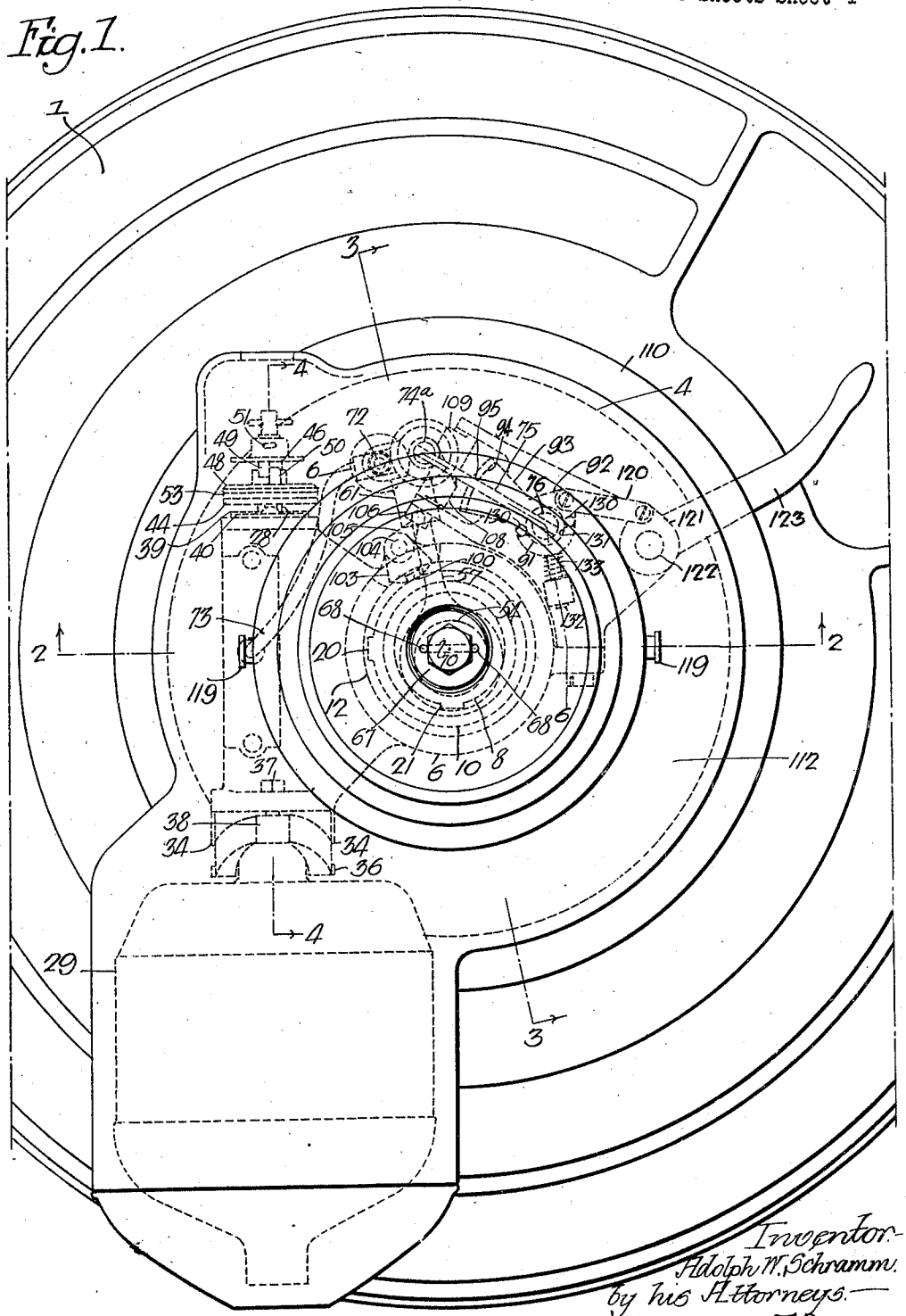
Jan. 17, 1928. 1,656,760

A. W. SCHRAMM

CHAIR ELEVATING MECHANISM

Filed Sept. 25, 1923 5 Sheets-Sheet 1

Fig. 1.



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Howson & Howson

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Fig. 2.

