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J. C. THOMPSON
SPINOGRAPH METHOD AND APPARATUS

2,532,967

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2 Sheets-Sheet 1

Fig. 1.

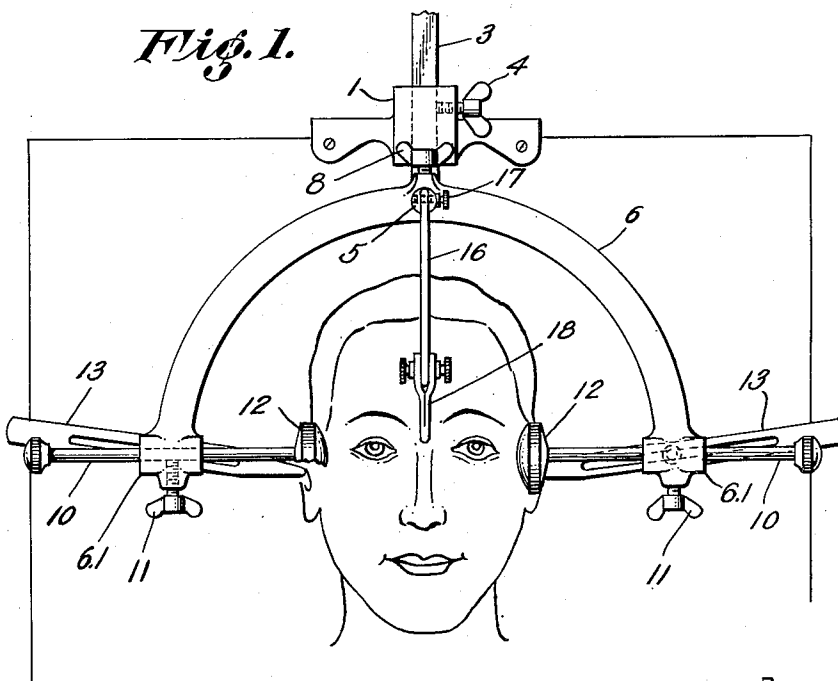


Fig. 2.

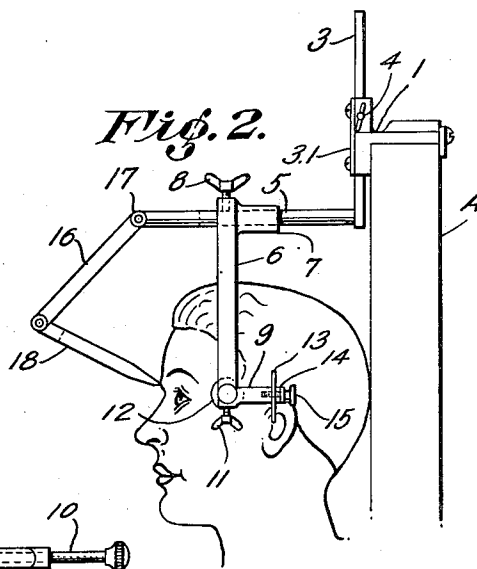
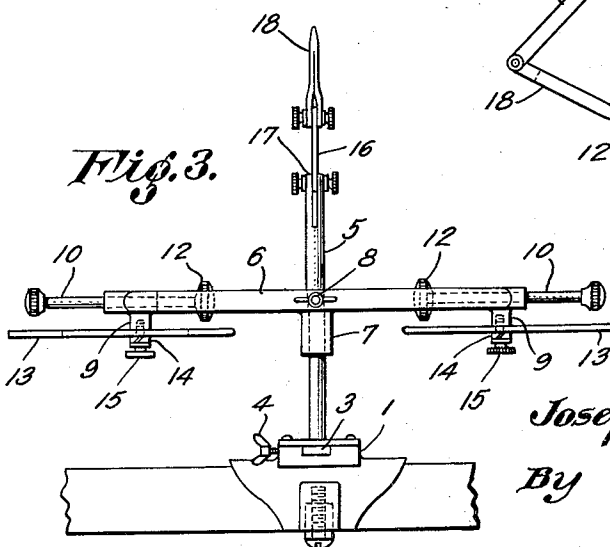


Fig. 3.



