W. H. HULTGREN & G. R. REBMANN.

CHAIR.

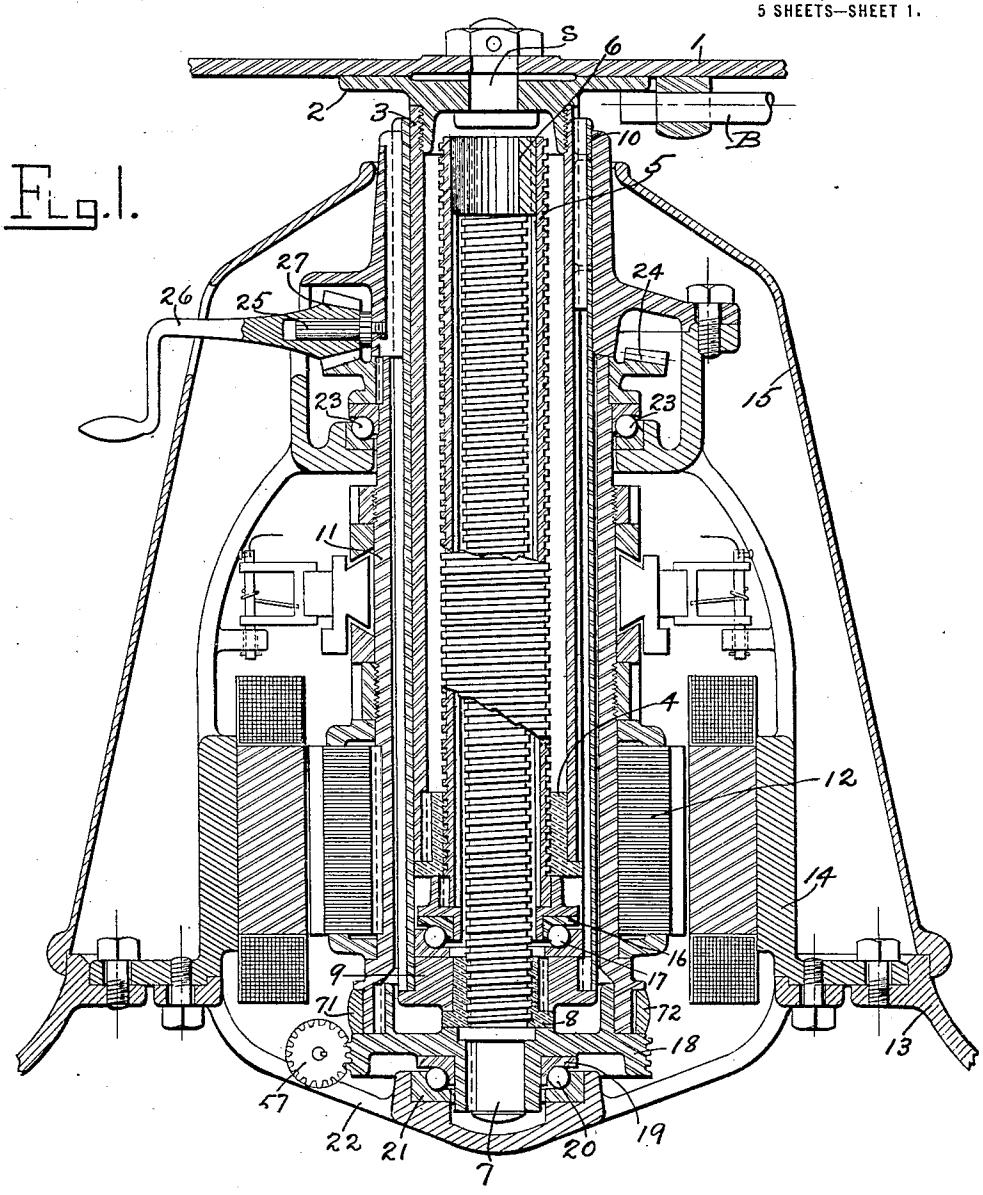
APPLICATION FILED JULY 13, 1917.

1,279,346.

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5 SHEETS—SHEET 1.

Fig. 1.



