

Apr. 10, 1923.

W. B. WESCOTT

1,451,382

APPARATUS FOR SUPPORTING CINEMATOGRAPHIC MACHINES OR THE LIKE

Filed June 28, 1917

3 sheets-sheet 1

Fig. 1.

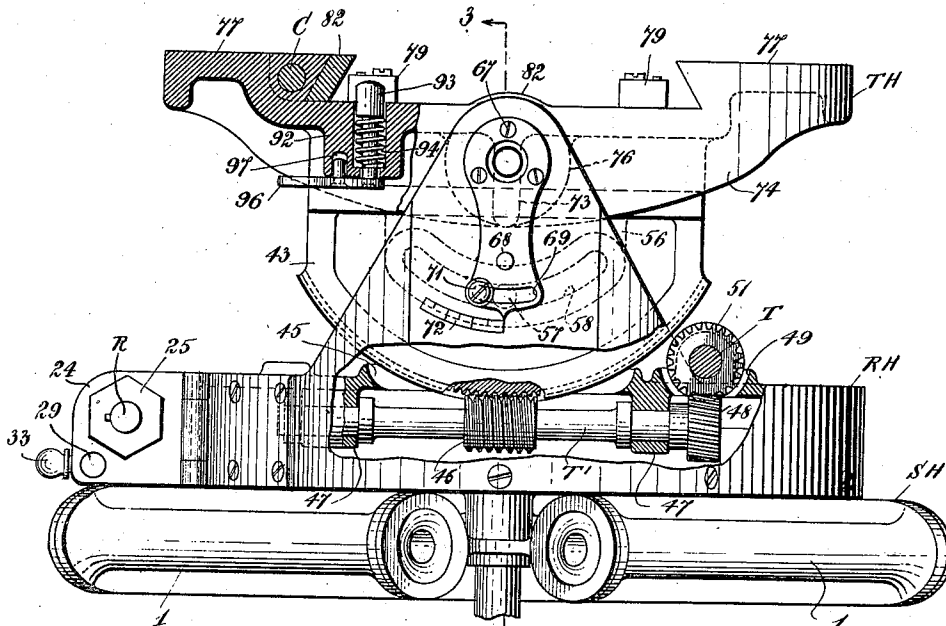
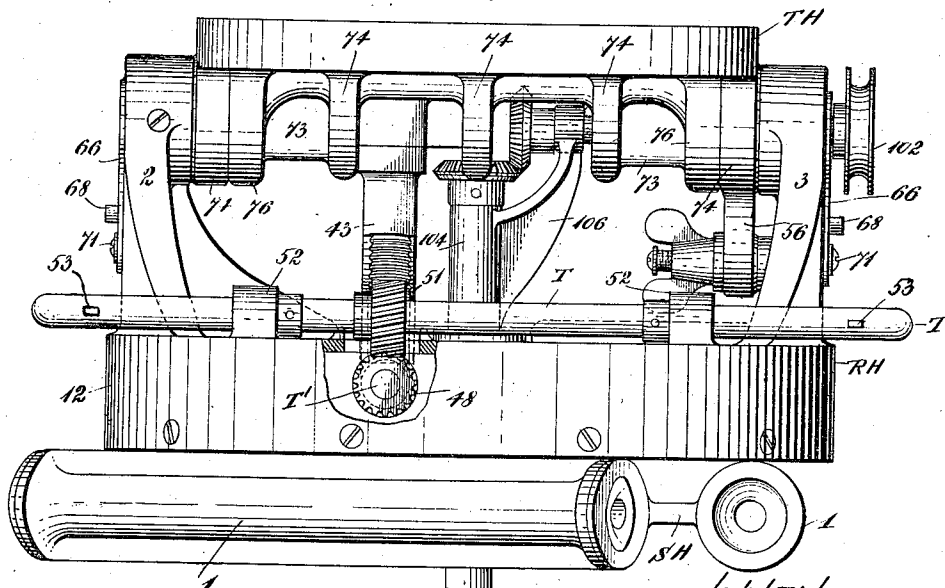


Fig. 2.



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Fig. 3.