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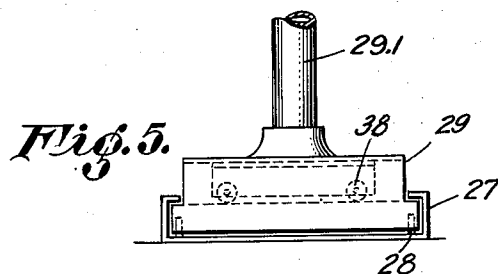
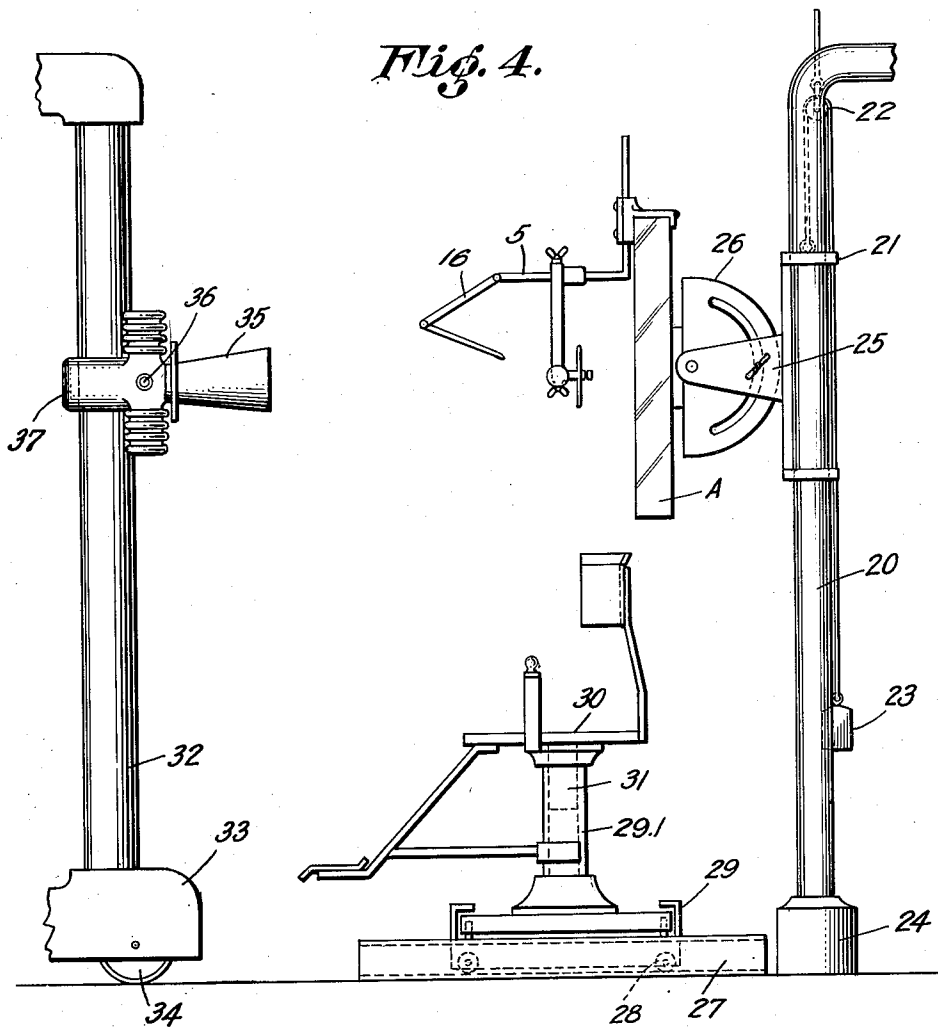
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SPINOGRAPH METHOD AND APPARATUS

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7 Claims. (Cl. 250—52)

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My invention relates to a method and apparatus for use in securing accurate spinographs of patients suffering from malformation, misalignments, subluxations or dislocations in the cervical region of the spine and particularly with relation to the axis, atlas and third cervical vertebra, and to the occipital, axial, atlantal, and third cervical articulations.