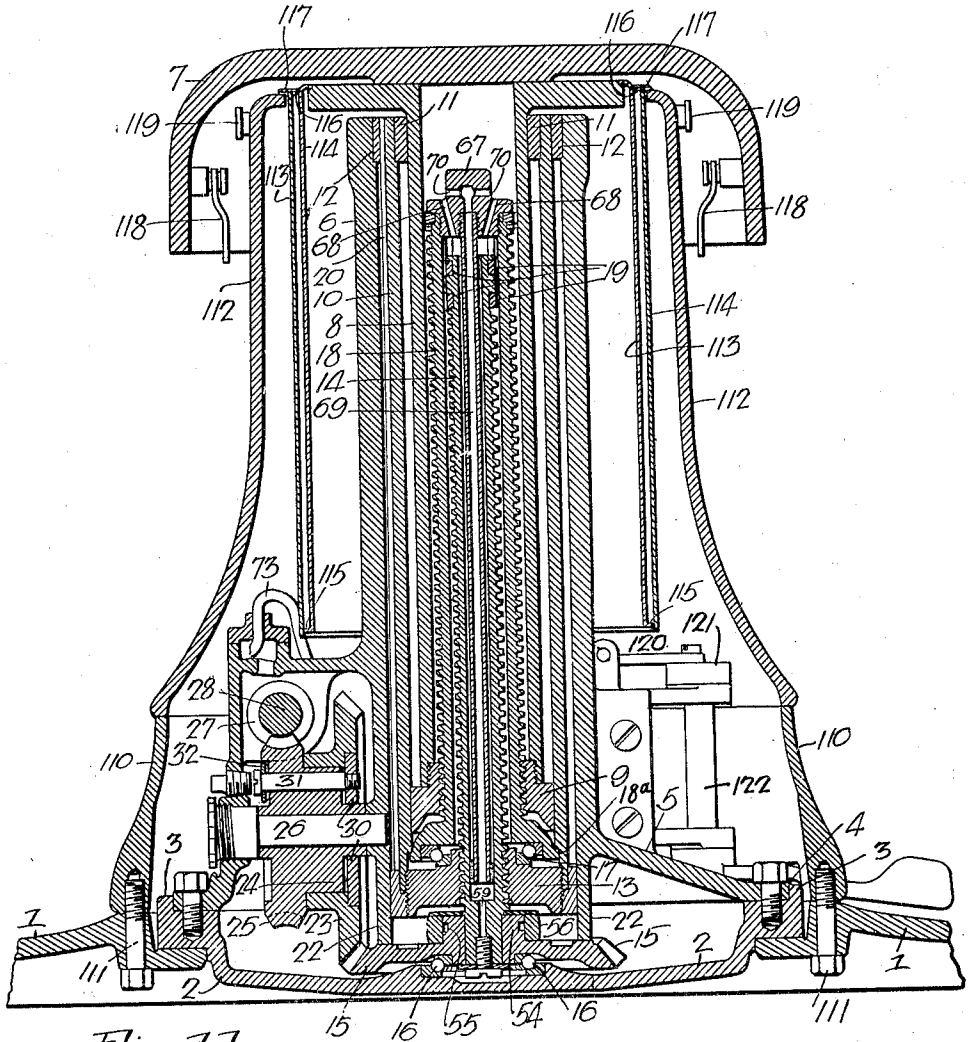

Fig. 11.

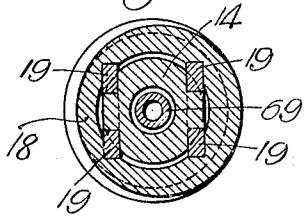

Fig. 12.

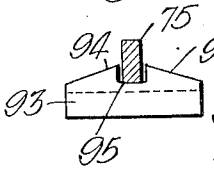

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Fig. 3.

