April 20, 1937. D. P. REDDING 2,078,159

VERTEBRAL ADJUSTER

Filed May 3, 1935 2 Sheets-Sheet 1

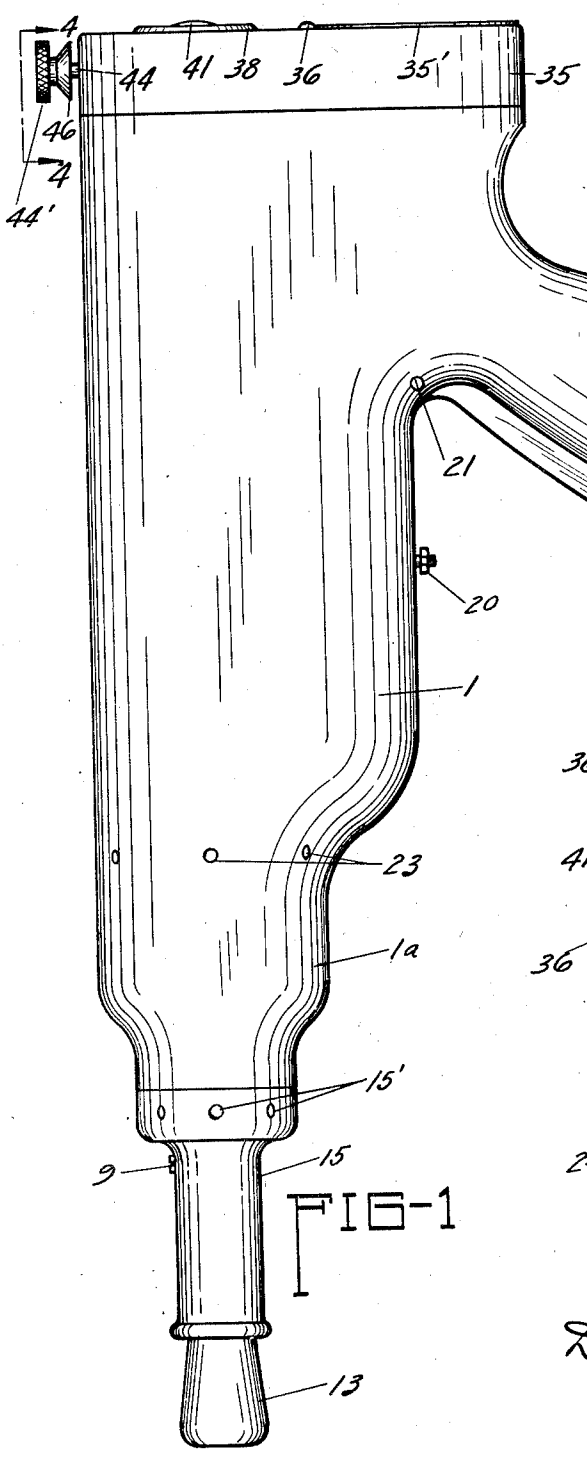


FIG-1

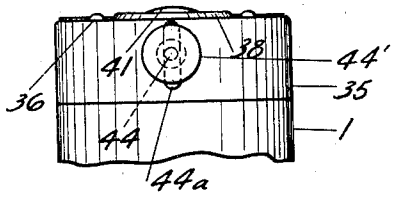


FIG-4

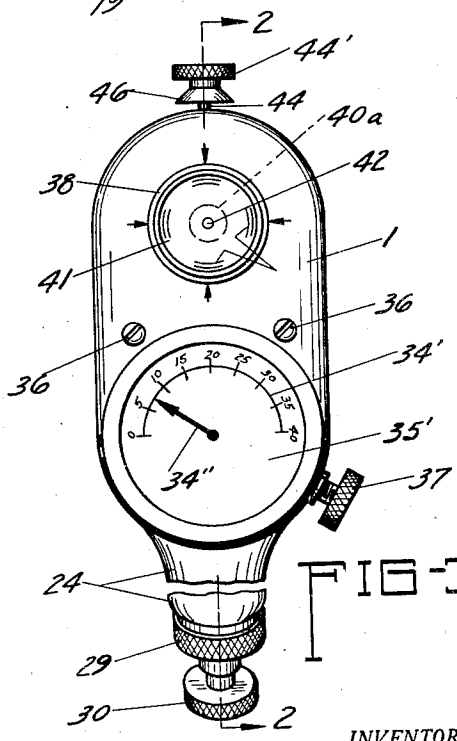


FIG-3

