formed behind the recess 21 in the periphery of the jack housing, preferably of vertical extent, from the face of which short stud bolts 36 at the upper portion and longer stud bolts 37 in the lower portion, project.

The web 35 has two openings in substantially vertical alignment, through each of which extends an elbow or fitting 38 internally bored to form a conduit, having each a shoulder abutting the inner face of the web, or an interposed adjusting nut 40, mounted on a threaded barrel 42 of the fitting, which also carries lock nut 41. It will be clear that the barrel of the fitting is horizontally adjustable in the web to allow for variations in the castings, either of the web, or of the subsequently attached devices. The barrels 42 terminate in tapered glands 43 communicating with the bore 44 of the fittings. To the inner end of one elbow or fitting a pipe or conduit 45 is affixed in registry with its bore, forming a discharge pipe or conduit leading to and forming communication with the foot pump cylinder 27, preferably at a point 46, just above the valves 28 and 30. It will be clear that this conduit may lead to any other portion of the hydraulic system of the chair, although the disclosed form is preferred. The other elbow is in communication with a pipe or conduit 47 leading down into the oil reservoir, to a point below its normal liquid level. As shown in Fig. 8, a cover plate 48 is provided having tapered recesses 49 formed on its inner surface arranged for registry with the terminals of the fittings or elbows, with soft metallic double ended frusto conical tubes 50 interposed between the tapered recess and the tapered gland of the respective fitting terminals as a plug for the ends of the fittings. The outer surface of the cover plate is arranged to be flush with the surface of the jack and to be held in its position by nuts 52 engaging the stud bolts. Thus in the normal pedal operation of the chair jack, without the electrification thereof as will be described, the conduit leading to the foot pump cylinder is effectively plugged by the cover plate connection and the normal functioning of the chair jack is not affected. Other forms of plugs may be used if desired.

It will be observed that the web 35 in recess 21 is connected at the lower end with the main body of the jack housing by an upwardly sloping portion 53, forming a groove or pocket at the bottom of recess 21, which communicates with the interior of the jack housing by a small port 55, for drainage purposes.

It will be apparent that the chair jack described herein so far, is of normal operation, appearance and cost, but that auxiliary conduits are formed in the jack housing ready for such subsequent use as may be desired, but their presence is not noticeable and the

operation is not affected in any manner. For the purpose intended, namely, the ready and facile attachment of a motorized pump unit, it is desirable that the hydraulic unit be of utmost simplicity. This has been achieved by the invention herein, and at the same time the efficiency of the unit, and of the assembled chair and motor unit is marked.

The motor unit is comprised of a pump housing casting 56, and the motor 57, entirely supported, preferably, by the pump housing casting 56, through which casting the liquid passes into the hydraulic system of the chair jack, as will be described, so that the conduits for the transmission of power and the single support of the motor are identical structures. This arrangement is not essential to the production of an operative motor driven hydraulic chair, as will be later discussed, but it is preferred in the interests of simplicity and economy.

The pump casting 56 comprises a plate 58, having openings 60 for the reception of the stud bolts 36 and 37, and has an arm 63 extending from the plate, of smaller cross-sectional area than the plate or flange 58, so as to be disposed between the bolt openings with clearance sufficient to permit manipulations of nuts on said bolts. The arm 63 tapers outwardly and terminates in a semi-cylindrical enlargement 64. This enlargement 64 has an integral flange 65 on one end, apertured to receive bolts or screws 66, extending through a flange 67 of the motor 57. The enlargement 64 is bored to receive a pump 71. An intake bore 73 is formed in the arm 63 extending between a port 74 of the pump and a tapered outlet in the face of plate 58, arranged for registration with the appropriate fitting in the web 35 in recess 21 of the chair jack. A discharge conduit 76 is similarly formed extending between the pump port 77 and internally tapered outlet 78 in the plate 58, arranged for registration with the other fitting in web 35. Soft metal glands 79 are provided between the opposed tapering orifices of the fittings and the pump casting arranged to be tightly engaged in a liquid-tight joint when the pump casting is drawn up into the recess 21 by the action of nuts 52 on stud bolts 36 and 37, as will be clear.

It will be clear that the rotary pump, which may be of any desired nature, although for practical purposes should be susceptible to high pressure work, as is the gear pump disclosed, should be of such reduced size and capacity as to permit of direct drive from the electric motor 57. The direct drive is an important phase of the invention, as the gearing heretofore availed of involves disadvantages materially affecting the practicability of the device. It will be noted that the gear pump elements may be inserted laterally into the enlargement 64, and held in by the cover plate 72 forming a part of the pump.

Within the enlargement 64 of the arm 63, the pump shaft 77′ is disposed in a bore opening into a pocket 74 having an oil drain groove 75 leading from the pocket through the arm 63 to discharge on the inner face of the plate 58. It is possible that in operating the pump some slight amount of liquid may escape from the confines of the pump, working its way out along the pump shaft, especially after considerable use of the pump when the parts are well worn. The oil groove mentioned drains this liquid off unobtrusively, delivering it to the oil drainage groove 54 in recess 21, from which it passes through port 55 into the interior of the chair jack to the oil reservoir. To confine the seeping oil to the oil pocket 74, a flinger or oil ring may be mounted on the pump shaft, by which the oil on the pump shaft is flung tangentially against the inner surfaces of the pocket by centrifugal force.