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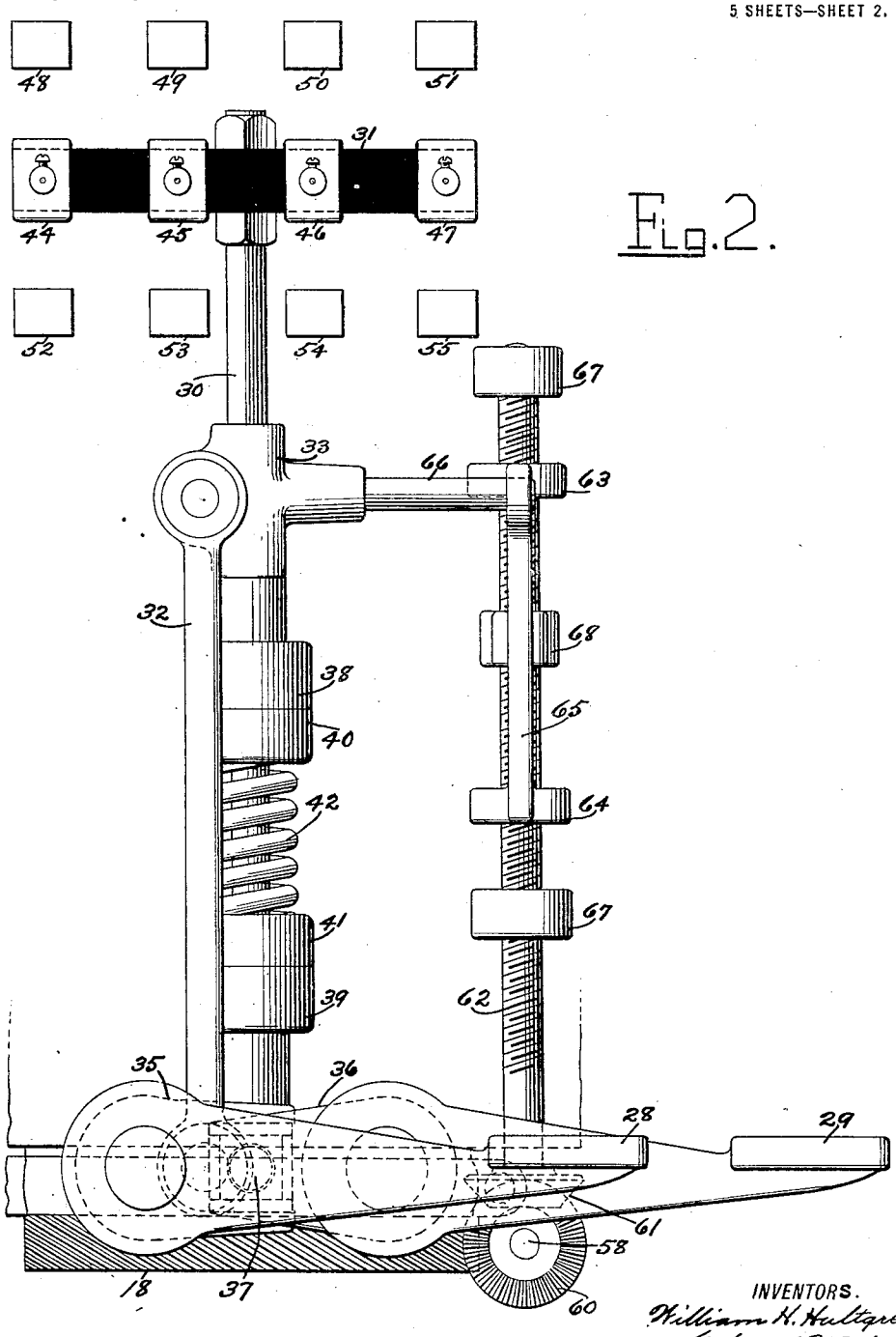


Fig. 2.