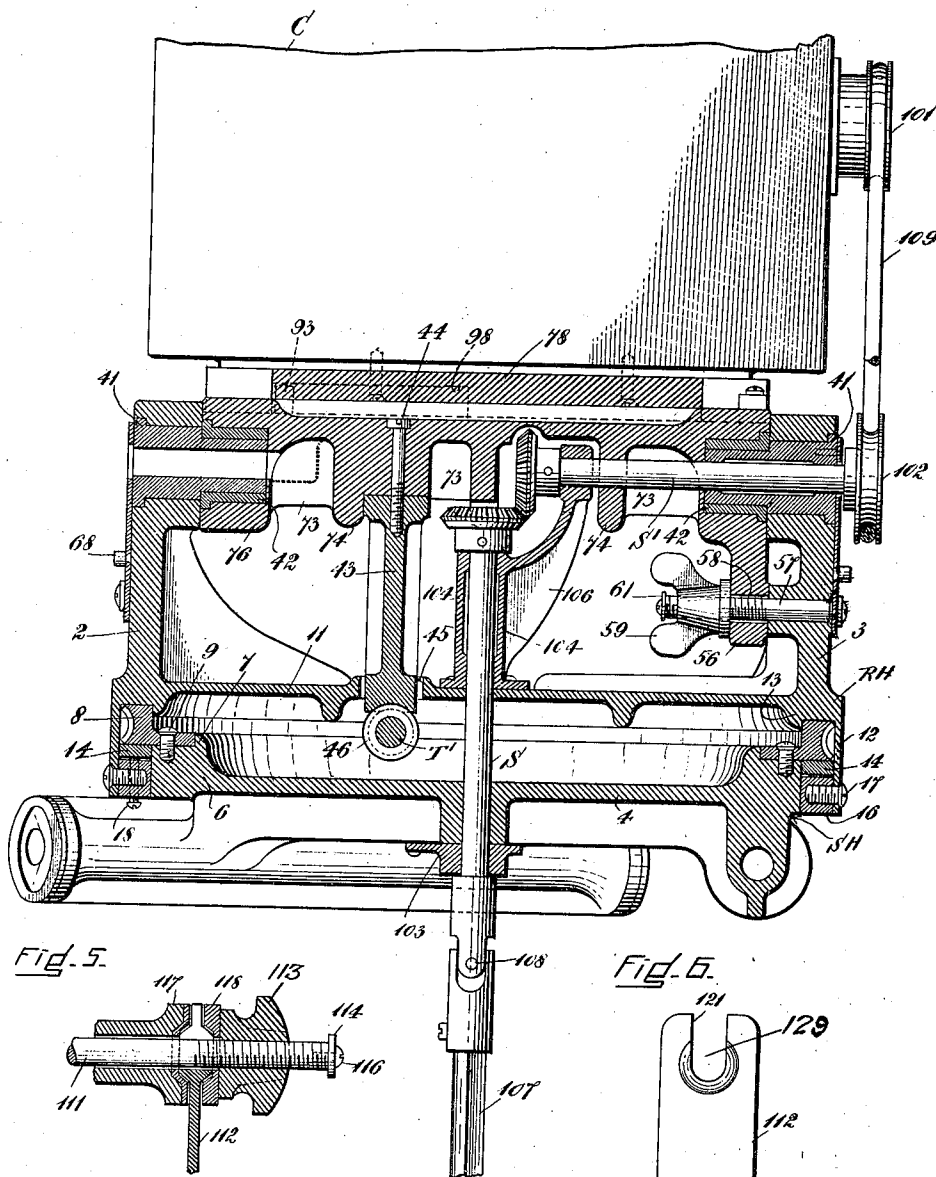


Fig. 5.

Fig. 6.

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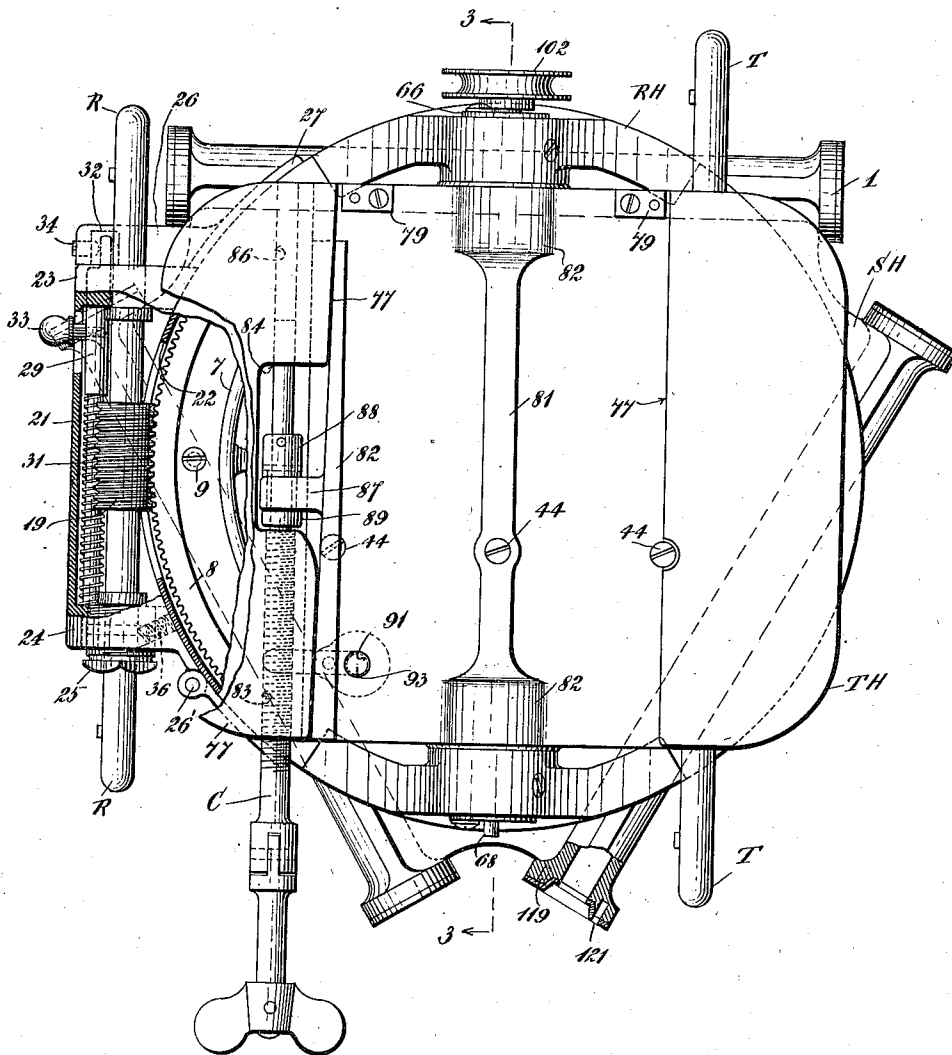
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5 sheets-sheet 3

Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM BURTON WESCOTT, OF WELLESLEY, MASSACHUSETTS, ASSIGNOR TO KALMUS, COMSTOCK & WESCOTT, INCORPORATED, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

APPARATUS FOR SUPPORTING CINEMATOGRAPHIC MACHINES OR THE LIKE.