The motor shaft 77′ has a slot and groove connection with the pump shaft, and is maintained in alignment with the latter by an armature bushing extending into a bore in the pump housing flange. The motor carries at a convenient point electrical connections for conveying current to the motor, and to the switch to be described, such as conduit 84, housing conductors 85. This may take the form of permanent connections as shown, or may be made detachable by the use of separable connectors as are well known in the electrical art. It is of interest to note that the electrical connections are preferably remote from the chair jack, as shown, so that danger of short circuits and other difficulties from the liquid of the elevating system contacting with conductors is obviated.

Any desired sort of circuit controller may be used to regulate the current passing into the motor, and may obviously be disposed at points remote from the motor. It is preferred, however, to use the switch disclosed, and to mount it directly upon the motor for the sake of compactness and simplicity. The switch comprises a plate 86 having a flange 88, attached to the end of the motor 57. Contacts 90 are mounted on the flange 88, in horizontal alignment with the arms of a bridge piece 91, carried by a rod 92, slidably mounted in journals or sleeves 93 mounted on the plate 86. The rod 92 has lugs 94 embraced by the split fingers 95 of a yoke 96, pivoted on a shaft or stud 97 carried by the plate. A quick throw pawl 98 is also mounted on the shaft or stud 97, having on the side toward the plate lugs 100 and 101 in position to kick the yoke and thus move the rod 92 forward and back, and establishing and breaking contact of the bridge piece 91 and contacts 90. The quick break is established by the action of a tension spring 102, extending between a screw on the plate and a lug on the pawl, extending from the face opposite to the plate.

This face also carries an ear 105 in position to be struck by either of two lugs of a horizontally slidable link 108. The lugs on the link comprise a short lug 106 arranged to strike the ear 105 throwing the bridge piece 91 against the contacts 90, then arranged to slide toward the motor under the ear if the inward movement of the link is continued after the switch has been thrown, and a longer lug 107 arranged to strike the ear 105 on the opposite throw of the link 108, so as to break the established contact. The outer end of the link 108 is pivotally connected to a lever arm 110, in turn affixed upon and movable with the shaft 17, under the actuating influence of the foot lever 18.

By the switch assembly and connections disclosed, it will be observed that the foot lever 18, normally energizing the foot pump plunger and cylinder for elevating the chair, is coupled to, and actuates, the circuit controller of the motorized unit, when the latter is attached. Depressing the foot lever or pedal 18, pushes link 108 inwardly toward the motor, causing the short lug 106 to engage the ear 105 and to swing the pawl on its pivot until it passes dead center, when the tension of the spring will snap it to the end of its movement, kicking the yoke by means of lug 100, and snapping the bridge piece against the contacts and closing the circuit. As noted, continued pressure on the pedal has no undesirable effect, as the ear 105 will have been swung out of the path of movement of the short lug 106, and the pumping action incident to movement of the pedal may take place with the motor running, or in the event that the circuit has been disrupted as though the motorized unit were not installed. Release of the pedal returns the link 108 to its normal retracted position, and opens the circuit by swinging the pawl on its pivot, with a quick break of the contacts through contact of the longer lug 107 with ear 105. The pawl swinging thereby past dead center and lug 101 striking the yoke, with a snap break of the circuit.

It is to be observed that although the conduits leading to the web in the chair jack are shown as terminating therein, for the subsequent connection with conduits in the casting housing the pump, yet it is contemplated that the auxiliary conduits may extend from any desired portion of the hydraulic system to any other points relative to that system that may be expedient. And although the motorized unit as disclosed is mounted directly upon the chair jack, yet remote positioning thereof is contemplated. For instance it is contemplated that the motorized unit may be disposed at considerable distance from the chair, as for instance in the pedestal of a dental unit, or on another floor, and connected by flexible conduits with the hydraulic system of the chair, (not shown). It is preferred that the auxiliary conduits be preformed in the chair jack as disclosed, yet it is also contemplated that the motorized unit be provided for attachment to standard chairs of any description, and to connect the unit to the hydraulic systems by auxiliary conduits tapped into the most available portion of the hydraulic system, (not shown).

Assuming a dental chair as disclosed herein, as provided for pedal operation, the attachment of the motorized unit will be obvious. The plate 48 is removed, thus exposing the open ended fittings in the web 35. A soft metal gland 79 is inserted in the end of each fitting, the pump housing casting is applied in the recess 21, with the tapering outlets in engagement with the glands, the nuts 52 are applied to the stud bolts 36 and 37 and screwed down against the plate 58 to force the glands into a liquid tight engagement with the registering conduits. The lever arm 110 is attached to the end of the pedal shaft 17, the electrical connections are established in a circuit, and the assembly is complete. It will be obvious that the circuit controller may be actuated otherwise than as disclosed, and of course disposed wherever most convenient. To broadly designate the actuation of a circuit controller, whether by pedal or by hand, the term "manual" control will be used.