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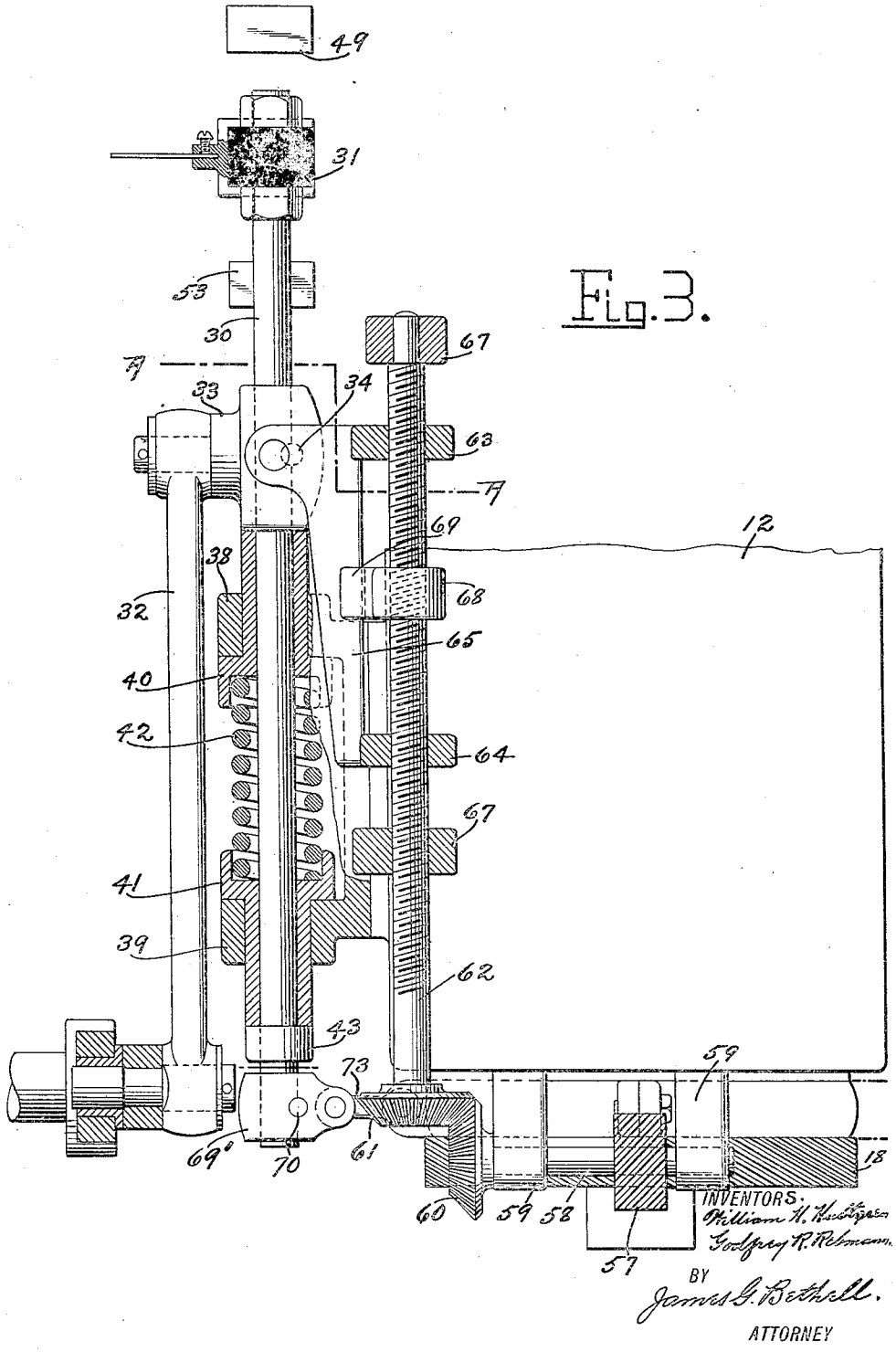


Fig. 3.

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5 SHEETS—SHEET 4.

FIG. 6.

