Nov. 3, 1942. R. S. ESTEY 2,300,559

MICRO-PROJECTION APPARATUS

Filed May 9, 1941 5 Sheets-Sheet 1

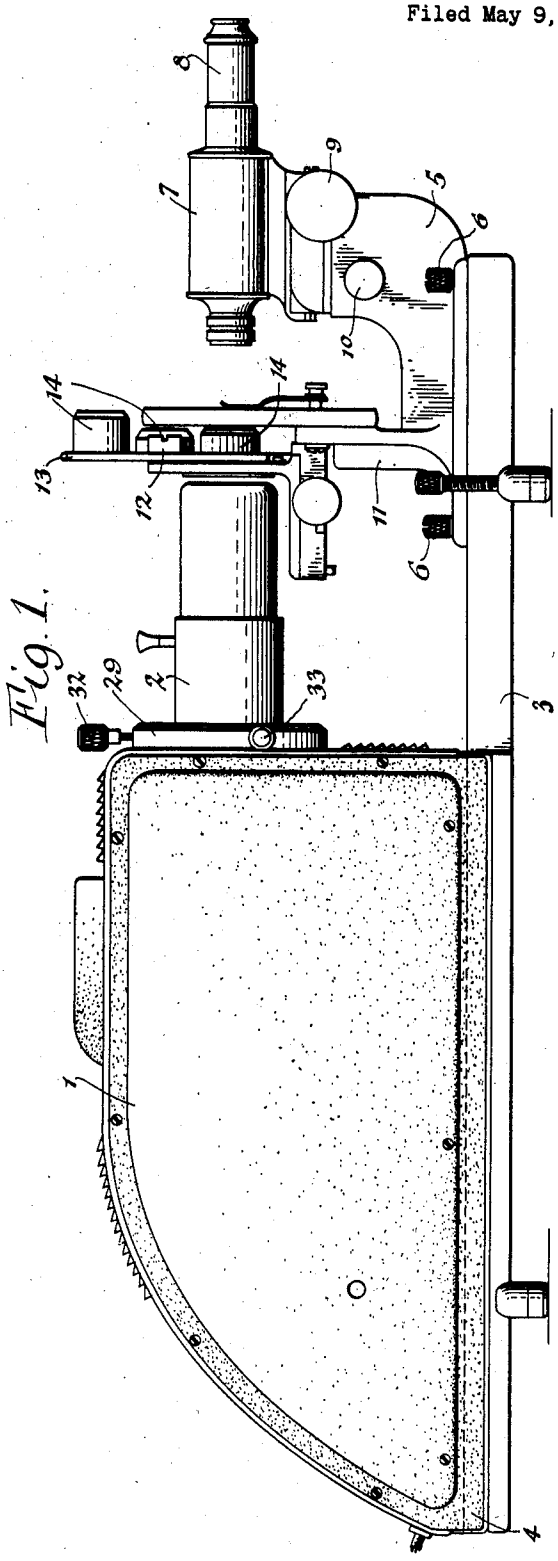


Fig. 1.

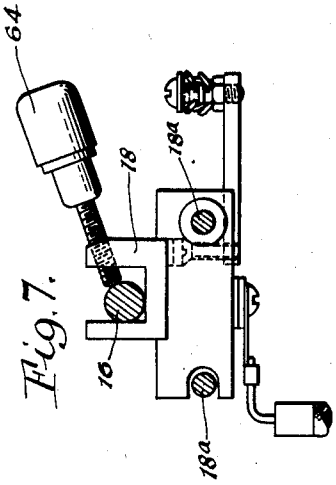


Fig. 7.

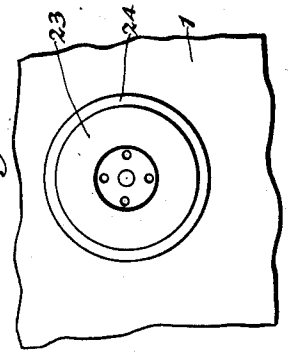


Fig. 6.