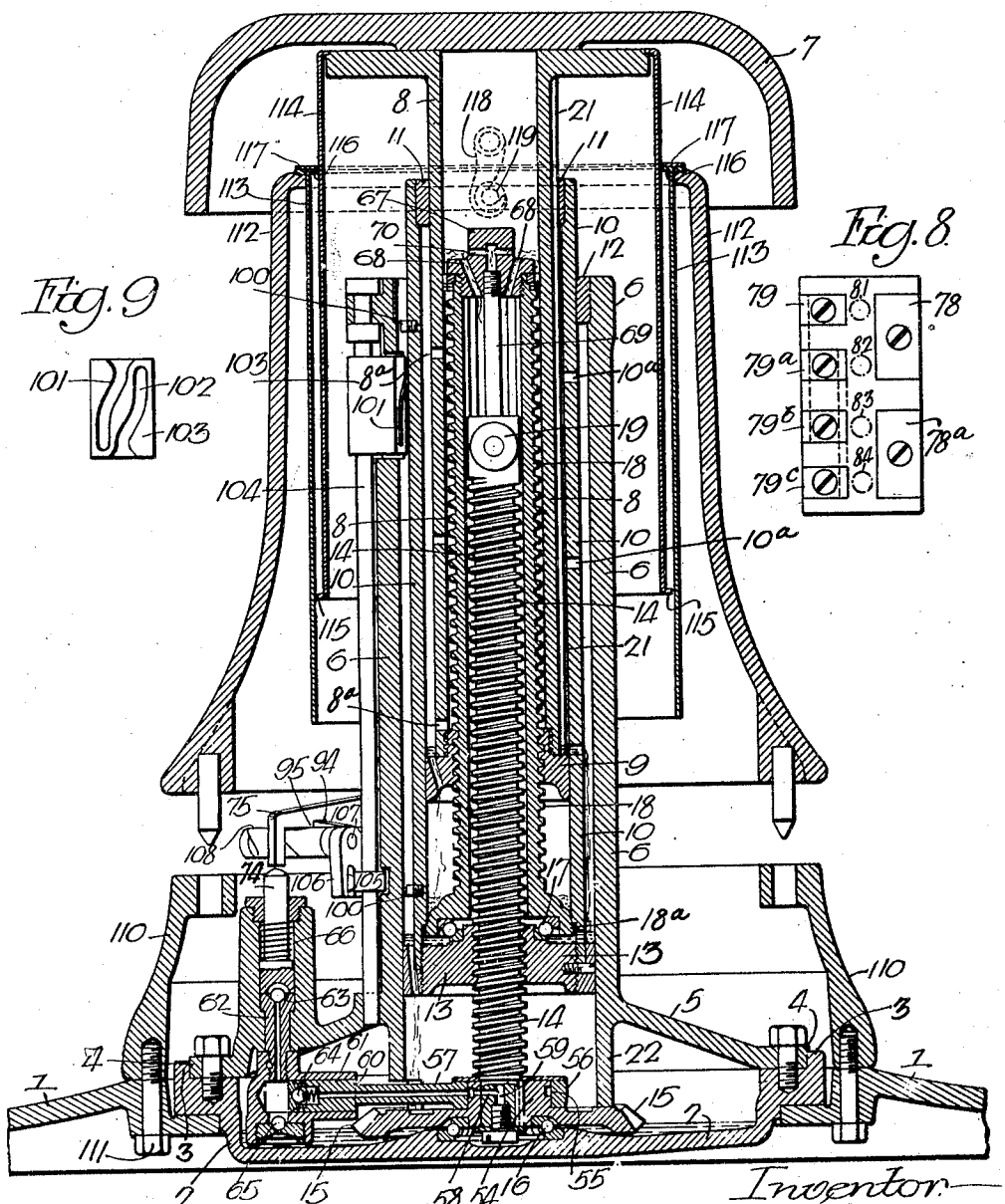

Fig. 9

Fig. 8

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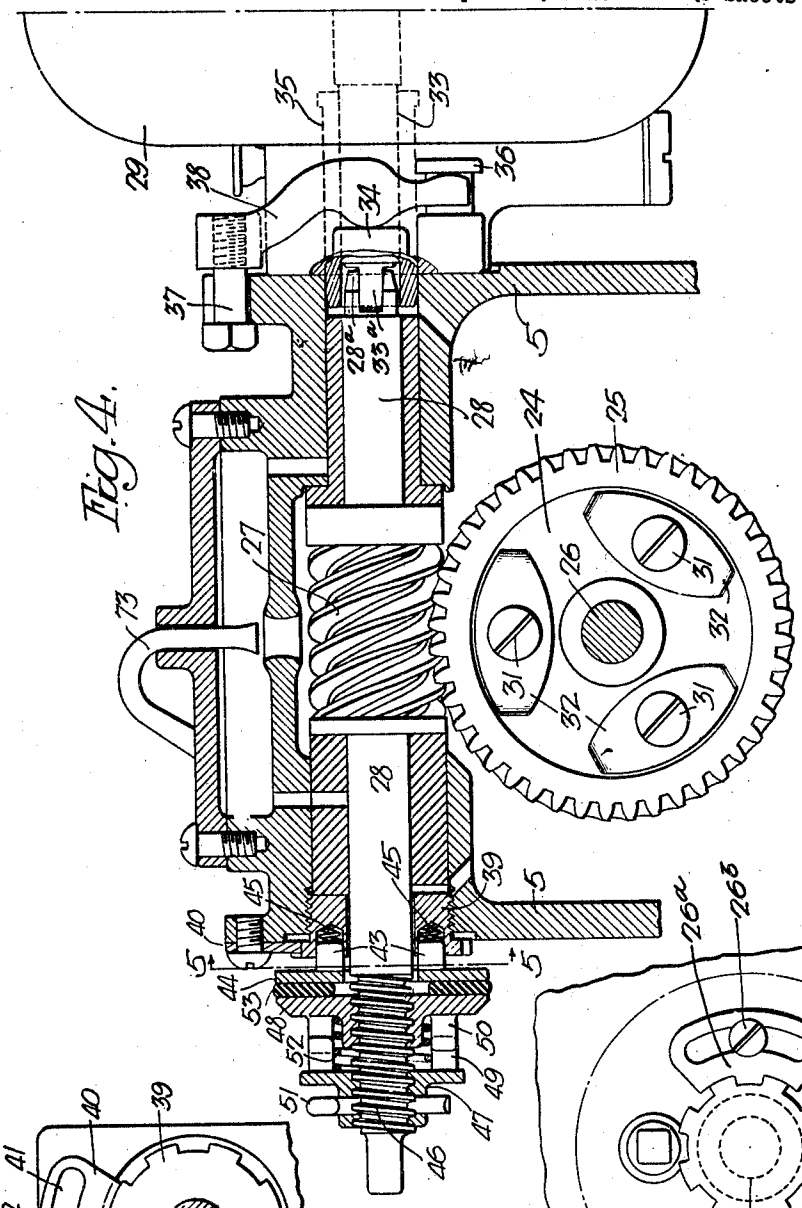

Fig. 4.

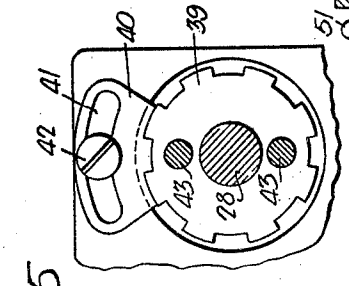

Fig. 5

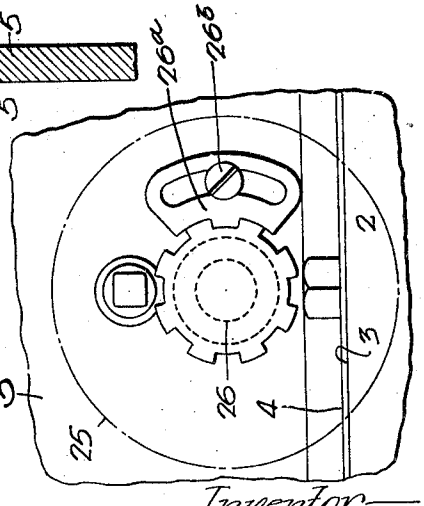

Fig. 10.

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Fig. 6.

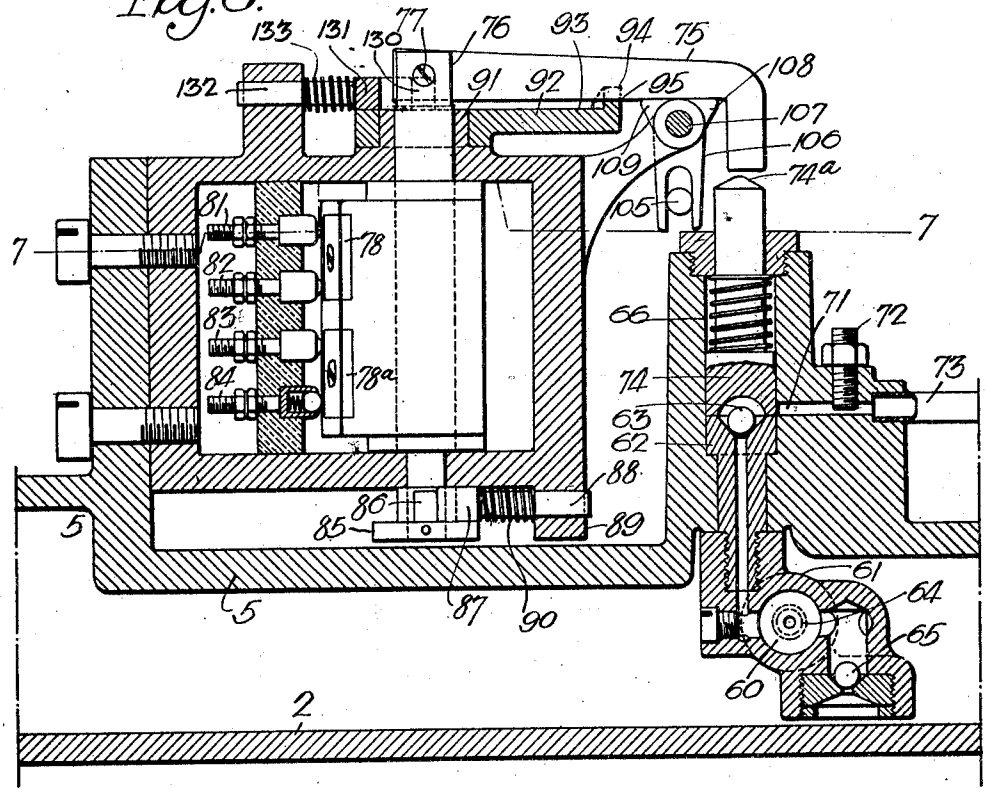
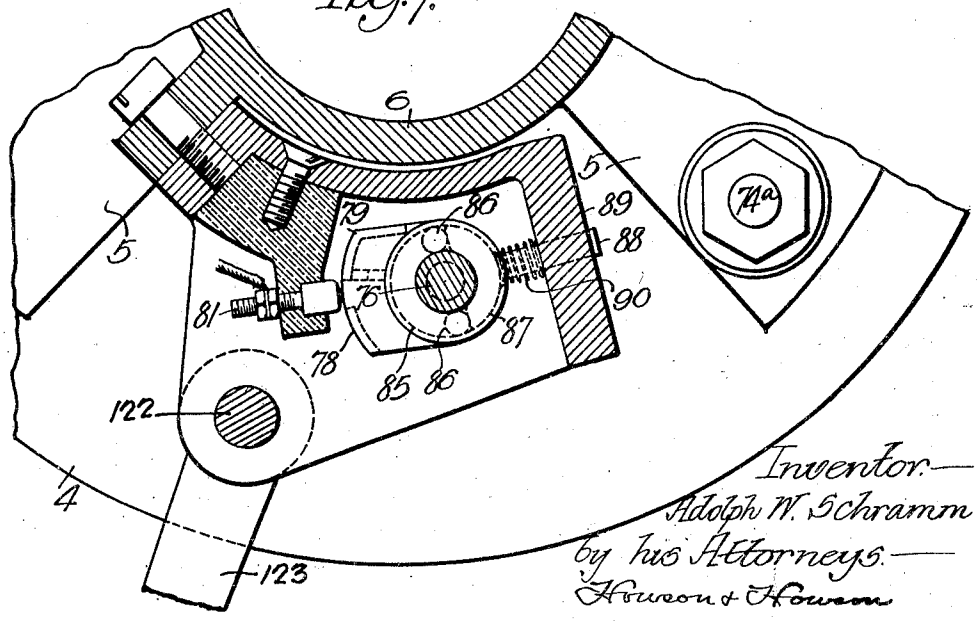