In apparatus heretofore in use it has been common practice for the operator in taking spinographs to manipulate the head of the patient in such a way as to bring it in line with particular parts of the apparatus designed to gauge and make a record of the position of the patient's head for the purpose of determining subsequent structural changes which might appear on a subsequent spinograph.

It is a matter of common knowledge that patients suffering from misalignment or subluxation whether of congenital or traumatic origin, habitually carry the head in a position or posture varying from the normal upright posture of a well person with unimpaired spinal column; and that in order to accurately ascertain the deviations from the normal in the regions indicated, it is necessary to take the spinographs of the head in that habitual posture rather than to manipulate the patient's head into the correct normal position before taking the spinographs.

In order to insure getting a correct spinograph in such cases it thus becomes necessary to allow the patient to remain in his habitual posture and to vary the position of the bucky and the X-ray tube to correspond to the posture of the patient to meet a predetermined position of the apparatus, as has been common practice heretofore.

To do this, the patient is placed upon an adjustable seat of a type in common use which may be moved either forward and back or laterally and which is also revolvable so that while the patient's head is in his characteristic posture, the apparatus may be so positioned that a line projected from one tragus to the other will be parallel to the photographic plate even if the head is tilted or twisted to one side and where the central lines of the rays passing from the X-ray tube to the photographic plate will be at a right angle to the plate and to the tragus line just mentioned. At the same time, the rays should be centered at a definite point lying in the sagittal plane such as the bridge of the nose or the Cupid's bow of the upper lip.

The objects of my invention are to provide a method and apparatus by which adjustments of the patient's seat and other apparatus may be made and the patient's head stabilized in such habitual posture whereby spinographs may be

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obtained accurately disclosing the relative position of the parts mentioned while in such abnormal habitual posture; to provide a bucky support to carry the bucky and the photoplate at the rear of the patient's head at a right angle to the sagittal plane but tiltable from front to rear at an angle to the vertical if desired, with an alignment bar mounted upon the top of the bucky extending forward at a right angle thereto and carrying a yoke which is adjustable both longitudinally of the alignment bar and rotationally thereof, having pointers which can be readily applied to both tragi of the patient in a line parallel to the bucky and with pads arranged to fix the head against unintentional movement after the apparatus is so adjusted; to provide an alignment bar with a pointer movable vertically in a fixed plane along the axis of the alignment bar with a finger or pointer which may be applied to any point in the sagittal plane which lies in the vertical plane of the alignment bar; to provide spinograph apparatus which can be adjusted to accommodate it to any habitual or abnormal posture of the patient in combination with means for moving the patient into the desired position while retaining such habitual or abnormal posture; to provide a method of taking spinographs which will produce accurate portrayals of the parts mentioned above while the patient's head and neck and shoulders are in the abnormal or characteristic posture which has become fixed or habitual by reason of misalignment or subluxation. Other objects will appear by the description following.

I accomplish these objects by the method herein described and the means illustrated in the accompanying drawings, in which:

Figure 1 is a front elevation of my apparatus as applied to a patient;

Figure 2 is a side elevation of same;

Figure 3 is a plan view of the apparatus with the patient omitted;

Figure 4 is a side elevation showing in outline the general arrangement of the seat, ray projector and bucky support of X-ray apparatus in common use;

Figure 5 is a detail of the movable parts for the seat.

My apparatus includes a bucky A or photographic plate carrier mounted upon an upright support 20 with base 24 and adjustable thereon vertically by the slide 21 with strap 22 and counterweight 23, and being tiltable forward and back with the semicircular plate 26 pivoted on the bracket 25.

A bracket 1 is secured to the top of the bucky by screws or any other suitable means. In the bracket 1, a rectangular bar 3 is adjustably

mounted in a suitable groove formed therein and may be held in adjusted position by the thumb screw 4 and by a face plate 3.1 united to the bracket by screws or other suitable means.