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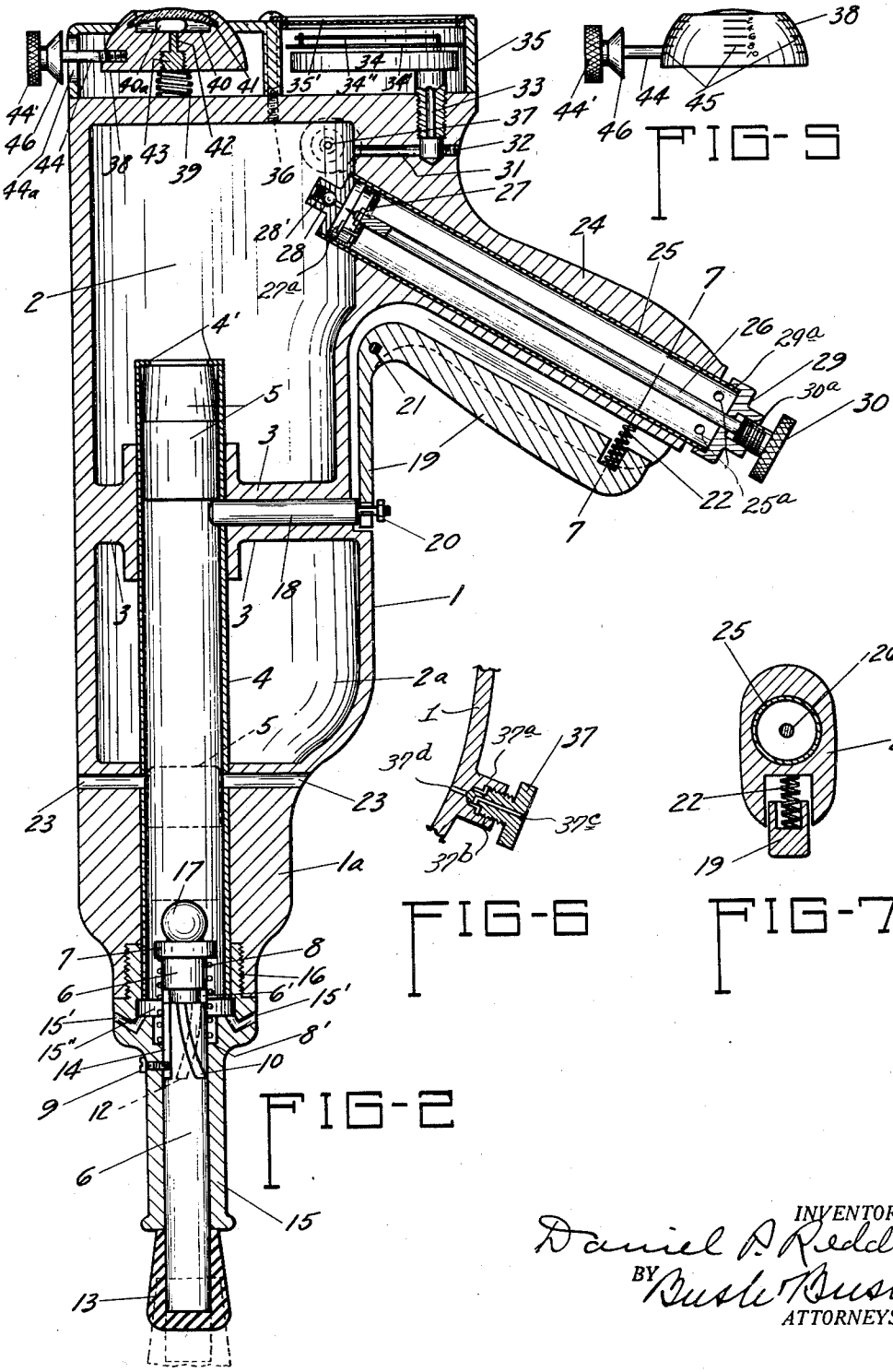


FIG-2

FIG-5

FIG-6

FIG-7

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Patented Apr. 20, 1937

2,078,159

UNITED STATES PATENT OFFICE

2,078,159

VERTEBRAL ADJUSTER

Daniel P. Redding, Kansas City, Mo.