Application filed June 28, 1917. Serial No. 177,518.

To all whom it may concern:

Be it known that I, WILLIAM BURTON WESCOTT, a citizen of the United States, resident of Wellesley, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Apparatus for Supporting Cinematographic Machines or the like, of which the following is a specification.

10 This invention relates to adjustable supporting apparatus and more particularly to portable apparatus for supporting power-driven cinematographic apparatus such as a power-driven camera, although the invention in many of its aspects is adapted to be employed for supporting things other than power-driven apparatus and devices other than cinematographic machines.

One object of the invention is to provide improved apparatus for supporting a device in such manner that it may be angularly adjusted in two planes angularly disposed with respect to each other. Another object is to provide apparatus of this character which, while readily adjustable, possesses great rigidity and affords a markedly high degree of stability, thereby being especially adapted for use in taking motion pictures. A further object is to provide angularly adjustable apparatus affording a range of adjustment which is large in comparison with the size of the apparatus. A still further object is to provide means for adjusting the angularly adjustable portions of the apparatus toward and from each other so that the relative position of the cooperating mechanism on the respective portions may be regulated. Another object is to provide a unique arrangement of the transmission system whereby power may be transmitted through the apparatus without interfering with the various adjustments and indeed so there is a cooperative relationship between the transmission system and the adjustment means. Still another object is to provide rigid and convenient adjustable means for supporting the apparatus, such means preferably being in the form of tripod legs.

50 Still further objects will be apparent from the following description and the accompanying drawings, in which,—

Figure 1 is a left elevation of the appa-

ratus showing parts broken away and showing parts in cross-section;

Figure 2 is a rear elevation of the apparatus showing parts broken away;

Figure 3 is a vertical transverse central section of the apparatus showing a camera mounted thereon;

Figure 4 is a top plan of the apparatus showing parts broken away and showing parts in section;

Figure 5 is a vertical longitudinal section through the pivoted connection between the apparatus and supporting means such as a tripod leg; and

Figure 6 is an elevation of the upper end of a tripod leg.

The apparatus, in its entirety, comprises a stationary head SH adapted to be suitably supported as, for example, by means of tripod legs attached to the head at opposite ends of the three hollow bearings 1 integrally secured to the bottom of the stationary head and arranged in triangular form (Fig. 4); a rotating head RH mounted on the stationary head SH so as to rotate horizontally about the vertical shaft S; and a tilting head TH mounted in standards 2 and 3 disposed at opposite sides of the rotating head RH, the tilting head TH being so mounted on the rotating head RH as to be tilted about a horizontal axis concentric with the shaft S'. The camera C, or other apparatus, is either rigidly or adjustably mounted on the tilted head TH, as hereinafter described.

The stationary head SH comprises a flat horizontal plate portion 4 (Fig. 3), and around the outside of portion 4 an enlarged annular rim 6. The rim 6 is accurately machined, both on its outer periphery and upon its upper surface, concentrically with the shaft S. The upper surface of the rim 6 is preferably machined only throughout the outer portion thereof so as to leave a flange 7 disposed on the inside of the machined portion. Upon the upper surface of rim 6 and abutting against the flange 7 is mounted a worm wheel 8 by means of screws 9 or other suitable means. The worm wheel 8 is preferably provided with the worm teeth disposed upon its outer periphery and extending entirely therearound.

The rotating head RH comprises a horizontal central portion 11 disposed substantially parallel with and somewhat above the horizontal portion 4 of the stationary head SH. The lower portion of the rotating head RH is provided with a depending cylindrical flange 12 extending downwardly around the worm wheel 8 and extending somewhat therebelow. The lower surface of the rotating head RH immediately within the flange 12 is carefully machined to form a smooth bearing surface adapted to rest on the upper surface of the worm wheel 8, a flange 13 being provided on the inside of the bearing surface to engage the inner periphery of the worm wheel 12, so as accurately to maintain the rotating head in position concentrically with respect to the stationary head SH. In the space below the worm wheel 12, between the stationary head SH and the flange 12, is disposed a bearing ring 14 adapted to engage the lower surface of the worm wheel 12. This bearing ring 14 is maintained in position by means of a supporting ring 16 secured within the flange 12 by suitable means such as screws 17, the bearing ring 14 being held up snugly against the worm wheel 8 by means of screws 18 threaded through supporting ring 16 and at their upper ends bearing against the lower surface of the bearing ring. By virtue of this arrangement, the bearing ring 14 may not only be accurately adjusted in snug relationship to the worm wheel 8, but the wear between the worm wheel 8 and the lower bearing surface of the rotating head and the upper bearing surface of bearing ring 14 may be compensated for from time to time by slightly advancing the screws 18 through the supporting ring 16.

As shown most clearly in Figure 4, the mechanism for rotating the head RH comprises a worm-wheel 19 mounted on a shaft R, which in turn is mounted in a casing 21 disposed at one side of the lower portion of the rotating head in such manner that the worm wheel 19 may be held in engagement with the worm wheel 8 mounted on the stationary head as above described, the flange 12 of the rotary head having a portion on one side cut away so as to form an opening 22 for the worm 19 to extend into engagement with the worm wheel 8. The casing 21 for the worm 19 comprises two end portions 23 and 24, the end 24 being pivotally mounted at 26' on the outside of the flange 12 and the end 23, when the casing 19 is swung about pivot 26' into the closed position shown in Figure 4, being disposed in juxtaposition to a member 26 secured to the outside of the flange 12 by means of a flange 27. The projection 26 is of less vertical depth than the casing 23, and is disposed below the shaft R so that

the shaft passes over the projection when the casing is swung into closed position. The shaft R is mounted at one end in a bearing opening extending through the end 23 of casing 21, and at the other end the shaft is mounted in a bearing 25 threaded into the end 24 of casing 21. The shaft is provided with a collar immediately within the end 23 and with another collar immediately inside of the bearing 25 so that when the bearing 25 is suitably adjusted in the end 24 the shaft R is maintained in accurate longitudinal position.