To the lower end of the bar 3 a round alinement rod 5 is rigidly united extending forwardly from the bar at a right angle thereto. At the front end of the rod 5 a link 16 is hinged for movement in the vertical plane of the longitudinal axis of the rod 5 by a hinge 17. A pointer 18 has one end similarly hinged to the outer end of the link 16 and is arranged to be swung into contact with a point in the sagittal plane of the patient such as the bridge of the nose as shown in Figure 2.

A slide 7 is mounted upon the rod 5 and carries a yoke 6. The slide 7 may be held against rotational or longitudinal movement by a thumb screw 8. At the lower end of the yoke, arms 9 extend rearwardly and have adjustably mounted thereon pointers or fingers 13. The fingers 13 are slotted longitudinally and may be held in place by lock washers 14 and thumb screws 15 the stems of which are threaded into bores formed in the arms 9, thus allowing both longitudinal and angular adjustment of the pointers 13.

At the lower ends of the yoke 6, hubs or bosses 6.1 are formed in which rods 10 are slidably mounted and in which they may be locked in position by the thumb screws 11. Upon the inner ends of the rods 10, pads 12 are mounted to bear against the head of the patient and hold it in his habitual posture, if any, after the apparatus has been alined by the use of the frontal pointer 18 and the lateral pointers 13.

In the use of this apparatus, the patient is first seated upon a movable seat 30 having a laterally movable base on a carriage 29 supported by the base 27 of the apparatus and arranged to be slidable both forward and back on rolls 28 and also laterally on rolls 38. In addition thereto, the seat is revolvable with the shaft 31 seated in a tubular base 29.1. The seat is adjusted so that when the patient sits thereon in his habitual or characteristic position, the back of his head will be close to the front of the central part of the bucky and so far as can be determined by visual observation, a line extending from one tragus of the patient to the other would be parallel to the plate carried by the bucky. The sagittal plane of the patient would either coincide with a vertical plane passing through the longitudinal axis of the alinement rod or cut such plane at an angle to the vertical. When the patient has been so positioned, the nasal pointer 18 is applied to the middle of the bridge of the nose and one of the pointers 13 is applied to the tragus on one side of the head. If necessary, the seat is then rotated, the yoke 6 rotated as necessary upon the alinement bar 5, and the other pointer 13 applied to the other tragus. In cases where there is a variation in the shape of the head so that one side is larger than the other, the seat may be moved so as to bring the sagittal plane of the patient in line with the alinement bar.

In cases where the head of the patient is tilted laterally, it is obvious that a line projected from one tragus to the other would be tilted from the horizontal and in that case the sagittal plane of the patient would also be tilted from the vertical.

In the use of this apparatus, it is preferable to have the patient and the apparatus so positioned that the pointer 18 when lowered into the

position shown in Figure 2, will touch either the bridge of the nose or else the Cupid's bow of the upper lip. When so arranged, it is obvious that this point of contact will lie in the sagittal plane and also in the vertical plane passing through the axis of the alinement rod 5. These two planes may coincide or the sagittal plane may be tilted in accordance with the habitual tilt of the head of the patient.

After the apparatus has been adjusted as described, the pads 12 are carried inwardly so as to rest against the temples of the patient and to hold the patient's head in position to which the apparatus has been adjusted, the pads being secured in place by the thumb screws 11 and the yoke itself being secured in place at the necessary angle by the thumb screw 8.

The X-ray tube on the pivot 36 is then positioned so that its central rays will pass through the cone 35 and the vertical plane on the longitudinal axis of the alinement bar and will pass through the sagittal plane of the patient. It may be positioned so that the central rays will travel in a line parallel to the alinement bar or it may be turned at an angle to the horizontal. The tube and cone may be adjustably secured by a holder 37 slidably mounted on the post 32 the lower end of which is mounted in a base 33 carried on casters 34 in the usual way.