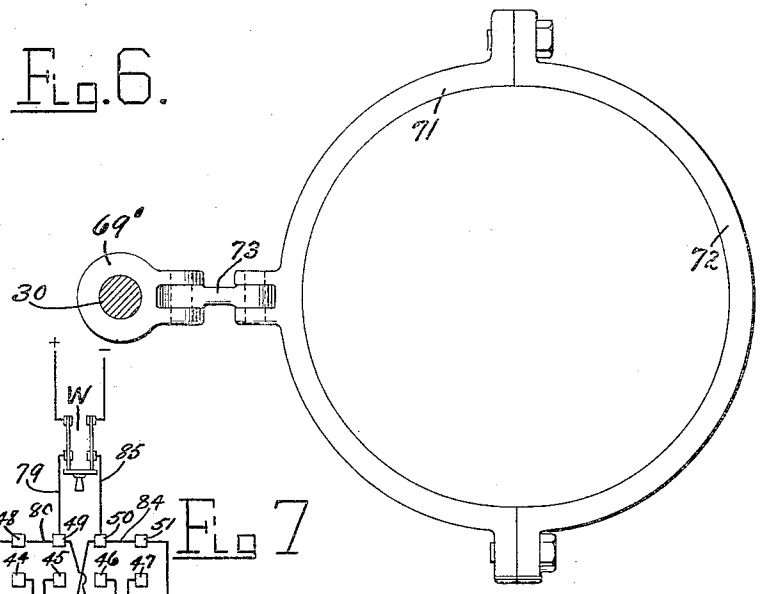


FIG. 7

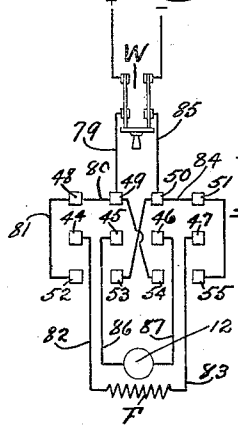
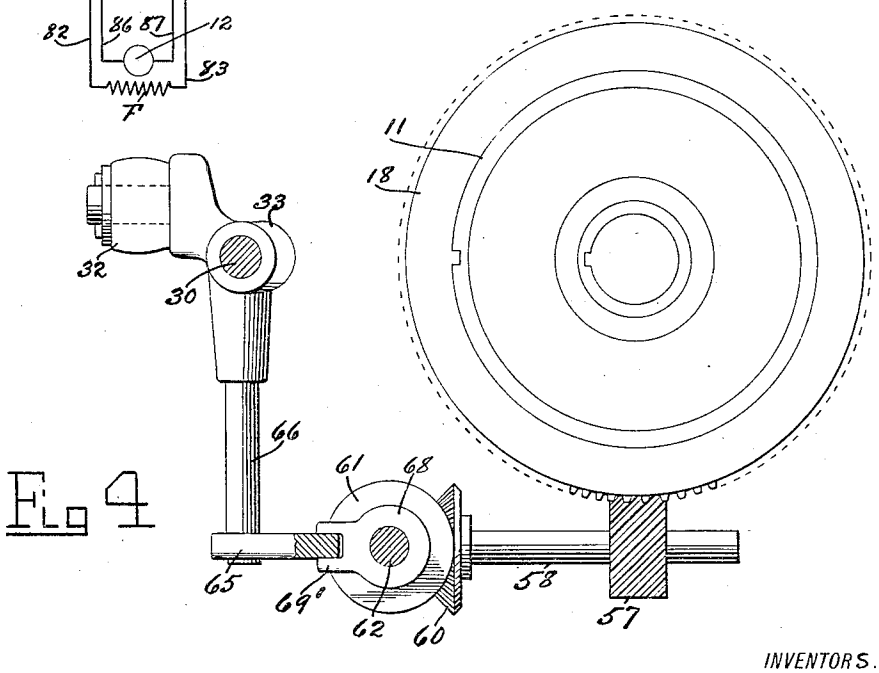


FIG. 4



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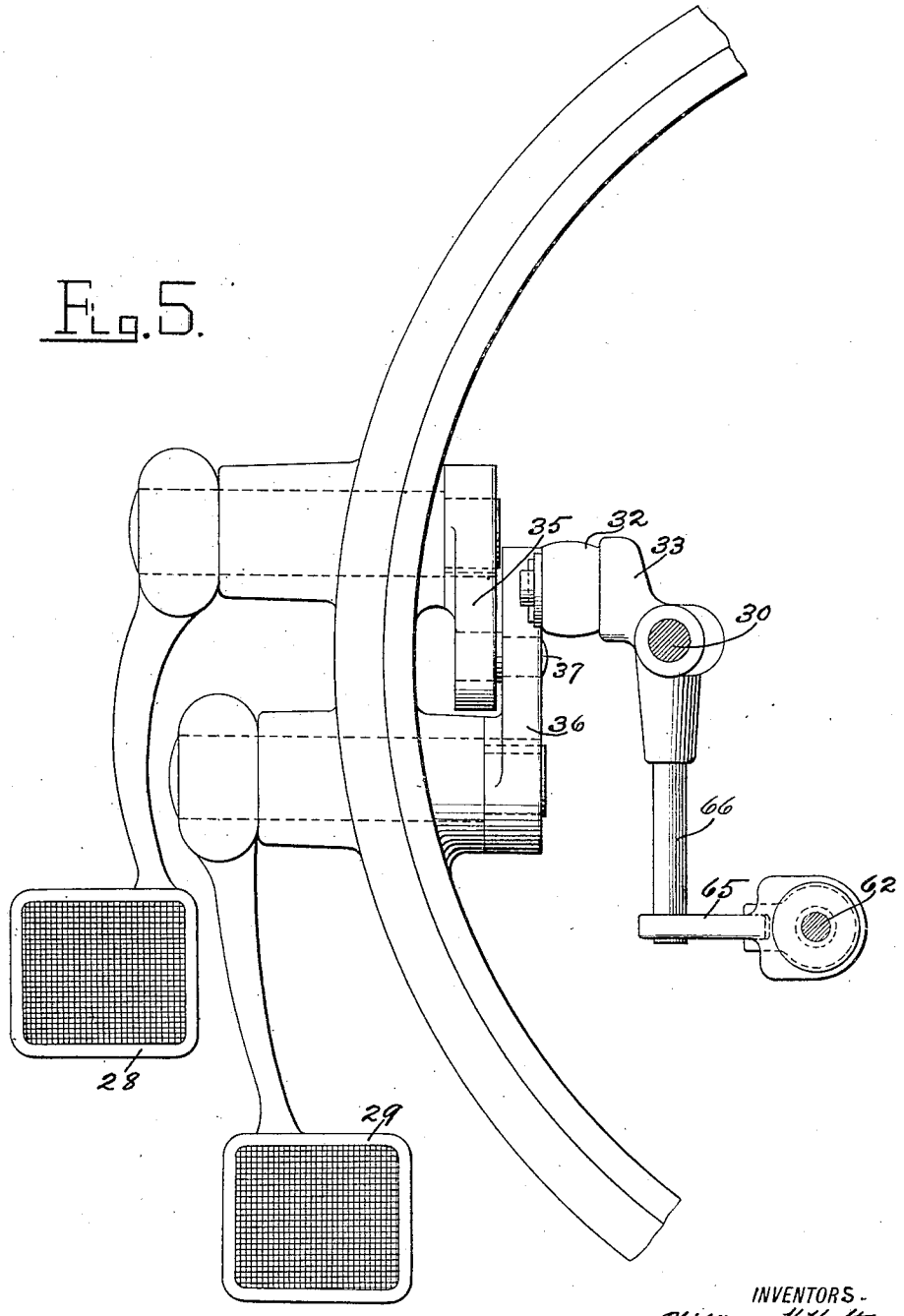
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5 SHEETS—SHEET 5.