In operation the dentist depresses pedal 18, in the preferred form, thus energizing motor 57, which being directly coupled with the pump draws liquid from the sump through one conduit, and forces the liquid out through the other conduit under pressure into the foot pump cylinder. The pressure in the cylinder is bult up steadily with an absence of pulsations, energizing the jack so that the chair is elevated. The raising of the chair continues as long as the switch is kept closed, until the maximum elevation is attained, when the jack automatically opens a release or relief valve in the conventional manner, thus venting the liquid to the sump again. To lower the jack, the relief valve is opened as in the conventional practice and the chair descends by gravity.

It is to be noted that the movement of the chair jack is even, smooth and free from pulsations or vibrations, that the motor does not reverse but runs in one direction only, and that a quiet, economical and efficient motorized unit is provided, for unitary assembly with a standard dental chair, forming in the assembly an efficient and economical dental chair.

I claim as my invention:

1. In a dental chair in combination, a base, a chair jack disposed in the base, a power cylinder, conduits connecting the cylinder with the jack, check and relief valves disposed in the conduits, a supplemental conduit communicating with the hydraulic system formed of the power cylinder and conduits,

and leading to a point on the base for subsequent conducting engagement with an auxiliary power source.

2. In a dental chair, a base including a fluid sump or reservoir, a chair jack, a hydraulic system for the chair jack including a foot pump cylinder, conduits, and check and relief valves communicating with the sump, a casing enclosing the base, supplemental conduits terminating in the casing and extending respectively to points of communication with the hydraulic system and said sump, and arranged for association with an electrically operated power source mounted on said casing.

3. In a dental chair, a base comprising a stationary oil reservoir, a jack rotatably mounted on the base in a casing, a hydraulic system mounted on the casing for actuating the jack and including a pedal operated power cylinder, the casing having a recess and a web in the recess, intake and discharge conduits terminating in the web and extending respectively to communication with the sump and the hydraulic system, and a cover plate removably mounted to cover the recess and conceal the terminals of the conduits, the terminals of said conduits arranged for operative association with an independent detachable power source upon removal of said cover plate.

4. In a dental chair, a stationary oil reservoir, a casing rotatably mounted on the reservoir and having a pump unit attachment device, a chair jack mounted in the casing, a foot pump cylinder and piston mounted in the casing, connections between the cylinder and the jack, a check valve between the cylinder and the connections, and an intake valve between the cylinder and the oil reservoir, a web formed in the casing having apertures, conduits projecting through the apertures and extending respectively to communication with the oil reservoir and to the pump cylinder on the piston side of said valves, and means adjacent the projecting conduits in the web supplementing the pump unit attachment device to attach a power pump unit for energizing the hydraulic system.

5. In a dental chair, a casing, a chair jack in the casing, conduits terminating near the surface of the casing, and a cover plate normally covering the conduits but removable to permit the attachment of a power pump unit.

6. In a dental chair in combination, a casing, a power pump, conducting connections, and valves mounted in the casing, a supplemental conduit extending from the power pump to a point near the surface of the casing, the surface of the casing adjacent the conduit being removable, and means including bolts for mounting an electrically operated pump unit projecting from the casing in registry with the conduit for energizing the power pump.

7. A dental chair jack, comprising a casing, a jack within the casing, a pump housing casting projecting from and rigidly mounted on the casing, conduits formed in the casting, a pump in the casting, a motor mounted on the casting in driving relationship to the pump, the casting forming the sole support of the motor.

8. In a dental chair, a chair base including hydraulic elevating mechanism, an electrically operated gear pump unit comprised of a housing for the pump and its conduits and a motor carried thereby, means for attaching the housing externally upon the chair base for actuating the elevating mechanism, said housing forming the sole support of the motor.

9. As an auxiliary power unit for dental chairs, a housing having ports and a recess, a gear pump in the recess, a shaft for the gear pump, a motor, a shaft from the motor engaging the shaft of the pump axially, means rigidly connecting the motor to the housing, and means on the housing for attaching the unit to a dental chair.

10. A power unit for dental chairs of the hydraulic type, comprising a housing, a pump rotatively mounted in the housing, the housing having conduits communicating with the pump and a terminal of the housing, a shaft for the pump rotatively disposed in the housing, a recess or groove formed in the housing adjacent the end of the shaft, and an oil drain groove formed in the housing between the oil recess and the terminal of the housing for carrying off oil leakage from the pump shaft.

11. In a dental chair, a casing, a housing including a plate, means for mounting the plate on the casing, conducting passages formed in the housing extending from the plate to a recess formed in the housing, a gear pump element disposed in the recess communicating with the passages, an electric motor carried by the housing, a shaft thereof in driving relation to the gear pump element, conduits for the chair elevating mechanism terminating in registry with the passages in the housing.

12. In a dental chair, a base casing, a hydraulic jack and system mounted in the casing, a pedal power cylinder housed in the casing and communicating with the system, and an auxiliary electrically operated power source mounted externally of and on the casing for movement with the casing and communicating with the cylinder and utilizing same as a conduit for energizing the hydraulic system.

In testimony whereof, I affix my signature.

PERCY RUSSELL.