Fig. 7.



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Patented Jan. 17, 1928. 1,656,760

UNITED STATES PATENT OFFICE.

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CHAIR-ELEVATING MECHANISM.

Application filed September 25, 1923. Serial No. 664,697.

One object of this invention is to provide a novel elevating mechanism particularly adapted for dental and barbers' chairs, whereby it shall be possible to conveniently control the raising and lowering of a chair body, and the invention especially contemplates means for moving said body continuously as opposed to intermittently acting means, in either direction for any desired distance within predetermined limits, together with means whereby the speed of movement is caused to be the same when the chair body is lowered as when it is raised, or if desired, made different from the latter.

A further object of the invention is to provide novel means for limiting the movement of the several parts of the device with a view to preventing damage from overtravel.

The invention also contemplates elevating mechanism including coaxial screws together with novel means for operatively connecting certain of said screws and novel means for preventing the actuating motor being reversed until it has come to rest.

The invention further includes automatic safety devices whereby the reversal of the motor is prevented until it and incidentally the mechanism to which it is connected, has come to rest, together with means whereby the motor controlling switch is automatically released from the control of the operator when the parts of the device has moved to within predetermined distances of the limit of their safe travel in either direction.

Another object of the invention is to provide novel braking means for causing the downward speed of the chair body to be the same as its upward speed, which mechanism shall also be available for holding the chair body with its applied load in any given position, as well as for preventing its coasting downwardly;—the construction moreover being such as to operate silently.

I also desire to provide a device of the general character above indicated with novel means for mounting the motor so as to maintain the alignment of the motor shaft and the member driven therefrom, which means shall be particularly adapted to permit of the motor being conveniently removed and replaced by another.

The invention also includes a novel form of cover particularly designed to facilitate the inspection of the mechanism and including novel means whereby it may be conveniently and quickly moved into a position permitting of such inspection.

The invention likewise contemplates novel automatic means for supplying and circulating a lubricant for the elevating and guiding mechanism in order that wear may be reduced to a minimum.

I further desire to provide means for manually operating the chair in event of failure of the elevating motor to properly function or in the event of failure of the current supply.

These objects and other advantageous ends I attain as hereinafter set forth, reference being had to the accompanying drawings in which,

Fig. 1 is a plan of a chair constructed in accordance with my invention;

Figs. 2 and 3 are vertical sections taken respectively on the lines 2—2 and 3—3 of Fig. 1,—a part of the enclosing casing being shown in Fig. 3 raised to permit inspection of the elevating mechanism;

Fig. 4 is a vertical section on an enlarged scale, taken on the line 4—4, Fig. 1;

Fig. 5 is a transverse vertical section on the line 5—5, Fig. 4;

Fig. 6 is a vertical section also on an enlarged scale, taken on the line 6—6, Fig. 1;

Fig. 7 is a horizontal section on the line 7—7, Fig. 6;

Fig. 8 is an elevation of a portion of the motor reversing switch;

Fig. 9 is an elevation of the cam drum forming part of my invention;

Fig. 10 is an elevation of a detail of the invention;

Fig. 11 is an enlarged horizontal section taken through the telescoping screws and the rollers whereby they are splined together; and,

Fig. 12 is an elevation partly in section illustrating the connection between the switch and the controlling lever.

In the above drawings, 1 represents a base plate having a central circular opening in which is removably mounted a pan-like supporting member 2 held in place by suitable means such as screws (not shown). This pan is provided with an upwardly projecting flange 3 forming or defining an annular recess for the reception of the outwardly projecting flange 4 of a columnar frame which

has a body portion 5 and an upwardly extending hollow column 6 constituting a container and guideway for certain elements hereafter referred to.

A portion of the body of the chair is indicated at 7 and this has an inverted dished form, being fixed to and carried by the upper end of a vertically extending sleeve 8 to whose lower end is fixed an internally threaded nut 9 slidably guided within a second sleeve 10. The upper part of this first sleeve 8 is also guided in a suitable bushing 11 fixed within the upper end of said second sleeve 10. The upper part of the latter is likewise guided by a second bushing 12 mounted in the upper end of the column 6, while the lower end of said sleeve 10 has fixed to it a nut 13 which slidably engages and is guided by the inner cylindrical surface of the column 6.