Application May 3, 1935, Serial No. 19,676

12 Claims. (Cl. 128—69)

My invention relates to appliances designed for use by chiropractors in adjusting subluxations of the vertebrae by manual application to a patient by the practitioner.

The objects of my invention are:

1. To provide an improved instrument of the general class described in my co-pending application Serial No. 738,671 which has matured into Patent No. 2,048,220;

2. To provide an instrument of the class described having improved indicators and governing means to indicate and control the tilt or angle at which the instrument is held and the amount of force to be utilized in its application;

3. To provide an appliance of the class described:

(*a*) By which compressed air may be utilized as the moving force;

(*b*) Of superior speed and resiliency;

(*c*) By which the amount of force to be applied can be varied to any desired degree within the range of the given instrument;

(*d*) By which a speedy and unimpeded recoil can be assured;

4. To provide an improved apparatus for actuating a plunger by compressed air;

5. To provide improved means for cushioning the blow of an air-driven piston upon a movable plunger.

I accomplish these objects by the means illustrated in the accompanying drawings, in which:—

Figure 1 is a front elevation of my appliance;

Figure 2 is a vertical section on the line II—II of Figure 3;

Figure 3 is a top or plan view;

Figure 4 is a detail side view of the upper part of the left side of the housing;

Figure 5 is a detail side view of the tilt gauge or meter removed from its housing and showing the scales marked thereon;

Figure 6 is an enlarged sectional detail of the air-escape or reduction valve;

Figure 7 is a cross sectional view of the handle and air pump on the line 7—7 of Figure 2.

My appliance comprises a tubular housing, 1, with handle, 24, formed integral therewith and set at a convenient angle thereto.

The housing contains a compressed air chamber 2, formed between the upper end wall of the housing and a partition wall, 3, formed integral with the housing near the middle thereof. The lower end, 1*a*, of the housing, 1, is preferably contracted to form a support for the lower end of a barrel, 4, the upper end of which is seated with an air-tight joint in the partition, 3, and projects into the air chamber 2. The upper end of the barrel, 4, is provided with a flange, 4'. A floating piston, 5, is slidingly mounted within the barrel, 4, and forms an air-tight fit therewith. The flange, 4', prevents the piston, 5, from passing out of the upper end of the barrel. The lower end of the barrel extends into the extension, 15, hereafter described.

The extension, 15, is fitted into the lower end of the housing, 1, by a threaded joint, 16. A plunger, 6, is slidingly mounted in the extension, 15, having a head, 7, formed thereon which extends into the lower end of the barrel, 4.

Figure 2 shows the piston and plunger in solid lines in charged position and shows the piston and plunger in dotted lines at the end of their travel after being discharged.

The plunger, 6, is provided with a longitudinal groove, 14, on the periphery thereof with oblique or spiral grooves, 10 and 12, extending substantially lengthwise of the plunger but inclining in opposite directions from the groove, 14.

A set screw, 9, is secured in one side of the extension, 15, and a peripheral transverse groove, 6', is provided in the plunger extending around the plunger.

A compression spring, 8, is coiled around the plunger between the seat, 8', and the head, 7, of the plunger and acts to hold the plunger up in the barrel except when driven downwardly by the piston, 5.

Air vents, 15', extend through the extension, 15, and connect with an annular air passage, 15'', at the lower end of the barrel, 4.