Within the lower outer portion of the casing 19 a reciprocating shaft 29 is mounted longitudinally of the casing in suitable openings in the ends 23 and 24 of the casing. The rear end of the shaft 29 is of reduced diameter and is surrounded by spring 31 bearing at one end against the end 24 of casing 19 and bearing at its other end against the shoulder formed by the larger portion of the shaft 29 so as to urge the rod forwardly. The forward end of the rod is provided with a flat portion which is adapted to project into an opening 32 disposed in the outer end of the projection 26 when the casing is in closed position. A handle 33 is threaded into the larger portion of the rod 29 through a suitable slot in the casing 19, so that the rod may be withdrawn from the opening 32 against the action of spring 31. A screw 34 is preferably threaded through the forward end of the projection 26 so as to engage the forward face of the flat end of rod 29 and thereby maintain the casing 19 in such position that the worm 19 fits snugly against the worm wheel 8, the screw 34 affording means for accurately adjusting the operative relationship between the worm and worm wheel. A small recess is preferably drilled in the inner portion of end 24 of the casing 21 in substantially normal relationship to the outer surface of the flange 12 of the rotating head RH, and a compression spring 36 is secured within the opening in such manner as to engage the flange 12 and urge the casing 21 outwardly about the pivot 26', so that the casing 21 is automatically swung outwardly when catch-rod 29 is withdrawn thereby disengaging the worm from the worm wheel.

As above stated, the head TH is so mounted upon the rotating head RH as to be tilted about a horizontal axis concentric with the shaft S'. The means for controlling this tilting motion is as follows: The standards 2 and 3 are provided with bearings 41 and surrounding the inner ends of these bearings are bearings 42 mounted in the opposite sides of the tilting head TH. A worm wheel quadrant 43 is secured to the underside of the head TH by means of screws 44, so as to present its worm teeth downwardly and so as to lie in a vertical plane

perpendicular to the axes of the bearings 41 and 42. The worm wheel quadrant extends downwardly through an opening 45 in the horizontal portion 11 of the rotating head RH, and within the lower portion of the rotating head is disposed a worm 46 in operative relationship to the worm wheel quadrant 43 (Fig. 1), the worm 46 being rigidly mounted on a shaft T' rotating in bearings 47 extending downwardly from the horizontal portion 11 of the rotating head RH, collars being provided on the shaft T' to engage the opposing faces of the bearing 47 so as to prevent longitudinal movement of the shaft T'. Upon one end of the shaft T' is disposed a gear-wheel 48, and extending through an opening 49 in the portion 11 of the rotating head RH is a gear 51 meshing with the gear 48. The gear 51 is mounted upon a shaft T arranged to rotate in bearings 52 extending upwardly from the horizontal portion 11 of the rotating head RH (Fig. 2), collars being provided on the inside of bearings 52 to prevent longitudinal movement of shaft T. The shaft T extends outwardly somewhat beyond the rotating head on each side of the apparatus and is provided with keys 53 on the ends so that a handle of suitable character may be applied to either end for the purpose of rotating the shaft and thereby tilting the head TH. The gear-wheels 48 and 51 are preferably of the spiral type so that they snugly mesh together notwithstanding the fact that they are disposed in perpendicular planes.

In order to anchor the head TH so as to prevent its being tilted with relation to the head RH locking means is provided, the following being the preferred form of this means: Depending from the right-hand end (Fig. 3) of the tilting head TH in a perpendicular plane parallel with the central portion of the standard 3 is a flange 56, and in the lower portion of this flange is an arcuate slot 58 disposed concentrically with respect to the shaft S' in alinement with the bolt 57 which extends through an opening in standard 3 and thence through the arcuate slot 58. Upon the inner end of the bolt 57 is threaded a wing-nut 59, and a washer 61 is screwed to the inner end of the bolt to prevent the wing-nut being accidentally removed. Thus, by advancing the wing-nut 59 against the flange 56, the flange may be tightly gripped between the the wing-nut and the standard 3, thereby locking the tilted head in fixed position with respect to the rotating head.

Owing to the fact that a certain amount of wear will take place in the connection between the worm-wheel quadrant 43 and worm 46, a certain amount of lost motion will develop between the worm-wheel 43 and worm 46. In order to compensate for

this lost motion from time to time. I preferably provide means for vertically adjusting the tilting head TH with relation to the rotating head RH. This means comprises bearings 41, the inner portions of which, namely, the portions extending into the bearings 42, are made eccentric with respect to the portions thereof which are disposed in the standards 2 and 3, so that by rotating the bearings in the standards 2 and 3 the tilting head supported on the the inner eccentric portions of the bearings is raised or lowered. My preferred means for rotating the bearings 41 comprise flat plates 66 secured to the outer ends of the bearings 41 by means of screws 67. The members 66 extend downwardly from the bearings and are provided with projections 68 by which the members may be rotated, thereby rotating the bearings 41. Slots 69 are provided in the lower ends of the members 66, respectively, these slots being concentric with the horizontal axis of the tilting head, and screws 71 are threaded into the standards 2 and 3 so as to extend through the slots 69, so that the heads of the screws engage the outer surface of the members 66, either directly or through the medium of washers, and thereby secure the members 66 and bearings 41 in adjusted position. In order to facilitate an equal adjustment of the two members 66 a scale 72 may be mounted on each of the standards 2 and 3 along the path of a pointed projection on the lower end of each of the members 66. When the apparatus is first assembled the parts are preferably so proportioned that the proper adjustment between the worm quadrant 43 and worm 46 will be secured with the eccentric portions of the bearings 41 displaced horizontally (to the right in Fig. 1) from the horizontal axis of the tilting head and with the pointer members 66 disposed in the vertical position shown in Fig. 1. As lost motion develops between worm quadrant 43 and worm 46, the pointer members are shifted equal amounts along the scale 72, thereby dropping the tilting head with relation to the rotating head.