Mounted coaxially within the sleeves 8 and 10 is a vertically extending screw 14 having fixed to its lower end a gear 15. The latter and the screw 14 are supported on a suitable ball bearing 16 carried by the pan structure 2. This screw is engaged by the nut 13 of the sleeve 10 so that said sleeve will move vertically up or down when the gear and its attached screw are rotated. The nut 13 supports a ball bearing 17 which in turn supports a tubular screw 18 extending through the nut 9. These two telescoping screws 14 and 18 are operatively connected so that they necessarily rotate together, while being free to move longitudinally one over the other. For this purpose I mount on the upper end of the screw 14 two pairs of coaxial rollers 19 (Fig. 11) and so form the interior of the screw 18 as to provide guideways for said rollers, which thus insure relative longitudinal movement of said screws with a minimum friction. At the same time the above construction insures that said screws are in effect keyed or splined together so that they necessarily rotate together.

The nut 13 is rigidly fixed to the sleeve 10 which is prevented from rotating in the column 6 by a longitudinally extending and preferably integral key 20, (Fig. 1) operative in a keyway of the bushing 12 which is fixed in the upper end of the column 6. Similarly the nut 9 is fixed to the lower end of the sleeve 8 which is provided with a key 21 also preferably integral with the tube and longitudinally slidable through a suitable keyway in the bushing 11 fixed in the upper end of the sleeve 10.

With this construction and arrangement of parts, rotation of the gear 15 causes rotation of the screws 14 and 18, and rotation of the screw 14 will cause vertical movement thereon of the nut 13 and hence of the sleeve 10. This vertical movement of the nut 13 imparts a similar movement to the hollow screw 18, which being rotated with the screw 14, imparts relative vertical movement to the nut 9 and sleeve 8. The latter is consequently moved vertically at a speed, which, if the two screws have the same pitch, is double that of the nut 13 and its sleeve 10. It is to be noted that the above mechanism, while being of a compact nature owing to the telescopic action of the screws and their associated sleeves, none the less possesses for a given height of column or frame structure, considerable range of movement so that the chair body will be raised to a relatively great height when the parts are at their upper limit of motion.

It is especially to be noted that the frame structure 5—6 is provided with a downwardly extending flange 22 coaxial with the screws 14 and 18 and designed to extend immediately adjacent the body of the gear 15 so as to insure that this shall not separate from or move vertically relatively to the ball bearing 16 or its supporting structure 2. Likewise the outer screw 18 has on its lower end an outwardly extending flange 18ª which projects under a suitable annular shoulder formed on the lower portion of the sleeve 10 so as to prevent the possibility of said screw moving vertically relatively to the ball bearing 17 and the nut 13 on which it rests.

For driving the bevelled gear 15, I provide a second bevelled gear 23 frictionally connected to the hub 24 of a worm gear 25 (Fig. 2). The latter gear is rotatably supported upon a fixed spindle 26 suitably mounted in a portion of the frame structure 5 and is driven from a worm 27 on a shaft 28, actuated by means hereafter described, from an electric motor 29. To lock the spindle 26 in place it is formed with a notched head (Fig. 10) designed to be engaged by the tooth of a dog 26ª, having a slot concentric with said spindle and designed for the reception of a clamping screw 26ᵇ.

For frictionally connecting the bevelled gear 23 with the worm gear 25, I provide a ring 30 coaxial with said bevelled gear 23 and frictionally drawn against it by a series of screws 31 extending through the hub 24 of the worm wheel 25 parallel to the spindle 26. Each of these screws is yieldingly acted on by a bowed spring plate 32, (Fig. 4) mounted between its head and the adjacent face of the worm wheel 25, and the arrangement and proportions of the parts are such that slippage will occur between the ring 30 and the bevelled gear 23 when more than a predetermined load is applied to the latter:—the device serving as a safety mechanism to protect the whole driving train from the stresses due to the momentum of the rotating element of the motor when certain limit stops come into action as hereafter described.

For operatively connecting the worm

shaft 28 with the armature shaft 33 of the actuating motor 29, the adjacent ends of these shafts are preferably provided with a flexible coupling, in the present instance consisting of two series of intermeshing teeth 28^a and 33^a, (Fig. 4). For detachably securing the motor to the frame and coupling its armature shaft to the worm shaft 28, I form on the motor casing a pair of oppositely projecting lugs 34, and coaxially with the armature shaft 33 provide said motor with a sleeve 35 projecting beyond a plane portion of the motor casing which lies at right angles to said armature shaft. The face of that portion of the frame 5 against which the motor is to be mounted is likewise faced off, and concentrically with the worm shaft 28 is recessed for the reception of the projecting end of the motor sleeve 35. The frame 5 is also provided with a pair of headed studs 36, so positioned as to lie respectively under the lugs 34 when the end of the sleeve 35 is entered in the recess of said frame;—the latter having an opening vertically above the worm shaft 28 for the reception of a bolt 37. This bolt is designed to be threaded into the upper and central portion of a clamping yoke 38, the lower ends of whose branches rest upon the lugs 34, beyond which they are forked to respectively fit upon the studs 36 (Fig. 4).

With this arrangement of parts, when it is desired to operatively connect the motor with the worm shaft the sleeve 35 is entered in the recess of the frame 5 so that the toothed end 33^a of the armature shaft 33 meshes with or operatively connects to the correspondingly toothed end 28^a of said worm shaft 28. The yoke 38 is then placed between the body of the motor and the lugs 34 so that it extends over these and has the forked ends of its branches engaged with the studs 36, after which the bolt 37 is tightened, thus through the yoke so acting on the lugs 34 that the plane face of the motor is brought into and maintained in intimate engagement with the adjacent plane face of the supporting frame, while the two shafts 33 and 28 are operatively coupled in alignment.