Upon the head, 7, of the plunger, 6, I place a cushion, 17, preferably comprised of a rubber ball of suitable consistency which to some extent cushions the blow of the piston, 5, upon discharge. Upon the lower end of the plunger, 6, I secure a resilient cushion, 13, preferably somewhat similar to the rubber cap commonly used upon crutches, which acts as a cushion to prevent injury to the soft tissues of the body to which the apparatus is applied. The cushions, 17 and 13, may be made of any degree of hardness or resiliency desired and the size, shape and thickness thereof may be varied as desired to meet the requirements of different cases.

A trigger, 19, is pivoted upon the handle on a pivot, 21. The lower end of the trigger is formed with a bore or opening in which a coiled tension spring, 22, is seated which acts to retain the trigger in charged position but permits discharge by manual pressure upon the trigger. The

opposite end of the trigger is formed which embraces the lower end of a catch pin, 18, which is slidingly secured in the partition, 3, and the inner end of which is adapted to engage and lock the sliding piston, 5, in charged position and to release same when the catch pin, 18, is withdrawn by the trigger, 19. The front end of the trigger may be attached to the catch pin by reducing and threading the outer end of the pin and mounting a threaded nut, 20, thereon.

In the handle, 24, I mount the barrel, 25, of an air pump with piston rod, 26, and piston, 27.

At the inner end of the pump I provide a check valve, 28, held in place by a spring, 28'. At the outer end of the pump, I provide a cap, 29, suitably secured upon the outer end of the barrel by a pressfit, 29*a*, or other suitable means. This cap is bored out to permit the passage of the piston rod, 26, and is formed with an enlarged bore on the outer face adapted to receive the threaded end, 30*a*, of a knurled head, 30, which is suitably united to or formed integral with the piston rod, 26. An inlet valve, 27*a*, is mounted upon the piston, and ports, 25*a*, are formed in the outer end of the barrel, 25, to permit passage of air as the piston is moved in either direction in the barrel. The threads upon the threaded end of the head, 30, permit the piston rod to be locked in its innermost position by turning the head, 30.

A reduction valve, 37, is mounted in a nipple, 37*a*, formed integral with the housing, 1, by which the air may be permitted to escape from the air chamber, 2, in order to permit the piston, 5, to seat itself in the inner end of the barrel, 4, also to permit a reduction of the air pressure when overcharged. The valve, 37, is provided with threads, 37*b*, by which it may be secured and adjusted in the nipple, 37*a*. A small bore or opening, 37*c*, is provided in the valve, 37, to permit the air to escape.

Upon the upper end of the housing, 1, I mount a cap or instrument housing, 35, by set screws, 36. This instrument housing contains at one end an air gauge, 34, connected by air passages, 31 and 33, to the air pressure chamber, 2, and having a scale, 34', with an indicator or needle, 34'', pivotally united thereto to indicate the air pressure within the reservoir or compression chamber, 2. A threaded plug, 32, is screwed into the outer end of the bore or passage, 31, to close it.

Near the opposite end of the cap, 35, I form a circular opening in which I mount a hemispherical tilt meter, 38, the spherical surface of which projects through the circular opening and is held in contact therewith by a compression spring, 39, one end of which bears against the upper end of the housing, 1, and the other end of which bears against the flat face of the hemisphere of the tilt meter, 38.

In order to set the tilt meter, 38, in the various desired angular positions, I unite thereto a stem, 44, having a knurled head, 44', united thereto. The outer end of the stem, 44, passes through a slot, 44*a*, formed in the periphery of the cap, 35. The tilt meter is provided with a liquid chamber to hold the liquid, 40, in which an air bubble, 40*a*, is secured which moves in contact with a cover glass or crystal, 41, which acts to close the liquid chamber. In order to insert the liquid into the chamber, a bore or hole, 42, is drilled in the hemisphere, 38, which may be closed by a threaded plug, 43.

Upon the periphery of the hemisphere, 38, I provide parallel scale marks, 45, which are preferably so spaced as to indicate a tilt of two degrees for each mark and may be numbered if desired. The bore, 42, is accurately centered so as to afford a center gauge for the bubble, 40*a*.