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MICRO-PROJECTION APPARATUS

Filed May 9, 1941 5 Sheets-Sheet 2

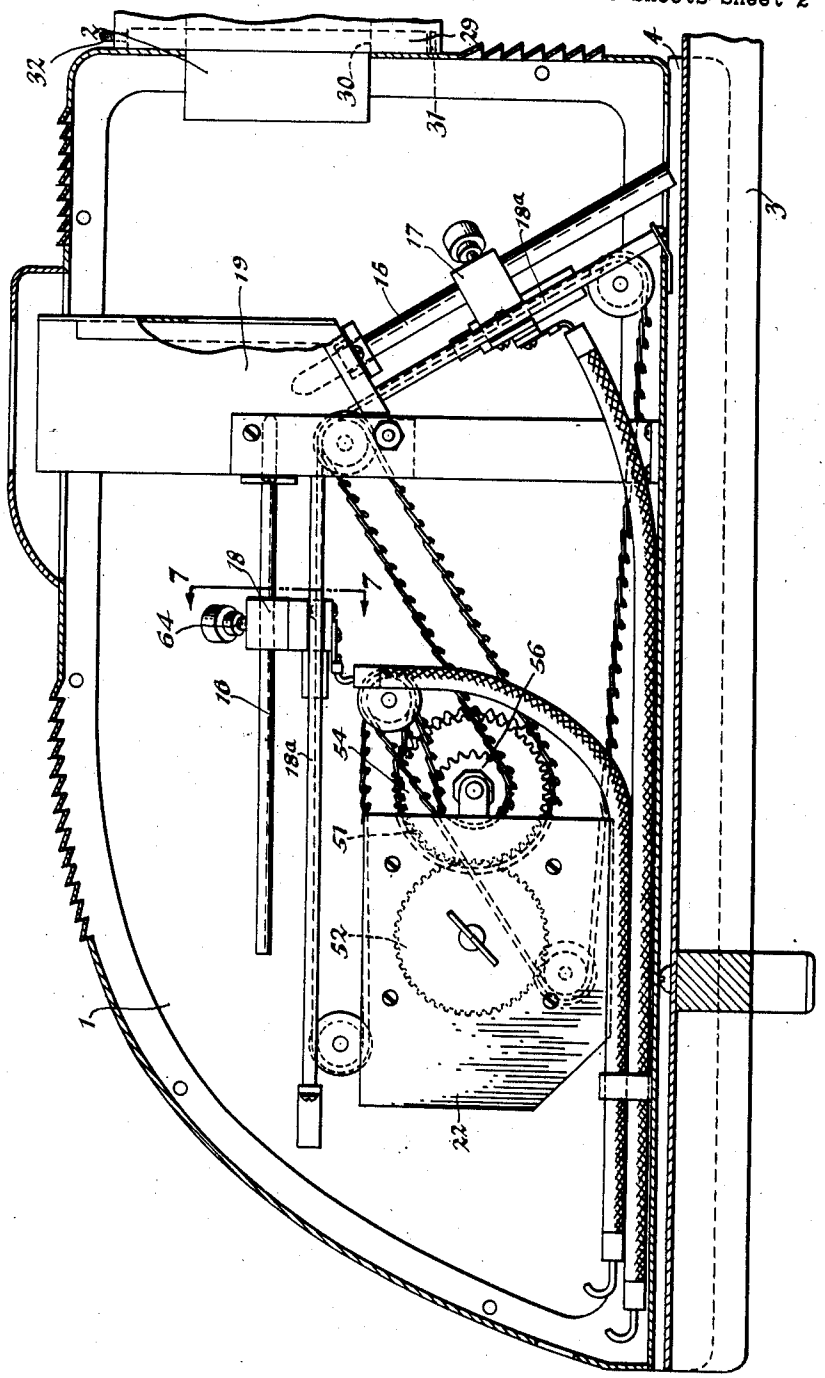


Fig. 2.