For insuring that the downward movement of the chair shall take place at the same speed as its upward movement and also for the purpose of bringing the motor to rest when the electric current is cut off, I provide suitable mechanism such as that shown in Figs. 4 and 5, which broadly consists of an automatic braking device applied in the present instance to the worm shaft 28, although obviously without departing from my invention, it may be applied at other parts of the mechanism between the motor 29 and the screw 14. This device includes in the present instance a retaining ring 39 threaded into the frame structure 5 coaxially with the work shaft 28 and incidentally designed to adjustably retain in position the worm 27, carried by said shaft. This ring is preferably castellated and is adjustably held in any given position by a toothed plate 40, (Fig. 5) having a slot 41 for the reception of a clamping screw 42 threaded into said frame. The outer face of the ring 39 is formed with holes for the reception of a suitable number of pins 43 projecting from and in the present instance, integral with a disc 44. In said holes are suitable springs 45 tending to force outwardly said pins and the disc.

The outer portion of the worm shaft 28 is provided with a relatively coarse thread 46 on which are mounted a relatively fixed nut 47 and an adjustable nut 48, respectively provided with pairs of cooperative projections or teeth 49 and 50, whereby the rotation of the nut 48 is limited relatively to the nut 47. The latter is fixed in any given position on the screw 46 by a cotter pin 51, and between said nuts I mount a suitable coil spring 52 having its ends connected to them respectively so that it tends to turn the nut 48 on the screw 46 in one direction and opposes its movement in the opposite direction. This second nut 48 is provided with an outwardly extending flange and between the latter and the disc 44 is mounted a ring 53 of material, such as brake lining, for causing friction between these members.

With this arrangement of parts, when the armature of the motor 29 is turned in such a direction as to cause elevation of the chair body, the shaft 28 and the worm 27 thereon turn in such a direction that the screw 46 tends to cause the nut 48 to back away from the disc 53 and hence relieve the friction between the flange of said nut and the fixed disc 44. As a result, this braking and regulating device offers practically no opposition or resistance to the above noted rotation of the shaft 28 and the consequent elevation of the chair body. If, however, the direction of rotation of the motor is reversed or occurs in the opposite direction, as when the chair body is to be lowered, the shaft 28 and hence the screw 46, turn in such a direction that the nut 48 is automatically moved toward the disc 44, owing to the combined action of the spring 52 and to the friction existing between the face of its flange, the friction ring 53 and the disc 44, as well as to the inertia of the nut 48 or to the latter alone if said spring be omitted, as may be the case under certain conditions.

As a consequence of this rotation of the nut 48 and the resultant increased friction between its flange and the fixed disc 44, the springs 45 are compressed by the pins 43

and the frictional resistance to the rotation of the shaft 28 is increased until finally the nut 48 is so far rotated on the screw 46 that its pins 50 come into engagement with the pins 49 of the fixed nut 47. Thereafter no further relative rotation of the two nuts can occur and the continued rotation of the shaft 28 and the operation of the motor is opposed by the constant frictional force due to the above device. If during this operation, the current should be cut off from the motor, the frictional resistance applied by said device serves as a brake which brings to rest the motor armature and the train of mechanism connected thereto, so that coasting or downward drifting of the chair body is effectually prevented. By means of the adjustable nut 47, the amount of the braking force applied may be so regulated that the motor and its associated parts are caused to operate at any desired speed when the chair body is moving downward, and when current is cut off from the motor will bring it to rest and thereafter hold it motionless. As soon as the downward movement of the chair body has been arrested, the above described braking- or load-regulating device is again in condition to permit either the relatively free upward movement of the chair body without opposition, or to exert a frictional opposition to its downward movement as above described.

For providing the necessary lubrication to the above described mechanism and also for supplying a working fluid for governing the motor controlling elements of the apparatus, I utilize a liquid such as a suitable lubricating oil and form the hub of the bevelled gear 15 with, or mount upon it, an eccentric 54 (Fig. 3) having an annular groove or channel 55 communicating through a passage 58 with an axial passage 59 in the screw 14. Mounted on the eccentric 54 is a strap 56 having an eccentric rod 57 formed with a plunger 60 operative in an oscillatory cylinder 61. The latter is mounted to operate on a hollow spindle 62 fixed in the frame structure 5 and provided at its upper portion with a valve seat for the reception of a check valve 63. The hollow passage of this spindle communicates with the chamber of the cylinder 61 which has also a passage opening into the lower portion of the pan 2 and controlled by a check valve 65. The plunger 60 and eccentric rod 57 are hollow or tubular and the former has a suitable seat for the reception of a spring-controlled valve 64; the arrangement being such that the rotation of the gear 15 reciprocates the eccentric rod and plunger 60, causing liquid to be drawn from the pan 2 into the chamber of the cylinder 61 and discharged therefrom through said plunger and connecting rod into the screw 14. It is also delivered through the spindle 62 past the valve 63 into the chamber of a cylinder 66 formed to extend vertically in a portion of the structure 5.

The upper end of the second screw 18 is normally closed by a plug 67 having passages 68 leading outwardly from its hollow interior. Into this plug is threaded a downwardly extending tube 69 making a sliding but oil tight fit with the wall of the axial bore 59 of the inner screw 14 and open at the bottom so as to receive oil therefrom. As a result of this construction, when the plunger 60 is operated, oil flows from the cylinder 61 into the screw 14 and thence through the tube 69 regardless of whether the outer screw 18 is in its lower or any other position. Said oil is delivered from the tube 69 through passages 70 in the plug 67 from which it is free to flow downwardly on the surface of the screw 18 as well as through passages 68 so as to lubricate the threads of the screw 14. It may also enter other suitably placed passages 8^a and 10^a so as to provide the desired lubrication for the other parts of the telescopic elements of the chair elevating mechanism above described and from all of these said lubricant drains back into the pan 2 for repeated use. From the lower part of the cylinder 66 I provide a passage 71, (Fig. 6) whose area of cross section may be regulated and restricted to any desired extent by a screw 72 and which leads to a discharge pipe 73 whose outlet is so positioned as to deliver lubricant over the worm 27 and to its associated bearings.