In order to strengthen the tilting head TH both laterally and horizontally, a rib 73 is disposed along the transverse center line on the under side of the tilting head, the central portion of the rib being cut away to provide space for the gearing connecting the shafts S and S'; and ribs 74, each having an arcuate contour, are disposed in spaced relationship on the under side of the tilting head in planes perpendicular to the rib 73, bosses 76 being provided upon the inside of the outer flanges 74 to receive the bearings 42.

My preferred means for mounting the camera C upon the tilting head TH comprises

dovetail guides 77 cooperating with a gib 78 screwed or otherwise secured to the bottom of the camera. When the gib is inserted into the guides from the left hand side, as in the illustrated embodiment, stops 79 may be provided at the opposite end of the guideway to limit the extent of the insertion of the gib. Owing to the fact that the standards 2 and 3 project upwardly somewhat above the bottom of the guideway, the lower face of the gib is preferably made concave about a transverse axis so as to clear the standards and so as to bear on the upper surface of the head TH only along the outer portions adjacent the guides 77. In order further to strengthen the tilting head a rib 81 may be disposed transversely along the central portions of its upper surface between the raised portions 82 which are disposed above the bearings 42.

In order to lock the camera in position in the guideway wedging mechanism is provided. This mechanism preferably comprises a member 82 having a cross-sectional shape substantially as represented in Fig. 1 and being arranged to fit in the angle between the forward dovetail guide 77 and the bottom of the guideway. This member 82 is tapered longitudinally, it being thicker horizontally at the left hand end than at the right hand end, as shown in Fig. 4, and the dovetail guide 77 against which the tapered member 82 rests is inclined to the guideway so that the distance between the guides 77 at the right hand side of the head is less than at the left hand side, the taper of the member 82 and the inclination of the cooperating guide 77 being such that the face of the member 82, which is opposed to the dovetail guide 77 on the opposite side of the guideway, is substantially parallel to the said opposed face. Thus, as the member 82 is moved to the right along the cooperating guide 77 it is also moved toward the opposing guide and with the gib 78 of the proper width the movement of the member 82 causes the gib to be tightly clamped between this member and the opposing guide 77.

Suitable means for moving the member 82 along the guideway comprises a shaft C which is threaded through an opening 83 in the guide 77 and which extends across an opening 84 in the central portion of the guide 77 into an opening 86 in the opposite side of the opening 84 in alinement with the opening 83. The member 82 is provided with a projection 87 which has a slot therein, the vertical dimension of which is substantially equal to the diameter of that portion of the shaft C extending across the opening 84 and the horizontal dimension transversely of the shaft C of which is slightly greater than the diameter of the shaft. Collars 88 and 89 are pinned to the shaft C on opposite sides of the projection 87 so that, as the shaft C

moves longitudinally, the member 82 is moved therewith, the longitudinal movement of the member 82 also moving it transversely to clamp or release the gib 78, as above described. A knurled head or wing-nut may be provided to rotate the shaft C, and to avoid obstructing the passage of the gib 78 into or out of the guideway the knurled head or wing-nut may be made detachable from the shaft C as is shown in Fig. 4, for example.

In many cameras now in use the lens system for the focusing mechanism, is positioned at one side of the main lens system of the camera, and in order to focus the camera along the optical axis of the main lens system it is necessary to shift the camera laterally in focusing so that the optical system of the focusing mechanism is in alinement with the normal path of the main optical system. For this reason I preferably provide means whereby the camera may be shifted laterally the required amount in focusing and whereby the camera may be shifted back precisely to its normal position after a focusing operation is completed. The preferred means for accomplishing this purpose will now be described.

In the bottom of the guideway near the left-hand side of the tilting head and adjacent the clamping member 82 is provided an opening 91 extending vertically through the bottom of the guideway into a boss 92 disposed on the under side of the horizontal portion of the tilting head. At the bottom of this boss is provided a smaller opening through which extends a plunger shaft carrying at its upper end a plunger 93 fitting snugly within the opening 91. A compression spring 94 is disposed in the opening 91 between the plunger head 93 and the bottom of the opening so as normally to urge the plunger head forwardly above the horizontal plane of the guideway in the path of the gib 78. On the lower end of the plunger is mounted a handle 96 which extends outwardly from the plunger and which is provided with a pin fitting into a recess 97 adjacent the opening 91. By depressing the handle 96 the plunger 93 may be depressed against the action of spring 94 beneath the level of the guideway; and upon releasing the handle 96 the spring 94 forces the plunger upwardly into the position shown in Fig. 1, the pin disposed in recess 97 serving to prevent rotation of the handle 96.

In the lower side of the gib 78 is provided an elongated recess 98 extending horizontally of the guideway and being so positioned as to receive the plunger 93 therein. The recess 98 is so disposed in the gib 78 that with the plunger 93 engaging the left-hand end of the recess the pulley 101 on the camera is in alinement with the pulley 102 on the supporting head, this being the operative position of the camera; and the recess 98 is of

such length that when the camera is moved to the left along the guideway to such an extent that the plunger 93 engages the opposite end of the recess, the optical axis of the focusing mechanism occupies the same position as does the optical axis of the main lens system when the camera is in the normal position shown in Fig. 3.