Thus the spinograph may be taken with the rays passing at a right angle both vertically and horizontally to the X-ray plate and through a horizontal line passing through the bridge of the nose or the Cupid's bow of the upper lip or other desired point. So also the X-ray projector may be deflected at any desired angle to the vertical so as to give the desired portrayal of the axis, atlas and third cervical and in such case, the bucky may be tilted so as to cause the photographic plate to stand in a plane at a right angle to the central rays of the projector or it may be retained in its vertical position and produce a corresponding portrayal of the axis, atlas, etc.

I make no separate claim to apparatus for tilting the bucky forward and back, as such apparatus is well known and in common use.

It is obvious that my method and apparatus will furnish spinographs portraying existing subluxations as they actually exist much more accurately than the apparatus heretofore in use which requires manipulation and adjustment of the patient's head into a posture corresponding to the position of the apparatus rather than to adjust the apparatus to the habitual posture of the patient's head.

It has been found by abundant experience that this method and apparatus will promote more accurate reading and determination of existing misalignments, to the great benefit of patients generally.

Furthermore, it has been found by actual experience that the method and apparatus above described will greatly facilitate the taking of spinographs and substantially reduce the time necessary for that purpose.

Several points must be considered before going into the actual use of my process and apparatus. First of all, the operator must have a seat or turn-table on which the patient is seated which enables the operator to move the patient from side to side, back and forth, and to revolve around a point without changing posture of his head. This type turn-table enables the doctor to rotate the patient or reverse the rotation without difficulty. Under no circumstances should the

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patient's head be rotated on the body manually as this can change the alinement which is needed for careful analysis.

It is necessary that the bucky must be mounted on standards or a wall mount thus enabling the operator to move the bucky up and down; also the operator must be able to tilt the bucky so as to increase or decrease the angle of said bucky in order to conform with the posture of the patient.

The next step in the use of this apparatus is determining and fixing the points of alinement of the patient's skull to be X-rayed. For an anterior-posterior or A.-P. point of alinement, the equal distance between the eyes at or about the bridge of the nose or Cupid's bow of the upper lip is used. From a lateral point of view the anatomy of the ear must be carefully considered.

The user should first examine the ears of the patient to note if there is any malformation of the tragus of the ear which is directly in front of the meatus. Whenever a malformation appears to be present the operator must make the proper compensation.

Placement for A.-P. or nasium.—The user should place the patient in the usual manner for A.-P. view so the shoulders and back of the head will touch the bucky lightly, then lower the yoke until it clears the head about half an inch. Bring the alinement pointer down in close proximity to the patient's head and move the seat and patient until the pointer locates a point equidistant between the eyes at the bridge of the nose, then loosen the screw which tightens the yoke on the alinement rod thus enabling it to be moved backward and forward thereon; then slide the tragus finder in on one side of the patient (either side) and move the yoke back and forth until the tragus finder locates the tragus or the small depression at the top of the tragus. Now slide the tragus finder to the ear on the opposite side of the patient and note its relationship to the other tragus. If the corresponding point is not reached, the patient must be rotated and the yoke moved back and forth until the tragus finders on each side of the head locate corresponding identical points at or above the tragus. When this is accomplished, again lower the alinement pointer and if the patient is not centered therewith, move the seat of the patient until the alinement pointer can touch the midway point between the eyes or Cupid's bow of the upper lip.

Next bring in the clamp pads simultaneously (not separately) and lock the bolts at the same time. The patient's skull is now placed without rotation or laterality in relation to the central rays of the tube. It is necessary only to lift the alinement pointer to get the desired picture. The placement will be accurate due to the fact that the meati of the ears are parallel to the bucky thus eliminating the rotation of the skull and the central rays are directed between the eyes and will remove the laterality. The central rays of the tube will pass through a point between the eyes bisecting the skull giving the desired placement.

In taking the A.-P. view, it is advisable to have the head pads above the zygomatic arch, as the patient will find difficulty in opening his jaws, provided the pad is clamped below the zygomatic arch. For base-posterior view, the same procedure is followed with the exception that the yoke is lowered considerably more than it is in the nasium or A.-P. view.