In order to prevent accidental overtravel of the chair-operating mechanism in either direction and to permit of the apparatus being reversed after it has been brought to either extremity of its possible movement, as well as to prevent the possibility of reversal of the motor while its armature is still turning, I provide the mechanism shown in Figs. 2, 3, 6 and 7, which is particularly distinguished by the fact that it utilizes the lubricating liquid as its governing medium. For this purpose, the cylinder 66, (Fig. 6) has mounted within it a plunger 74 whose upper end is made conical as indicated at 74^a, so as to be capable of co-operating with the suitably formed portion of a switch lever 75. This latter is connected to what in the present instance is a vertically extending spindle 76, by a horizontal pivot 77 which extends through a slot in said spindle so as to be capable of axially turning it. This spindle governs or is operatively associated with motor controlling mechanism or apparatus such as certain relatively movable contacts 78, 78^a, 79, 79^a, 79^b, and 79^c, (Fig. 8) which coact with suitable fixed contacts 81—82 and 83—84 for controlling the starting, stopping and direction of rotation of the motor.

Suitable means are provided for resisting movement of the spindle 76 with its contacts

from and for insuring its return to, a neutral or "off" position, and for this purpose I provide a device such as a disc 85 fixed to the spindle. This disc has a pair of pins 86 projecting from one of its faces so as to cooperate with the ends of the branches of a yoke 87. This is mounted on an arm 88 slidable in a suitable portion 89 of the fixed supporting structure, and acted on by a spring 90, whereby said yoke is at all times pressed toward the pins 86, thus tending to return the spindle 76 with its attached parts to a mid or neutral position.

The fixed supporting structure 89 coaxially with the spindle 76, is provided with a hub or extension 91 on which is rotatably mounted the controlling lever 92 for starting, stopping and causing reversal of the motor, and this lever is connected by a link 120, (Fig. 1) with an arm 121 fixed to a vertically extending spindle 122 (Fig. 2) which likewise has fixed to it a foot lever 123 projecting from the base. Said lever 92 has an arm 93 formed with an upwardly projecting rib 94 having an upwardly opening central recess 95 (Fig. 12) designed for the reception of the switch lever 75 under certain conditions, it being noted that said rib slopes upwardly on both sides to this centrally placed recess. As shown in Fig. 6, the lever 92 has a pair of upwardly projecting posts 130 designed to cooperate with the arms of a yoke 131 whose body 132 is slidably guided in an opening in the structure 89. A spring 133 on this body at all times presses the ends of the yoke toward the posts 130 and tends to return the lever 92 to or retain it in its neutral or mid position. The parts are so designed and arranged that when, owing to the presence of liquid under pressure in the cylinder 66, (Fig. 6) the plunger 74 is forced to its upper limit of motion, it is capable of swinging the switch lever 75 on its pivot 77 to such a height as to move it out of the recess 95 and thus operatively uncouple it from the foot or main lever 92. Moreover, owing to the conical form of the end 74ª of this plunger 74, which is so positioned as to be operative when the levers 92 and 75 are in their neutral or "off" positions, the lever 75 will ride up on this end as said two levers approach the neutral or "off" position and will be disconnected from said foot lever. If, however, said plunger is in its lower position, it obviously cannot operate on the lever 75 and hence cannot then act to disconnect it from the control lever 92.

With this construction, if for example the foot controlled lever 92 be moved from its neutral position in either direction, it carries with it the switch lever 75 to which it is normally coupled. As a consequence, current is supplied to the motor 29, which thereupon operates to raise or lower the chair body and in any case causes operation of the pump provided by the plunger 60 and cylinder 61. This latter not only supplies lubricant to the various parts of the apparatus but at once causes said lubricant to act upon the plunger 74, which is thereupon moved to its upper position.

If now the foot lever be released and allowed to return to its "off" position, the switch lever 75 is automatically disconnected from it upon reaching its neutral or "off" position, owing to the fact that it rides up on the conical plunger end 74ª and is swung upwardly on its pivot 77 out of the recess 95. Consequently even though the foot lever be again operated from its "off" position, the motor cannot be started in either direction until it comes to rest, since it is first necessary that the pump plunger 60 cease to operate and for the liquid in the cylinder 66 to leak out through the restricted passage 71. When this has occurred, the plunger 74 falls and again permits the switch lever 75 to enter the recess 95 of the lever 92 so that this may be again moved by the operator. From the above it will be obvious that it is not possible for the operator to cause reversal of the motor until its armature has first come to rest. Damage to the latter is thus effectually prevented, since it is an impossibility to supply said motor with current while its rotor is still moving under its momentum or is being driven by the weight of the chair body and its associated parts.

In order to prevent the motor being continued in operation with a resulting injury to the apparatus after the chair body has been moved to its allowable limit of movement in either direction, I provide on the tube 10 two projecting pins or lugs 100, (Fig. 3) positioned to operate in cam grooves 101 and 102 formed in a cam drum 103 fixed to a vertical spindle 104 suitably supported on the frame,—preferably on a portion of the column 6. On the lower end of this spindle is an arm 105 which extends between the branches of a forked arm 106 (Figs. 1, 3 and 6) fixed to an oscillatory spindle 107, supported so as to extend horizontally under the switch lever 75. Fixed on said spindle is a sleeve having two cam portions 108 and 109 shaped to cooperate with the switch lever 75 when this is in the two positions in which the movable contacts 78 and 79 engage the cooperating fixed contacts of the electrical controller.

When the chair body is moved by the operation of the motor toward and into its extreme upper position for example, one of the projections 100 on the sleeve 10 enters the cam groove 102 for example, which is so shaped that as a result the cam drum 103 and hence the spindle 104 is turned through a predetermined angle. The arm 105 is thus likewise given an angular movement as is

also the lever arm 106 which it engages, so that the cam 109 on the spindle 107 is turned into such position as to elevate the switch lever 75 and thus release it from the foot lever 92. It thereupon is automatically returned to its neutral position and caused to cut off current from the motor, even though the foot lever 92 be still retained in its displaced position.

The same action obviously occurs adjacent the outer end of the limit of travel of the mechanism associated with the chair body, since the second one of the projections 100 so cooperates with the cam grooves 101 as to turn the spindle 107 into such a position that the part 108 of the cam sleeve similarly raises the switch lever 75 out of the recess of the operating lever, leaving it free to return to its "off" position in which the apparatus is permitted to come to rest without possibility of overtravel and consequent damage.