Thus in placing the camera in position on the tilting head TH the clamping member 82 is moved to the left into the position shown in Fig. 4, the plunger 93 is depressed below the level of the guideway, the gib 78 fastened to the bottom of the camera is inserted into the guideway and advanced to such position that the plunger 93 may be moved upwardly into the recess 78, after which the plunger 93 is allowed to rise. If it is not desired to focus the camera, the camera is moved to the right until the plunger 93 engages the left-hand end of the recess 78 and the camera is then locked into position by rotating shaft C in a clockwise direction, thereby advancing the clamping member 82 so as tightly to clamp the gib. In the event that it is desired to focus the camera at any time the clamping member 82 is withdrawn to such an extent that the camera may be moved to the left until the plunger 93 engages the right-hand end of the recess 98.

My apparatus is especially designed to permit the camera mechanism being driven by an electric motor or other source of power and to this end I provide the shafts S and S' geared together by means of bevel gears. The shaft S extends through openings in the stationary head and rotating head, through a bearing 103 on the bottom of the stationary head SH and through a bearing 104 mounted on the upper surface of the horizontal portion 11 of the rotating head. The shaft S' is rotatably mounted in the right-hand bearings 41 and 42 and also extends through one of the longitudinal ribs 74 and through a bearing in the bracket 106, the bracket 106 preferably being integrally connected to the vertical bearing 104. Power is transmitted to the shafts S and S' from shaft 107 through the medium of the universal joint 108, and power is transmitted from the pulley 102 to the pulley 101 by means of a belt 109 or other suitable means.

My invention also comprises improved means for attaching the tripod legs to the stationary head SH, in the event that the head is to be mounted on tripod legs, and the preferred form of this means is illustrated in Figs. 5 and 6. The bearings 1 have longitudinal openings therethrough adapted to receive shafts 111, these shafts extending from the ends of the bearings 1 through openings in the upper ends of the tripod legs 112, the legs being held in position on the shafts 111 by means of wing-

nuts 113 threaded on to the outer end of the shafts 111, a washer 114 being secured on each end of each shaft by screws 116 to prevent the accidental removal of the wing-nuts 113. Inasmuch as the bearings 1 and the wing-nuts 113 are preferably made of cast material, bearing plates 117 and 118 are preferably provided between the tripod legs 112 and the bearings 1 and wing-nuts 113, respectively, the bearing plates 117 and 118 being secured to the bearings 1 and wing-nuts 113, respectively, by means of screws 119 threaded into openings 121 as illustrated in Fig. 4.

Heretofore it has been the practice to employ tripod legs having a flat upper portion clamped between the bearings and suitable means, such as wing-nuts 113, so that the tripod legs are rigidly clamped against the bearings. It is frequently desirable to move the tripod legs in the plane of the supporting shafts such as 111, and with the prior construction this could only be accomplished by flexing the tripod leg in this direction. This flexing of the tripod legs is highly undesirable for the reason that it greatly accentuates the vibration of the apparatus, supporting members under flexing stress being much more prone to vibrate than supporting members which are not under such flexing stress. To overcome this difficulty and to afford other advantages I have provided means for permitting the tripod leg 112 to be rotated in the plane defined by the leg and the shaft 111.

This means comprises circular enlargements on opposite sides of the tripod leg 112 surrounding the shaft 111, these circular enlargements fitting into circular concavities in the bearing plates 117 and 118. Extending between the shaft opening 129 and the upper ends of each of the tripod legs 112 is a slot 121 so that the tripod legs can be removed from or attached to the shafts 111 without removing the wing-nuts from the shafts and the openings 129 are slightly larger than the shafts 111 so that the tripod legs 112 may be rotated somewhat in the planes of the shafts 111.

Another advantage afforded by the described ball and socket type of bearing is that, by virtue of the axial telescoping portions of the bearing, the tripod legs may readily be maintained in position on the shafts 111 without clamping them very tightly against the bearings 1 by means of the wing-nuts 113 so that they may be readily adjusted either about the axes of the shafts 111 or in the planes of the shafts 111, whereas in the prior construction the legs had to be tightly clamped between the bearings and the wing-nuts or equivalent means in order to prevent the legs from becoming accidentally disengaged from the supporting shafts. This resulted in great difficulty

in adjusting the tripod legs and indeed it was usually necessary to temporarily loosen the wing-nuts in order to permit the necessary adjustment.