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MICRO-PROJECTION APPARATUS

Filed May 9, 1941 5 Sheets-Sheet 3

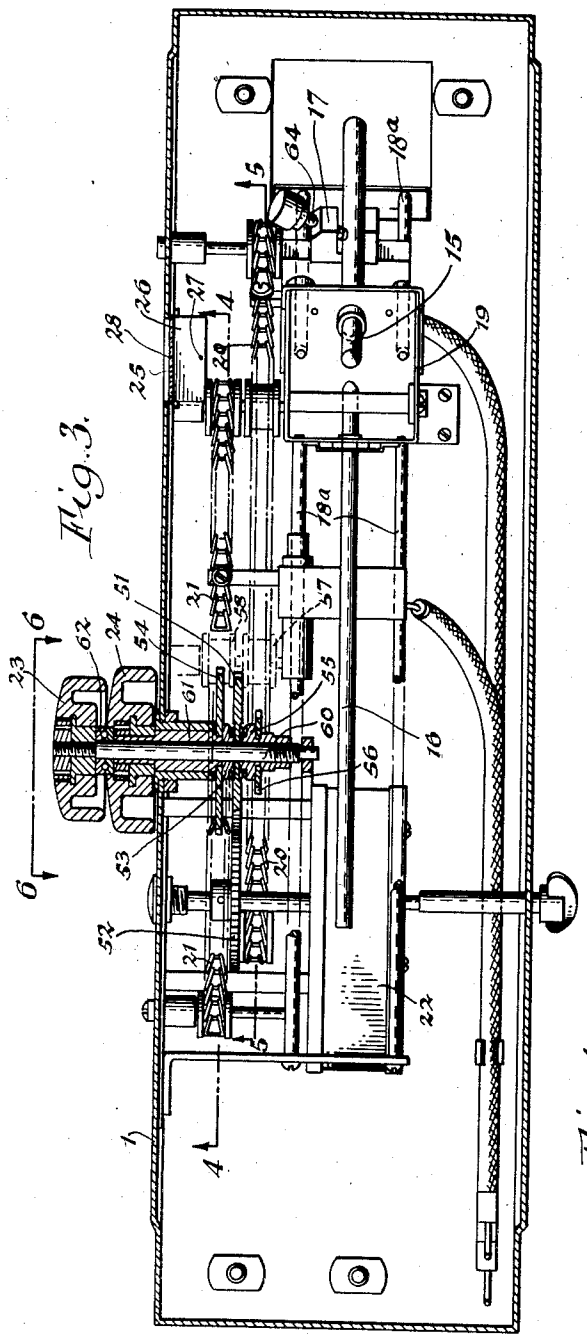


Fig. 3.

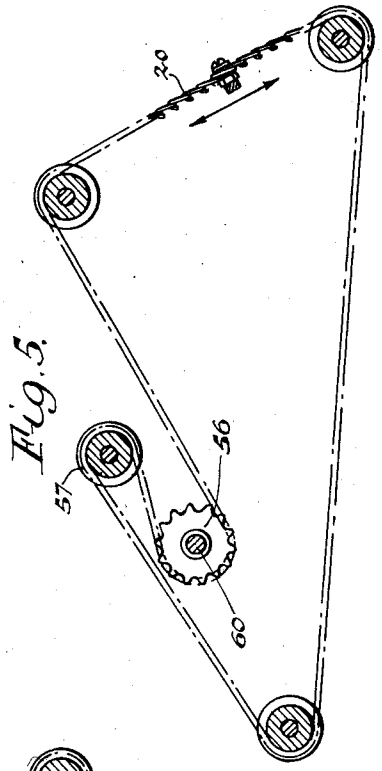


Fig. 5.

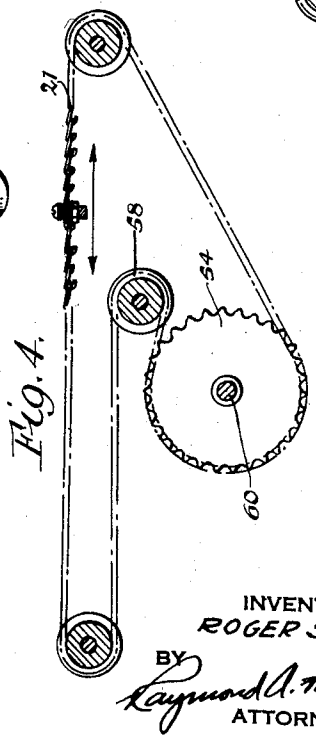


Fig. 4.