The spring, 39, is formed of sufficient size and strength so that the hemisphere, 38, will be held steadily in any adjusted positioned in its circular opening in the housing, 35, and the hemisphere, 38, may be tilted in one direction by moving the stem, 44, along the slot, 44*a*, and it may be tilted in the transverse direction by rotating the cap, 44', and stem, 44.

A collar, 46, may be mounted upon the stem, 44, to aid in preventing accidental displacement of the hemisphere, 38.

The partition, 3, may be either solid or perforated to permit passage of air from the compression chamber, 2, into the chamber, 2*a*. When the smaller compression chamber is desired, the partition, 3, will be made solid, but when larger capacity for air is desired, the partition, 3, will be left open to permit the passage of air between the chambers, 2 and 2*a*. Outlet ports, 23, are provided to permit the air to exhaust out of the barrel, 4, as soon as the piston, 5, has reached the lower end of its travel.

The size and proportions of the compression chambers and of the various outlets as well as of the air pump, may be varied to suit the requirements of various cases.

I prefer to form the floating piston, 5, of relatively heavy material so that a small piston will be able to deliver a sufficiently heavy impact, but it is obvious that the size, shape and weight of the piston, 5, and the size and length of the barrel, 4, may be varied as circumstances require.

In the operation of my device, the valve, 37, is opened, the extension turned upwardly and the piston will then drop by force of gravity to the inner end of the barrel, 4, the trigger being pressed so as to keep the catch pin, 18, from interfering with the downward movement of the piston while the appliance is in its inverted position and then released as soon as the piston has reached the extreme inner end of its travel, where it will be retained in its place by the catch pin, 18. The valve, 37, is then closed manually and the air pump operated until the air gauge indicates the desired pressure.

The tilt meter is then set to indicate the desired tilt and the head, 13, applied to the spinal column of a patient at the desired point to effect the desired action upon the vertebra. The device is then tilted until the bubble centers properly in the tilt meter and the trigger is then pressed withdrawing the catch pin, 18, and releasing the piston, 5, which is driven by force of compressed air downwardly against the cushion, 17, thereby exerting the desired impact upon the plunger, 6, and driving it downwardly against the patient.

As soon as the piston, 5, has completed its travel, the compressed air escapes through the ports, 23, and the spring, 8, raises the plunger, 6, thus permitting the desired recoil of the head, 13, and the portion of the body acted upon by the head, 13.

The apparatus may then be recharged as described and the operation repeated.

The plunger is set to apply right or left torque by grasping the head and pulling down on it until the set screw, 9, registers with the groove, 6. The plunger may then be rotated to the right or left as required to bring the set screw into reg-

ister with groove, 10 or 12, and then released, when the spring, 8, will lift the plunger upwardly to its charged position with the set screw resting in the lower portion of such groove.

As the plunger is then driven downwardly by the next impact of the piston, the plunger, 6, will be rotated by the set screw, 9, in the desired direction, thus producing the desired torque.

While I have shown only two curved grooves, 10 and 12, it is obvious that additional grooves may be provided if desired and the angle and curve of the grooves may be varied as desired.

For convenience of description, I refer to the lower end of Figure 1 as the lower end of the housing and to the upper end of Figure 1 as the upper end of the housing; also to the face of Figure 1 as the front of the housing and the opposite side of Figure 1 as the rear of the housing.

I also refer to the left of Figure 1 as the left of the housing and to the right of Figure 1 as the right of the housing.

It will be understood that this appliance as ordinarily used will be held in a substantially vertical position and applied to the spine or vertebra of a patient occupying a substantially horizontal position.

When it is desired to charge the compressed air reservoir, 2, from the compressed air tank, the valve, 37, may be opened a short distance and the nozzle of the compressed air hose applied to the central opening 37*c* shown in the valve, 37, in Figure 6. The compressed air may be then led through the opening or port 37*d* into the chamber, 2, and when the desired degree of compression has been reached, the valve, 37, may be screwed down so as to seat tightly and prevent the escape of the air from the reservoir, 2, the inner end of the valve, 37, being formed so as to seat against and close the port, 37*d*, when properly screwed down or tightened.