5 The operation of the apparatus will be apparent from the above detailed description, but the following may be added by way of summary: The stationary head SH is rigidly mounted upon any suitable means as, for example, tripod legs or a flat supporting surface, and the vertical and horizontal adjustments of the camera are secured by tilting the head TH and by rotating the head RH. The head RH is rotated by rotating the shaft R by means of a key or other suitable means; and by virtue of the fact that the shaft R is mounted on the rotating head it travels around with the rotating head, this being desirable for the reason that the operator usually moves around the apparatus as the camera is rotated. While this rotating means is especially intended to be employed in taking panoramic views, it obviously may be employed for horizontally adjusting the camera for any desired purpose. The pitch of the rotating worm and worm wheel is such that the head is rotated only slowly by the rotation of the shaft R, and in order quickly to rotate the head RH the worm 31 is disengaged from the worm wheel in the manner above described. In order to tilt the camera in a vertical plane the tilting head TH is rotated by means of the worm quadrant 43, shaft T' and shaft T. By virtue of the fact that the rotating head RH is arranged to rotate about the shaft S and the tilting head is arranged to rotate about the shaft S' the vertical and horizontal movement of the camera can be made at any time without interfering with the operation of the mechanism for transmitting power to the camera. Among the advantages afforded by my improved apparatus may be mentioned the following: The use of the dove-tail guides instead of a central screw for securing the camera on the apparatus affords a much more rigid means for connecting the camera to the apparatus. The spring pressed plunger 93 affords a ready means of laterally shifting the camera between the focusing and exposing positions. The unique disposition of ribs on the under side of the tilting head serves to make this head exceedingly rigid, and standards 2 and 3 being integrally connected to the rotating head instead of being bolted thereto form a much more substantial construction of the rotating head. Owing to the fact that the shaft T' carrying the worm which meshes with the worm quadrant 43 is mounted on the bottom of the horizontal portion 11 of the rotating head a very much larger worm quadrant may be employed for a given vertical depth of rotating head than if the worm shaft T'

were mounted on the top of the horizontal portion 11. This reduction of the vertical depth of the rotating head results in a more rigid construction, which is less subject to vibration. The eccentric bushings supporting the tilting head on the rotating head afford means for taking up lost motion as it develops, and thereby to maintain the parts in tight relationship. Owing to the fact that the worm wheel 8 is disposed at the extreme outer periphery of the stationary head and by virtue of the fact that the rotating head is rotatably mounted on the worm wheel disposed at this extreme outer position, much greater rigidity is afforded than if the worm wheel and bearing surface were disposed near the center of the apparatus, as has been done heretofore. The provision of a peripheral bearing surface on the rotating head in engagement with the worm wheel 8, namely, the outer face of the flange 13 (Fig. 3), affords excellent means for preventing radial movement of the rotating head with respect to the stationary head; and inasmuch as this bearing surface is disposed a considerable distance outwardly from the shaft S it is of relatively large circumference and can be machined more accurately and more easily than a bearing surface of smaller extent.

While I have described this apparatus as being particularly adapted to support a camera and as being particularly adapted to be employed in connection with tripod supporting legs, it is to be understood that it may be employed to support any machine or device and that it may be supported in any suitable manner.

The terms horizontal, vertical, above, below, etc., are employed in a relative sense more conveniently to refer to relative directions and relations and not in an absolute sense, although for the preferred use of my apparatus the terms are also accurately descriptive with reference to absolute directions and relations.

I claim:

1. In apparatus of the character described, the combination of a supporting head having a horizontally disposed base, a tiltable head mounted on and above the supporting head to rotate about a horizontal axis, a gear-wheel segment extending downwardly from the tiltable head concentrically with the said axis, the gear-wheel segment having a radius such as to extend at least to the plane of the horizontally disposed base, and a gear mounted beneath said base in operative relationship to the gear-wheel segment.

2. In apparatus of the character described, the combination of a supporting head having a horizontally disposed base, a tiltable head mounted on and above the sup-

porting head to rotate about a horizontal axis, a gear-wheel segment extending downwardly from the tiltable head concentrically with said axis, the horizontally disposed base having an opening therein and the gear-wheel segment being arranged to extend through said opening, and a gear mounted beneath said base in operative relationship to the gear-wheel segment.

3. In apparatus of the character described, the combination of a supporting head having a horizontally disposed base-plate, a tiltable head mounted on and above the supporting head to rotate about a horizontally disposed axis, a gear-wheel segment mounted concentrically with said axis on the tiltable head, the base-plate having an opening therein and the gear-wheel segment extending downwardly through the opening, and a gear disposed beneath the plane of the base-plate in operative relationship to the gear-wheel segment.

4. In apparatus of the character described, the combination of a supporting head having a horizontally disposed base-plate, a tiltable head mounted on and above the supporting head to rotate about a horizontally disposed axis, a gear-wheel segment mounted concentrically with said axis on the tiltable head to extend downwardly at least to said base-plate, a shaft mounted beneath said base-plate, a gear disposed on said shaft in operative relationship to the gear-wheel segment, a second shaft mounted above said base-plate, and gears mounted on the respective shafts in operative relationship so that rotation of the second shaft produces rotation of the tiltable head.

5. In apparatus of the character described, the combination of a supporting head having a horizontally disposed base-plate, a tiltable head mounted on and above the supporting head to rotate about a horizontally disposed axis, a gear-wheel segment mounted concentrically with said axis on the tiltable head, the base-plate having an opening therein and the gear-wheel segment extending downwardly through the opening, a shaft mounted beneath said base-plate, a gear disposed on said shaft in operative relationship to the gear-wheel segment, a second shaft mounted above said base-plate, and gears mounted on the respective shafts to extend through an opening in said base-plate into operative relationship, whereby rotation of the second shaft produces rotation of the tiltable head.

6. In apparatus of the character described, the combination of a stationary head and a rotatable head mounted thereon, the respective heads having horizontally disposed base plates and having cooperative annular bearings disposed on the respective base-plates concentrically with a vertical central axis at a substantial radial distance

outwardly from said axis, a tiltable head mounted on the rotatable head to rotate about a horizontal axis, a gear-wheel segment mounted concentrically with said horizontal axis, the said base-plate of the rotatable head having an opening therein and the gear-wheel segment extending through the opening, and a gear mounted beneath the said opening between said base-plates in engagement with the gear-wheel segment for tilting the tiltable head.