It is to be noted that if after the switch lever has been automatically disconnected from the operating lever at the upper limit of travel of the chair body for example, said latter lever may be again connected to said switch lever by permitting the former to move to the neutral position. The motor however, can only be started in such a direction as to cause downward movement of the chair body, since the cam 109 will again disconnect the switch lever 75 from the operating lever before the motor is connected to the supply circuit. If, however, the operating lever be moved in such a direction as to start the motor in the direction necessary to lower the chair body, it will carry with it the switch lever 75 and cause closing of the contacts on the controller necessary to cause operation of the motor as desired.

For normally enclosing and protecting the above described mechanism, I mount on the base plate 1 a relatively heavy casing ring 110 fastened to the base 1 by suitable bolts 111. On this ring rests the lower end of an enclosing casing 112, whose upper end extends under the downwardly flanged portion 7 of the chair body and has a central opening from which depends a sleeve 113. On the upper end of this latter is fastened a ring 117 loosely resting on the upper end of the casing 112 and designed to coact with a second sleeve 114 whose upper end is fixed to an outwardly extending flange of the tube 8 from which it depends. This second sleeve 114 has at its lower end an outwardly projecting flange 115 designed to engage an inwardly projecting flange 116 at the upper end of the outer sleeve 113, so that as the chair body is elevated, the two flanges 115 and 116 will come together, after which as the chair body continues to rise, the sleeve 113 will be drawn out of the main part 112 of the enclosing casing. As a result the elevating mechanism is completely enclosed, not only when the chair body is in its lower position, but also in any of its elevated positions.

When for any reason, it is desired to expose the elevating mechanism, the main casing 112 is raised, and for this purpose I provide a plurality of hooks 118 pivoted on the inside of the depending part of the chair body 7 and designed to cooperate with outwardly projecting pins or lugs 119 on the upper end of the casing 112. As the chair body is elevated by the operation of the motor, the hooks 118 are moved into engagement with these pins so that said body carries with it the casing 112 and the sleeve 113. Access may thereupon be had to the motor and other parts of the associated apparatus.

I claim—

1. The combination in chair elevating mechanism of a chair body; a motor; and means for transmitting power from said motor to raise the chair body comprising a supporting structure; a fixed spindle mounted in said supporting structure; a gear driven by the motor and rotatably mounted on said spindle; a second gear rotatably mounted on the first gear; and a slip clutch operatively connecting said gears under normal conditions.

2. The combination in chair elevating mechanism of a supporting structure; a shaft journaled therein; a motor having its casing formed to engage a portion of said supporting structure; the adjacent ends of said shaft and the armature shaft of the motor being formed to separably engage each other; and means for detachably clamping the motor to the supporting structure to maintain said shafts in operative connection, the same consisting of lugs on the motor, with a yoke mounted on the supporting structure and engaging said lugs to maintain the motor and supporting structure in engagement.

3. The combination in chair elevating mechanism of a supporting structure; a shaft journalled therein; a motor having its casing formed to engage a portion of said supporting structure; the adjacent ends of said shaft and the armature shaft of the motor being formed to be detachably coupled; and means for clamping the motor to the supporting structure to maintain said shafts in operative connection, the same consisting of a pair of lugs on the motor; posts on the supporting structure; a yoke fulcrumed on the posts and engaging the lugs; with a threaded member for holding the yoke in operative position.

4. The combination with a chair body of mechanism for raising said body; an enclosing casing for said mechanism; and means

for connecting the body to said casing comprising a hook to cause said casing to be raised with the body to expose said mechanism.

5. The combination with a chair body of mechanism for raising said body; a casing comprising telescoping members enclosing said mechanism and connected to the latter so as to be raised and lowered therewith; a main enclosing casing; and means including a hook for connecting said main casing to the body at will to cause it to be raised therewith.

6. Apparatus comprising a pair of screws; a nut for one of said screws, the other of said screws engaging said nut; and means for preventing a relative longitudinal movement between said nut and said last-mentioned screw.

7. In combination, a pair of shafts adapted to be detachably coupled; supporting members for the respective shafts, one of said members having a shoulder; and a fulcrumed element mounted on the other of said members and adapted to engage said shoulder, whereby said members may be secured in engagement.

8. In combination, a pair of shafts adapted to be detachably coupled; supporting members for the respective shafts, one of said members having a shoulder; an element fulcrumed on the other of said members and positioned to engage said shoulder; and means for exerting a force on said element, whereby said members may be secured in position.

9. In combination, a pair of shafts adapted to be detachably coupled; supporting members for the respective shafts, one of said members having a shoulder; a post on the other member; an element fulcrumed on said post and engaging said shoulder; and means for exerting a force on said element, whereby said members may be secured in position.

10. In combination, a pair of shafts adapted to be detachably coupled; supporting members for the respective shafts, one of said members having a pair of shoulders; a yoke fulcrumed on the other of said members with the respective arms thereof in engagement with said shoulders; and means for exerting a force on said yoke, whereby said members may be secured in position.

11. In combination, a pair of shafts adapted to be detachably coupled; supporting members for the respective shafts, one of said members having a pair of shoulders; a yoke fulcrumed on the other of said members with the respective arms thereof in engagement with said shoulders; and means extending from said first-mentioned member for exerting a force on said yoke, whereby said members may be secured in position.

12. In combination, a pair of shafts adapted to be detachably coupled; supporting members for the respective shafts, one of said members having a pair of posts; a pair of lugs on the other member; a yoke fulcrumed on said posts and engaging said lugs; and a member for holding said yoke in such position as to secure said supporting members in position.

13. Apparatus comprising a pair of hollow telescoping drive members; and a pipe positioned within the inner member and supported at one end on the outer member, the other end of said pipe being in sliding engagement with the adjacent wall of the inner member.

14. Apparatus comprising a pair of hollow telescoping drive members; a pipe positioned within the inner member and supported at one end on the outer member; and means for supplying a lubricant to the other end of said pipe.

15. Apparatus comprising a pair of hollow screws rotatably coupled in relative longitudinal movement; a pipe positioned within the inner screw and supported at one end on the outer screw; and means for supplying a lubricant to the other end of said pipe.

16. Chair elevating mechanism including a pair of screws; sleeves having portions respectively engaging said screws, said sleeves having perforations; and means for supplying lubricant through said holes to the coacting surfaces of said sleeves.

ADOLPH W. SCHRAMM.