It is obvious that various changes may be made in my appliance without departing from the spirit of my invention and I do not limit my claims to the precise forms shown.

I claim:

1. In a vertebral adjusting appliance, a housing containing a reservoir for compressed air, a barrel mounted in said housing having its inner end extending into the reservoir and formed with an inwardly turned flange thereon, an extension united to the lower end of the housing adjacent the outer end of the barrel, a plunger slidingly mounted within the extension, a piston fitted within the barrel, pneumatic means for actuating the piston to drive it down the barrel and cause an impact upon the plunger.

2. In a vertebral adjusting appliance, a housing containing a reservoir for compressed air, a longitudinal bore formed in the housing, a barrel mounted in said bore having its inner end extending into the reservoir and formed with an inwardly turned flange thereon, an extension threaded into the lower end of the housing adjacent the outer end of the barrel, a plunger slidingly mounted within the extension, a floating piston fitted within the barrel, means for filling the air reservoir with compressed air at the desired pressure, means adapted to retain the floating piston in the upper end of the barrel, and means to manually release the floating piston and permit the compressed air to drive it down the barrel into contact with the plunger.

3. In a vertebral adjusting appliance, a housing containing a reservoir for compressed air, a longitudinal bore formed in the housing, a barrel mounted in said bore having its inner end extending into the reservoir and formed with an inwardly turned flange thereon, an extension threaded into the lower end of the housing adjacent the outer end of the barrel, a plunger slidingly mounted within the extension, a floating piston fitted within the barrel, means for filling the air reservoir with compressed air at the desired pressure, means adapted to retain the floating piston in the upper end of the barrel, means to manually release the floating piston and permit the compressed air to drive it down the barrel into contact with the plunger and an adjustable gauge united to the housing adapted to indicate the desired degree of angle from the vertical at which the appliance is to be held.

4. In a vertebral adjusting appliance, a housing containing a reservoir for compressed air, a longitudinal bore formed in the housing, a barrel mounted in said bore having its inner end extending into the reservoir and formed with an inwardly turned flange thereon, an extension threaded into the lower end of the housing adjacent the outer end of the barrel, a plunger slidingly mounted within the extension, a floating piston fitted within the barrel, means for filling the air reservoir with compressed air at the desired pressure, means adapted to retain the floating piston in the upper end of the barrel, means to manually release the floating piston and permit the compressed air to drive it down the barrel into contact with the plunger, and exhaust ports formed in the barrel adapted to permit the compressed air to escape from the barrel and reservoir when the piston has reached a predetermined point in its downward travel.

5. In a vertebral adjusting appliance, a housing containing a reservoir for compressed air, a longitudinal bore formed in the housing, a barrel mounted in said bore having its inner end extending into the reservoir and formed with an inwardly turned flange thereon, an extension threaded into the lower end of the housing adjacent the outer end of the barrel, a plunger slidingly mounted within the extension, a floating piston fitted within the barrel, means for filling the air reservoir with compressed air at the desired pressure, means adapted to retain the floating piston in the upper end of the barrel, means to manually release the floating piston and permit the compressed air to drive it down the barrel into contact with the plunger, exhaust ports formed in the barrel adapted to permit the compressed air to escape from the barrel and reservoir when the piston has reached a predetermined point in its downward travel and a manually operable escape valve adapted when opened to permit the residuary air in the reservoir to escape as the floating piston is returned to the inner end of the barrel.

6. In a vertebral adjusting appliance, a housing containing a reservoir for compressed air, a longitudinal bore formed in the housing, a barrel mounted in said bore having its inner end extending into the reservoir and formed with an inwardly turned flange thereon, an extension united to the lower end of the housing adjacent the outer end of the barrel, a cushioned plunger slidingly mounted within the extension, a floating piston fitted within the barrel, means for filling the air reservoir with compressed air at the desired pressure, a catch pin slidingly mounted in the housing adapted to retain the floating piston in the upper end of

the barrel, and trigger operable means to release the catch pin and permit the compressed air to drive the floating piston down the barrel into contact with the plunger.