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In the vertex view the alinement pointer may be used to locate the external occipital protuberance instead of the bridge of the nose.

In taking a lateral view, simply place the patient in the usual way, taking out rotation by visualization. Lower the alinement pointer, turn the yoke up out of the way, and move the patient back or forth until the alinement pointer bisects the internal meatus of the ear.

Various modifications in the form and proportion of the parts may be made without departing from the spirit of my invention and I do not limit my claims to the precise forms shown in the drawings.

I claim:

1. In apparatus for taking spinographs of the axial region of the spine, a vertically adjustable bucky to carry a photoplate, a revolvable seat secured in adjustable relation to the bucky and movable both forward and back, and laterally thereof, a channeled bracket rigidly mounted upon the top of the bucky with a vertically adjustable supporting bar slidably mounted in the channel, an alinement bar having one end rigidly united to the lower end of said supporting bar and extending forwardly at a right angle to the supporting bar and to the photographic plate carried by the bucky, a slide mounted upon said alinement bar and slidable longitudinally thereof and carrying a semi-circular yoke adapted to span the head of a patient in front of the bucky, said slide being also revolvable upon said alinement bar, a thumb screw mounted in said yoke adapted to lock it in fixed longitudinal and rotational position upon the alinement bar, a link pivotally mounted in the outer end of the alinement bar and movable upon its pivot in a vertical plane projected through the longitudinal axis of said alinement bar, a pointer pivotally mounted upon the end of said link and movable upon its pivot in the same plane as the link, rearwardly extending arms united to the lower ends of the yoke respectively, coaxial pointers adjustably mounted in said arms, coaxial supporting bars threaded into suitable bores formed in the lower ends of the yoke carrying pads at their inner ends adapted to bear against the sides of the head of a patient spanned by said yoke to immobilize the head relative to said yoke.

2. In apparatus for taking spinographs of the axial region of the spine, a vertically adjustable bucky to carry a photoplate, a channeled bracket rigidly mounted upon the top of the bucky with a vertically adjustable supporting bar slidably mounted in the channel, an alinement bar having one end rigidly united to the lower end of said supporting bar and to the photographic plate carried by the bucky, a slide mounted upon said alinement bar and slidable longitudinally thereof and carrying a semi-circular yoke adapted to span the head of a patient in front of the bucky, said slide being also revolvable upon said alinement bar, a thumb screw mounted in said yoke adapted to lock it in fixed longitudinal and rotational position upon the alinement bar, a link pivotally mounted in the outer end of the alinement bar and movable upon its pivot in a vertical plane projected through the longitudinal axis of said alinement bar, a pointer pivotally mounted upon the end of said link and movable upon its pivot in the same plane as the link, rearwardly extending arms united to the lower ends of the yoke respectively, coaxial pointers adjustably mounted in said arms, coaxial supporting bars

threaded into suitable bores formed in the lower ends of the yoke carrying pads at their inner ends adapted to bear against the sides of the head of a patient spanned by said yoke to immobilize the head relative to said yoke.

3. In apparatus for taking spinographs of the axial region of the spine, a vertically adjustable bucky to carry a photoplate, a channeled bracket rigidly mounted upon the top of the bucky with a vertically adjustable supporting bar slidably mounted in the channel, an alinement bar having one end rigidly united to the lower end of said supporting bar and extending forwardly at a right angle to the supporting bar and to the photographic plate carried by the bucky, a slide mounted upon said alinement bar carrying a semi-circular yoke adapted to span the head of a patient in front of the bucky, said slide being also revolvable upon said alinement bar, a thumb screw mounted in said yoke adapted to lock it in fixed longitudinal and rotational position upon the alinement bar, a link pivotally mounted in the outer end of the alinement bar and movable upon its pivot in a vertical plane projected through the longitudinal axis of said alinement bar, a pointer pivotally mounted upon the end of said link and movable upon its pivot in the same plane as the link, rearwardly extending arms united to the lower ends of the yoke respectively, coaxial pointers adjustably mounted in said arms, coaxial supporting bars threaded into suitable bores formed in the lower ends of the yoke carrying pads at their inner ends adapted to bear against the sides of the head of a patient spanned by said yoke to immobilize the head relative to said yoke.