Fig. 5.



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CHAIR.

1,279,346. Specification of Letters Patent. **Patented Sept. 17, 1918.**

Application filed July 13, 1917. Serial No. 180,324.

To all whom it may concern:

Be it known that we, WILLIAM H. HULTGREN, a citizen of the United States, residing in Roselle Park, in the county of Essex and State of New Jersey, and GODFREY R. REBMANN, a citizen of the United States, residing in Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Chairs, of which the following is a specification.

Our invention relates to an improvement in adjustable chairs, such as those used by dentists, surgeons, barbers, etc., and is directed to providing means whereby the seat of such chairs may be adjusted with facility to any desired elevation, and held in such position.

In the embodiment of our invention as herein disclosed, we have provided supporting means for the platen carrying the seat of the chair, which supporting means are carried within a hollow post or shaft forming the armature shaft of a shunt wound electric motor, it being understood, of course, that any type of motor desired may be used, the motor furnishing the motive power for raising or lowering the chair seat. The supporting means are adapted to be adjusted vertically by means of nuts which coöperate with screw-threaded posts or columns, one within the other, and both carried within the armature shaft of the motor and rotated thereby. The threads on the posts are made of the proper pitch so as to prevent the chair seat descending by gravity. Simple mechanism operated by foot pedals is provided for controlling the circuit of the motor, the circuit to the motor being opened automatically, however, at the limits of travel of the chair seat. The foot pedals also control mechanical brake mechanism for the chair. Should the current to the motor fail, we have provided hand-operated mechanism whereby the chair may be operated temporarily by hand.

Referring to the drawings accompanying this application, Figure 1 is a section taken through the pedestal forming the base of the chair, showing the operating mechanism which is inclosed therein; Fig. 2 is an elevation of the pedal mechanism, showing the contact mechanism for the motor circuits, and the automatic stop motion mechanism; Fig. 3 is a part sectional elevation of the apparatus of Fig. 2 looking from the right; Fig. 4 is a view taken on the line A—A of Fig. 3; Fig. 5 is a plan view showing the pedals and their connection to the controlling mechanism for the motor, together with the automatic stop motion mechanism; Fig. 6 shows the brake mechanism; and Fig. 7 is a wiring diagram for the various circuits of the motor.

Like characters of reference designate like parts throughout the various figures of the drawings.

The chair seat, 1, is carried by the platen 2, screwed into a hollow post 3, the seat being rotatable on the platen about a stud S, brake mechanism B being provided to hold the seat in position on the platen; this brake mechanism will not be described, however, as it forms no part of the present invention. The post 3 is keyed to and supported by a nut 4 carried by a hollow screw-threaded column 5. Carried within the column 5 and keyed thereto is a nut 6 which in turn is keyed to a screw-threaded post 7, carrying a nut 8, which is keyed to a ring 9, the latter supporting a column 10, which is keyed to the post 3, and to the casting forming part of the usual pedestal of the chair. The columns 3 and 10 together form the support for the seat of the chair, the column 3 being within the column 10. A hollow shaft 11, carrying within it the mechanism so far described, forms the armature shaft of a shunt wound electric motor 12, the latter being carried by the base 13, which together with the casting 14, casing 15 and casting 22, forms the base and pedestal of the chair. The column 5 through the medium of a member 16, rests on ball bearings 17; carried upon the ring 9 at the lower end of the post 10 and keyed to nut 8 is a spiral gear 18, keyed to the armature shaft 11 of the motor. The post 7, through the medium of a member 18 to which it is keyed, and member 19 rests on ball bearings 20 carried in a race in a member 21 in the casting 22 forming the part of the base of the chair pedestal.