7. In a vertical adjusting appliance, a housing containing a reservoir for compressed air, a handle united thereto, a longitudinal bore formed in the housing, a barrel mounted in said bore having its inner end extending into the reservoir and formed with an inwardly turned flange thereon, an extension united to the lower end of the housing adjacent the outer end of the barrel, a cushioned plunger slidingly mounted within the extension, a floating piston fitted within the barrel, means for filling the air reservoir with compressed air at the desired pressure, a catch pin slidingly mounted in the housing adapted to retain the floating piston in the upper end of the barrel, a trigger pivotally mounted upon the handle adapted to release the catch pin and thus permit the compressed air to drive the piston down the barrel and cause an impact upon the plunger, exhaust ports formed in the barrel adapted to permit the compressed air to escape from the barrel and reservoir when the piston has reached a predetermined point in its downward travel and a manually operable escape valve adapted when opened to permit the residuary air in the reservoir to escape as the floating piston is returned to the inner end of the barrel.

8. In a vertebral adjusting appliance including a housing containing a reservoir for compressed air, a longitudinal bore formed in the housing, a barrel mounted in said bore having its inner end extending into the reservoir, an extension threaded into the lower end of the housing adjacent the outer end of the barrel, a plunger slidingly mounted within the extension, a floating piston fitted within the barrel, and pneumatic means actuating the floating piston to drive it down the barrel into contact with the plunger, a tilt gauge comprising a cap united to the housing having a circular opening therein, a hemispherical chamber closely fitting the circular opening and having a transparent face, a liquid enclosed in and nearly filling the chamber but including a bubble of air, and means for adjusting the angular position of the hemisphere relative to the cap.

9. In a vertebral adjusting appliance including a housing containing a reservoir for compressed air, a longitudinal bore formed in the housing, a barrel mounted in said bore having its inner end extending into the reservoir, an extension threaded into the lower end of the housing adjacent the outer end of the barrel, a plunger slidingly mounted within the extension, a floating piston fitted within the barrel, pneumatic means for actuating the floating piston to drive it down the barrel into contact with the plunger, a tilt gauge comprising a cap united to the housing having a circular opening therein, a hemispherical chamber closely fitting the circular opening and having a transparent face, a liquid enclosed in and nearly filling the chamber but including a bubble of air, means for adjusting the angular position of the hemisphere relative to the cap and a scale marked upon the spherical portion of the hemisphere adapted to indicate the angle of the tilt of the appliance from the vertical in all directions.

10. In a vertebral adjusting appliance, a housing containing a reservoir for compressed air, a barrel mounted in said housing having its inner end opening into the reservoir and formed with an inwardly turned flange thereon, an extension united to the lower end of the housing adjacent the outer end of the barrel, a plunger slidingly mounted within the extension, a piston fitted within the barrel, means for actuating the piston with compressed air adapted to drive it down the barrel and cause an impact upon the plunger.

11. In a vertebral adjusting appliance, a housing containing a reservoir for compressed air, a barrel mounted in said housing having its inner end opening into the reservoir, means integral with the barrel adapted to limit the rearward movement of the piston, an extension united to the lower end of the housing adjacent the outer end of the barrel, a plunger slidingly mounted within the extension with a resilient head protruding therefrom, a piston fitted within the barrel, means for actuating the piston with compressed air adapted to drive it down the barrel and cause an impact upon the plunger.

12. In a vertebral adjusting appliance, a housing containing a reservoir for compressed air, a longitudinal bore formed in the housing, a barrel mounted in said bore having its inner end opening into the reservoir, means integral with the barrel adapted to limit the rearward movement of the piston, an extension threaded into the lower end of the housing adjacent the outer end of the barrel, a plunger slidingly mounted within the extension, a floating piston fitted within the barrel, means for filling the air reservoir with compressed air at the desired pressure, means adapted to retain the floating piston in the upper end of the barrel, means to manually release the floating piston and permit the compressed air to drive it down the barrel into contact with the plunger, and exhaust ports formed in the barrel adapted to permit the compressed air to escape from the barrel and reservoir when the piston has reached a predetermined point in its downward travel.

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