4. In apparatus for taking spinographs of the axial region of the spine, a vertically adjustable bucky to carry a photoplate, a revolvable seat secured in adjustable relation to the bucky and movable both forward and back, and laterally thereof, a channeled bracket rigidly mounted upon the top of the bucky with a vertically adjustable supporting bar slidably mounted in the channel, an alinement bar having one end rigidly united to the lower end of said supporting bar and extending forwardly at a right angle to the supporting bar and to the photographic plate carried by the bucky, a slide mounted upon said alinement bar and slidable longitudinally thereof and carrying a semi-circular yoke adapted to span the head of a patient in front of the bucky, said slide being also revolvable upon said alinement bar, means to lock said yoke in fixed longitudinal and rotational position upon the alinement bar, a link pivotally mounted in the outer end of the alinement bar and movable upon its pivot in a vertical plane projected through the longitudinal axis of said alinement bar, a pointer pivotally mounted upon the end of said link and movable upon its pivot in the same plane as the link, rearwardly extending arms united to the lower ends of the yoke respectively, coaxial pointers adjustably mounted in said arms, coaxial supporting bars threaded into suitable bores formed in the lower ends of the yoke carrying pads at their inner ends adapted to bear against the sides of the head of a patient spanned by said yoke to immobilize the head relative to said yoke.

5. In apparatus for taking spinographs of the axial region of the spine, a vertically adjustable bucky to carry a photoplate, a revolvable seat secured in adjustable relation to the bucky and movable both forward and back, and laterally

thereof, a channeled bracket rigidly mounted upon the top of the bucky with a vertically adjustable supporting bar slidably mounted in the channel, an alinement bar having one end rigidly united to the lower end of said supporting bar and extending forwardly at a right angle to the supporting bar and to the photographic plate carried by the bucky, a slide mounted upon said alinement bar and slidable longitudinally thereof and carrying a semi-circular yoke adapted to span the head of a patient in front of the bucky, said slide being also revolvable upon said alinement bar, a thumb screw mounted in said yoke adapted to lock it in fixed longitudinal and rotational position upon the alinement bar, a link pivotally mounted in the outer end of the alinement bar and movable upon its pivot in a vertical plane projected through the longitudinal axis of said alinement bar, a pointer pivotally mounted upon the end of said link and movable upon its pivot in the same plane as the link, coaxial pointers adjustably mounted at the lower ends of the yoke in a line parallel to the photoplate, coaxial supporting bars threaded into suitable bores formed in the lower ends of the yoke carrying pads at their inner ends adapted to bear against the sides of the head of a patient spanned by said yoke to immobilize the head relative to said yoke.

6. In apparatus for taking spinographs of the axial region of the spine, a vertically adjustable bucky to carry a photoplate, a revolvable seat secured in adjustable relation to the bucky and movable both forward and back, and laterally thereof, a channeled bracket rigidly mounted upon the top of the bucky with a vertically adjustable supporting bar slidably mounted in the channel, an alinement bar having one end rigidly united to the lower end of said supporting bar and to the photographic plate carried by the bucky, a slide mounted upon said alinement bar and slidable longitudinally thereof and carrying a semi-circular yoke adapted to span the head of a patient in front of the bucky, said slide being also revolvable upon said alinement bar, a link pivotally mounted in the outer end of the alinement bar and movable upon its pivot in a vertical plane projected through the longitudinal axis of said alinement bar, a pointer pivotally mounted upon the end of said link and movable upon its pivot in the same plane as the link, coaxial pointers adjustably mounted at the lower ends of the yoke in a line parallel to the photoplate, and means to lock the said pointers in adjusted coaxial spaced relation.

7. In apparatus for taking spinographs of the axial region of the spine as described in claim 6, and pads carried by coaxial rods adjustably mounted in the lower ends of the yoke arranged at opposite sides to contact the head of a patient and stabilize same.

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