7. In apparatus of the character described, the combination of a stationary head and a rotatable head mounted thereon, the respective heads having horizontally disposed base-plates and having cooperative annular bearings disposed on the respective base-plates concentrically with a vertical central axis at a substantial radial distance outwardly from said axis, a tiltable head mounted on the rotatable head to rotate about a horizontal axis, a gear-wheel segment mounted concentrically with said horizontal axis, the said base-plate of the rotatable head having an opening therein and the gear-wheel segment extending through the opening, a shaft mounted on the under side of the base-plate of the rotatable head, a gear on the shaft in operative relationship to the gear-wheel segment, and means above the base-plate of the rotatable head extending through an opening in the base-plate for rotating said shaft, thereby to tilt the tiltable head.

8. In apparatus of the character described, the combination of supporting means, a tiltable head mounted on the supporting means, cooperative means mounted on the supporting means and tiltable head respectively for tilting the head, and means for adjusting the tiltable head toward and from the supporting means.

9. In apparatus of the character described the combination of a supporting head, opposed guides on the supporting head forming a guideway therebetween, one of the guides being obliquely disposed relatively to the longitudinal center line of the guideway, and a tapered clamping member fitting against said oblique guide so that its inner face is substantially parallel with said center line, the tapered member being arranged to slide along the oblique guide and thereby lock a device between the two guides.

10. In apparatus of the character described, the combination of a supporting head, opposed guides on the supporting head forming a guideway therebetween, one of the guides being obliquely disposed relatively to the longitudinal center line of the guideway, a tapered clamping member fitting against said oblique guide so that its inner face is substantially parallel with said center line, and means mounted on the supporting head for advancing the tapered

member along the oblique guide, thereby to lock a device between the two guides.

11. In apparatus of the character described, the combination of a supporting head, guide means forming a guideway on the supporting head, and means movably mounted on the supporting head so as to be moved into and out of said guideway, the movable means being arranged to cooperate with a device mounted in the guideway to limit the movement of the device along the guideway.

12. In apparatus of the character described, the combination of a supporting head, guide means forming a guideway on the supporting head, and a plunger mounted on the supporting head so as to be advanced and retracted into and out of said guideway, the plunger being arranged to cooperate with a device mounted in the guideway to limit the movement of the device along the guideway.

13. In apparatus of the character described, the combination of a supporting head, guide means forming a guideway on the supporting head, a plunger mounted on the supporting head so as to be advanced and retracted into and out of said guideway, and a spring for yieldingly urging the plunger into the guideway, the plunger being arranged to cooperate with a device mounted in the guideway to limit the movement of the device along the guideway.

14. In apparatus of the character described, the combination of a supporting head, guide means forming a guideway on the supporting head, the supporting head having an elongate recess opening into the guideway, a plunger in the recess having a head extending into the guideway, and a coiled spring surrounding the plunger within the recess for urging the head into the guideway.

15. In apparatus of the character described, the combination of a supporting head, guide means forming a guideway on the supporting head, the supporting head having an opening passing therethrough in alinement with the guideway, and a plunger mounted in the opening so as to be advanced and retracted into and out of said guideway, the plunger having means at its rearward end for effecting its reciprocation.

16. In combination with photographic means, positioning means, and a projection on one of said means extending into a slot in the other of said means, whereby the two means may be automatically positioned relatively to each other in the two extreme positions wherein the projection engages the respective ends of said slot.

17. In apparatus of the character described for supporting and positioning a photographic device, the combination of a

supporting head, guides on the supporting head overhanging the guideway therebetween so that the photographic device may be inserted into the guideway from the end thereof, and a plunger mounted on the supporting head so as to be advanced into the guideway in such manner as to project into a slot disposed longitudinally of the guideway in the said device, whereby the movement of the device in the guideway may be limited in both directions.

18. In combination with a photographic device having two parallel lens system, a stationary head, and means on the stationary head cooperating with the photographic device for limiting lateral movement of the photographic device in two directions, so that when the photographic device is in one extreme position one lens system is in alinement with a certain optical path and when the photographic device is in the other extreme position the other lens system is in alinement with the same optical path.

19. In combination with photographic means having two parallel lens system, supporting means, and a projection on one of said means extending into a slot in the other of said means, the slot being so disposed transversely to the plane of the lens systems and in parallelism with the plane of the lens systems that when the projection engages one end of the slot one lens system is in alinement with a given optical path and when the projection engages the other end of the slot the other lens system is in alinement with the same optical path.

20. Cinematographic apparatus comprising a stationary head, a rotatable head mounted on the stationary head to rotate about a vertical axis, means for mounting a power-driven device upon the rotary head, and a power shaft extending through said heads for transmitting power to said device, the power shaft extending along said axis so that the rotatable head may be rotated thereabout.

21. Cinematographic apparatus comprising a stationary head, a rotatable head mounted on the stationary head to rotate about a vertical axis, a tiltable head mounted on the rotatable head to rotate about a horizontal axis, means for mounting a power driven device upon the tiltable head, and a system of shafting extending through said heads for transmitting power to said device, the system of shafting extending along said axes so that the rotatable and tiltable heads may be rotated thereabout.

22. In apparatus of the character described, the combination of a supporting head, a rotatable head mounted on said tiltable head, a tiltable head mounted on said rotatable head, a worm wheel on the rotatable head for rotating same, a worm

wheel on the tiltable head for tilting same, the latter wheel extending substantially to the plane of the former wheel within the confines thereof, the former wheel being hollow, a worm disposed within said hollow wheel for actuating the worm wheel on the tiltable head, a shaft mounted on the rotatable head without the plane of the hollow wheel and gearing connecting the shaft and worm within the hollow wheel for actuating the worm. 10

Signed by me at Boston, Massachusetts,
this sixth day of June, 1917.

WILLIAM BURTON WESCOTT.