From the description thus far given, it will be seen that if the motor 12 is rotated the screw-threaded column 5 and post 7 will be rotated by reason of their keyed connection to the armature shaft 11 of the motor, and the nuts 4 and 8 by reason of this rota-

tion of the column 5 and post 7, will travel axially with key guided posts 3 and 10 to elevate or lower the chair seat.

To operate the chair temporarily, in the event of failure of current to the motor 12, we have provided a bevel gear 24, keyed to the armature shaft 11; a crank 26, carrying bevel gear 27, formed integral therewith if desired, may be placed in position on a stud 25 carried by the casting forming the pedestal of the chair, with the gear 27 meshing with gear 24. Rotation of the crank 26 on the stud 25 will rotate the armature shaft 11 to elevate or lower the chair seat as desired.

The mechanism for controlling the operation of the chair, will now be described, this mechanism being best illustrated in Figs. 2 and 3. The motor circuits are controlled by means of two pedals 28 and 29. A rod 30, carrying a fiber bar 31, is adapted to be moved vertically by the pedals 28 and 29, through a link 32, carried by a sleeve 33, which is operatively connected to the rod 30 by means of a pin 34. The link 32 is connected to the pedals through levers 35 and 36, the lever 36 being directly connected to the link, and the lever 35 being operatively connected to the lever 36 by means of a pin 37. The pedals are interlocked through mechanism similar to that shown in our Patent No. 1,265,384, granted May 7, 1918, so that but one pedal may be operated at a time. The rod 30 is guided in bearings 38 and 39, and carries bushings 40 and 41, seating in the bearings for the rod. As the pedal 28 is depressed, the member 33 is forced downwardly and carries with it the bushing 40 and rod 30, at the same time compressing a coil spring 42 carried on the rod 30, between the bushing 40 and 41. So soon, therefore, as the pedal is released, the spring 42 will return the parts to central position. Pressure on the pedal 29 moves the rod 30 in the opposite direction to that just described, and a collar 43 on the rod will carry the bushing 41 upwardly to again compress the spring 42, so that when pressure is taken from the pedal 29, the parts will again return to central position under the action of the spring, as before.

The fiber bar 31 carries a series of contacts 44, 45, 46 and 47, which are adapted to engage stationary contacts 48, 49 50 and 51, respectively, when the rod 30 is moved upwardly, and to engage stationary contacts 52, 53, 54, and 55, respectively, when the rod 30 is moved in the opposite direction. These contacts control the motor circuits as will be seen from reference to the wiring diagram of Fig. 7, and which circuits will be traced later on, to cause the same to rotate in one direction or the other as desired, depending upon whether it is desired to have the chair seat elevated or lowered.

In order to insure that the chair seat will come to rest properly, should the operator neglect to remove his foot from either of the pedals, we have provided mechanism to automatically break the motor circuits, at either limit of travel of the chair seat, this apparatus being illustrated fully in Figs. 2, 3 and 4. The spiral gear 18 carried at the lower end of the post 7 and keyed thereto and to the armature shaft 11, meshes with a spiral gear 57, mounted on a shaft 58, carried in bearings 59, 59 secured to the base casting 22. A bevel gear 60 is fixed on the end of this shaft, and meshes with a similar gear 61 carried at the lower end of a suitably guided screw-threaded rod 62. The rod 62 carries two collars 63 and 64, adapted to slide thereon. These collars are part of a member 65 connected to the sleeve 33 by means of the rod 66, so that as the sleeve 33 under the action of either of the foot pedals is moved vertically on the rod 30, the collars 63 and 64 will likewise and to the same degree be moved longitudinally of the rod 62. Bearings 67, 67, are provided for the rod 62. A nut 68 is threaded on the rod 62, and has a bifurcated lateral projection 69, straddling the member 65, so that as the rod 62 is rotated by the motor 12, through the train of gearing just described, the nut 68 must travel up or down the rod, depending upon the direction of rotation thereof. The various parts are so proportioned that with the motor in operation, the nut will travel up or down the rod 62 and come in contact with either the collar 63 or 64 to carry them either up or down, and with them the sleeve 33, thus causing the rod 30 to return to normal position under the action of the spring 42 together with the pedals 28 and 29 and thereby to separate the contacts 44, 52, etc., or 44, 48, etc., consequently opening the circuit to the motor 12. It will be understood of course, that this combined action of parts takes place only at the limits of travel of the chair seat, as predetermined by the ratio of the gears, the thread on the rod 62 and distance between collars 63 and 64. For intermediate positions it is merely necessary to remove the pressure from the pedals in order to break the motor circuits.

We have provided also, brake mechanism for the armature shaft 11, this brake going on automatically each time pressure is taken from the pedals. The brake is shown applied in Fig. 1, and its construction is illustrated in Figs. 3 and 6. It comprises a connection 69′ carried at the lower end of the rod 30 and keyed thereto by a pin 70. A brake band comprising two members 71 and 72, together forming an ellipse, as shown in Fig. 6, surround the armature shaft. The brake band is connected by means of a link 73 to the member 69′. Now, as the rod 30 is moved in either direction under the action

of the pedals, the brake band member 71 will be drawn away from the armature shaft 11, and as the rod 30 returns to central position under the action of the spring 42 the brake band will be again applied, so as to bring the motor to a state of rest, as shown in Fig. 1.

We shall now proceed to describe a cycle of operation of our apparatus. Assuming that it is desired to have the chair seat move upwardly, all the parts being in the normal position shown in the drawings: The operator depresses the pedal 29, which through the lever 36, and link 32, will move the sleeve 33 upwardly, carrying with it the rod 30, and bushing 41, the upward movement of the latter compressing the spring 42. As the rod 30 moves upwardly, it carries the fiber bar 31 upwardly, bringing the contacts 44, 45, 46 and 47, into engagement with the stationary contacts 48, 49, 50 and 51 respectively. The closing of these contacts closes circuits to the field and armature of the motor 12, the field circuit being traced from the plus main, main line switch W, conductor 79, contact 49, conductor 80, contacts 48, 44, conductor 82, field F, conductor 83, contacts 47 and 51, conductor 84, contact 50, conductor 85, and out at minus. The armature circuit of the motor may be traced from the plus side of the line, through the switch W, contacts 49 and 45, conductor 86, through the motor, conductor 87, contacts 46 and 50, conductor 85 and out the other side of the main line switch W to the minus side of the line. The armature shaft 11 of the motor will now rotate. Rotation of this shaft will rotate the screw-threaded post 7, through the spiral gear 18, the latter being connected to both the post 7 and the armature shaft 11 by keys. Rotation of the post 7 also rotates the column 5, by means of nut 6 keyed to post 7 as already described. Depression of the pedal 29 also operates the brake bands 71 and 72 to cause them to move to the left as viewed in Fig. 1, to relieve the brake pressure of member 71 on the armature shaft of the motor. Clearance is provided in the member 72 for this purpose as seen in Fig. 1. We will assume that the motor is wound so as to be at this time rotating the post 7 in an anti-clockwise direction. This movement of the post will cause the nuts 8 and 4 to travel upwardly, carrying with them the columns 10 and 3, which support the chair seat, the column 3 moving upwardly preferably twice as fast as the column 10. When the operator removes his foot from the pedal, the mechanism operated thereby, will all assume normal position, under the action of the spring 42, which it will be remembered has been placed under compression by depression of the pedal, and the fiber bar 31 will be moved downwardly to open the motor circuits by separation of the contacts, the brake will be applied to the armature shaft 11 of the motor, and therefore, the parts driven thereby, will be brought to rest. However, as it is within the bounds of possibility that the operator may forget to remove his foot from the pedal, we have provided the automatic stop mechanism which has already been described. When the pedal 29 is depressed, the upward movement of the sleeve 33 carries the collars 63 and 64 upwardly, until the collar 63 is in contact with the upper bearing 67 of the threaded rod 62. The rotation of the spiral gear 18, rotates the gear 57, which in turn rotates the gears 60 and 61, to rotate the threaded rod 62. The nut 68 being held from rotation on the rod 62 by the member 65 of the stop mechanism, will travel downwardly, until it engages the collar 64, after which it will cause the latter to move downwardly, carrying with it the sleeve 33, through its connection therewith by means of members 65 and 66, and therefore the post or rod 30, to separate the contacts 48, 49, etc., 44, 45, etc., respectively, and open the motor circuits, this action of the stop motion mechanism also applying the brake mechanism, and the armature shaft, and therefore the chair seat, will be automatically brought to rest. The chair seat will now remain stationary, until such time as it is desired to move it again in the opposite direction under the action of the motor, or by means of the crank 26 as the threads on the supporting columns for the chair seat, are of a sufficiently low pitch to prevent the chair descending by gravity. Should it be desired to move the chair seat downwardly, the pedal 28 may be depressed, moving all the parts connected therewith in the opposite direction to that just described, to close contacts 44, 45, etc., 52, 53, etc., respectively, to reverse the flow of current through the motor and cause the same to rotate in the opposite direction, at which time the nuts carried by the column 5 and post 7 will move downwardly to allow the chair seat to descend. The automatic stop motion mechanism will operate on the down motion as well, the collar 64, under the action of the pedal 28 being carried downwardly, carrying with it the collar 63; as the rod 62 will now be rotating in the opposite direction to that already described, the nut 68 will travel upwardly, until it engages the collar 63, which it will carry upwardly and through the connection 66, the sleeve 33, and thereby move the rod or post 30 upwardly to open the contacts controlling the motor circuits, at the same time applying the brake to the armature shaft, to bring the motor and chair seat to rest.

It will be appreciated that by connecting the motor to the chair seat as herein disclosed, no governor mechanism is necessary

in order to retard the descent of the chair seat, and also the compactness of the pedestal which supports the chair proper is preserved, as everything, with the exception of the foot pedals will be inclosed therein. By the use of the telescoping principle for the chair seat supporting members, we are able to adjust the chair seat as high as in the standard chair of this type, but at the same time retain sufficient support for the seat to maintain it rigid, when in extreme elevated position.

Having thus described our invention, and without limiting ourselves to the precise details of construction and arrangement of parts disclosed, what we claim, and desire to secure by Letters Patent of the United States is:—

1. In an adjustable chair, the combination of an electric motor, telescoping members supporting the chair seat and carried within the armature shaft of the motor, and means rotated by the motor for actuating said telescoping members.

2. In an adjustable chair, the combination of an electric motor, telescoping members supporting the chair seat, and carried within the armature shaft of the motor, and means rotated in opposite directions by the motor for actuating said telescoping members.

3. In an adjustable chair, the combination of an electric motor, telescoping members within the armature shaft of said motor, one of which is connected to the chair seat, telescoping screw threaded members also carried within the armature shaft of the motor, one of which is directly connected to the said shaft, means for connecting the screw threaded members to each other, and nuts mounted on said members and movable longitudinally thereof when the screw threaded members are rotated by the armature shaft to raise and lower the first-mentioned telescoping members and thereby actuate the chair seat, one of said telescoping members being supported by one nut which is mounted on the inner screw threaded member and the other by the nut mounted on the outer screw threaded member.

4. In an adjustable chair, the combination of supporting means for the chair seat, an electric motor for actuating the same, contact mechanism controlling the circuit of the motor, mechanism functioning independently of the supporting means for the chair seat and driven by the motor for controlling said contact mechanism, and additional means controlling said contact mechanism and controlling also the contact controlling mechanism which is driven by the said motor.

5. In an adjustable chair, the combination of supporting means for the chair seat comprising telescoping tubes, a rotatable tube provided with screw threads on its exterior surface, a non-rotatable nut actuated vertically by said screw threads, said rotatable tube having longitudinal slots on the interior thereof and diametrically opposite each other, a member rigidly connected to the upper end of the screw threaded tube having projections to engage the said longitudinal slots, a reversible motor having a hollow shaft adapted to receive the said supporting mechanism for the chair seat, exterior interlocking pedals adapted to control the motor to vary the elevation of the chair seat supporting means, and means coöperating with the motor armature shaft and limiting the longitudinal movement of the supporting means and consequent elevation of the chair seat within predetermined limits.

6. In an adjustable chair, the combination of supporting means for the chair seat comprising telescoping tubes, a threaded rotatable tube, a threaded rotatable column, a primary non-rotatable nut confined to axial longitudinal movement upon the threaded rotatable column, a secondary non-rotatable nut confined to axial movement upon the threaded rotatable tube, a member rigidly connected to the upper end of the rotatable column having means to transmit motion therefrom to the rotatable tube, ball bearings supporting said tube, a motor having a hollow armature shaft within which the supporting means for the chair seat are carried, and by which the supporting means are actuated to raise and lower the chair seat, the movement of the chair seat supporting means coinciding with the center of rotation of the armature shaft.

7. In an adjustable chair, the combination of supporting means for the chair seat comprising telescoping tubes, a motor for actuating the supporting means, said supporting means having axial longitudinal motion on a common axis coinciding and parallel with the center of rotation of the motor armature shaft, keys and keyways to direct the longitudinal movement of the tubes and to prevent their relative rotation, a member carrying directly one of the tubes and coöperating with a primary non-rotatable threaded nut, a member rigidly secured to one of the telescoping tubes and pivotally connected to the chair seat, and locking mechanism coöperating therewith to hold the chair seat in any desired radial position at right angles to the axis of rotation of the motor.

8. In an adjustable chair, the combination of supporting means for the chair seat comprising telescoping tubes, a motor for actuating said chair seat supporting means, said tubes being coincident with the center of rotation of the motor, means to prevent

rotation of and to direct the longitudinal movement of said tube, a non-rotatable nut, a member carrying directly one of the telescoping tubes and resting upon said nut, a member rigidly secured to one of the telescoping tubes and pivotally carrying the seat of the chair, and locking means carried thereby to lock the chair seat in any radial position at right angles to the axis of rotation of the motor.

In testimony whereof, we have signed our names to this specification.

WILLIAM H. HULTGREN.
GODFREY R. REBMANN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."