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MICRO-PROJECTION APPARATUS

Filed May 9, 1941 5 Sheets-Sheet 4

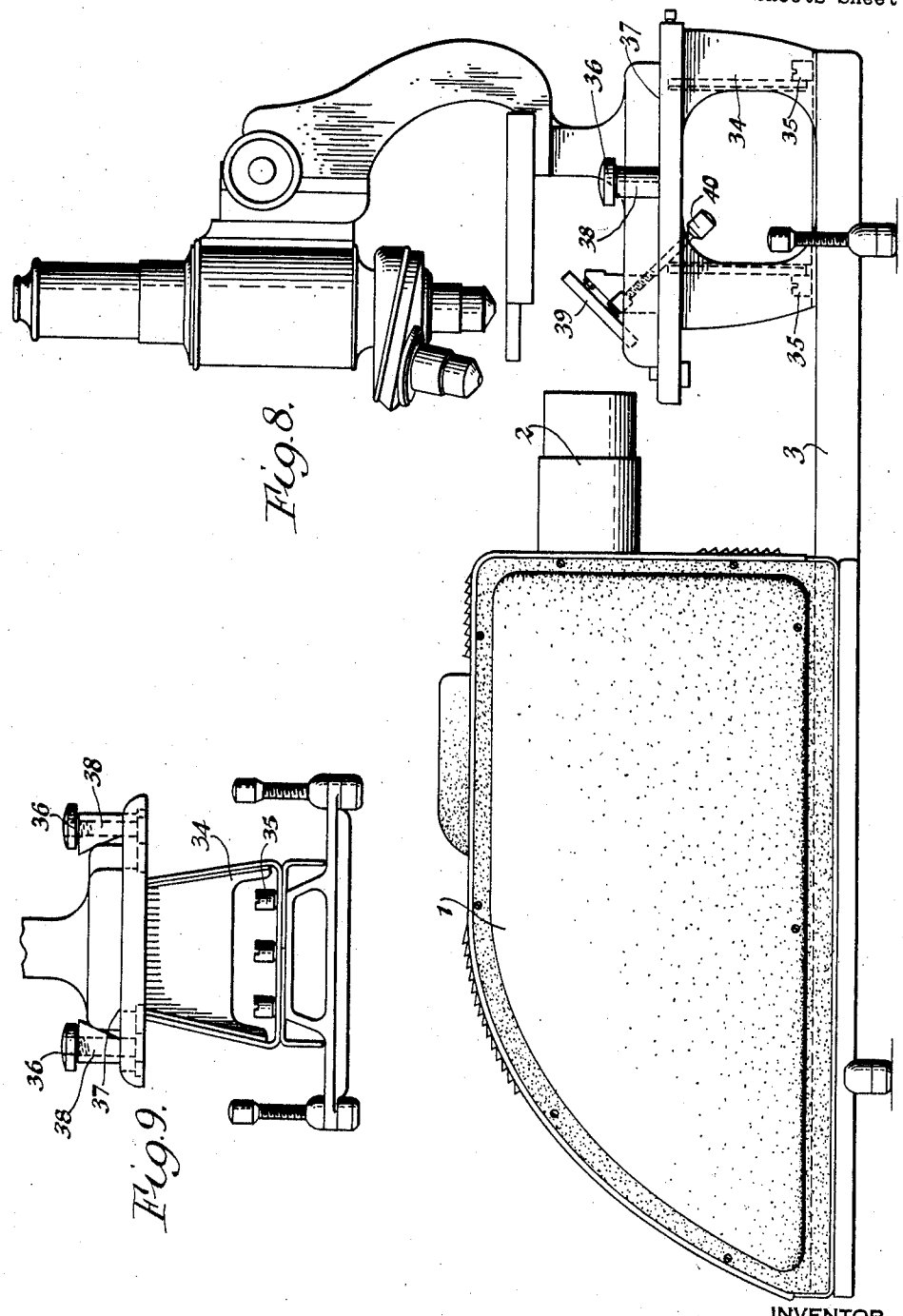


Fig. 8.

Fig. 9.

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MICRO-PROJECTION APPARATUS

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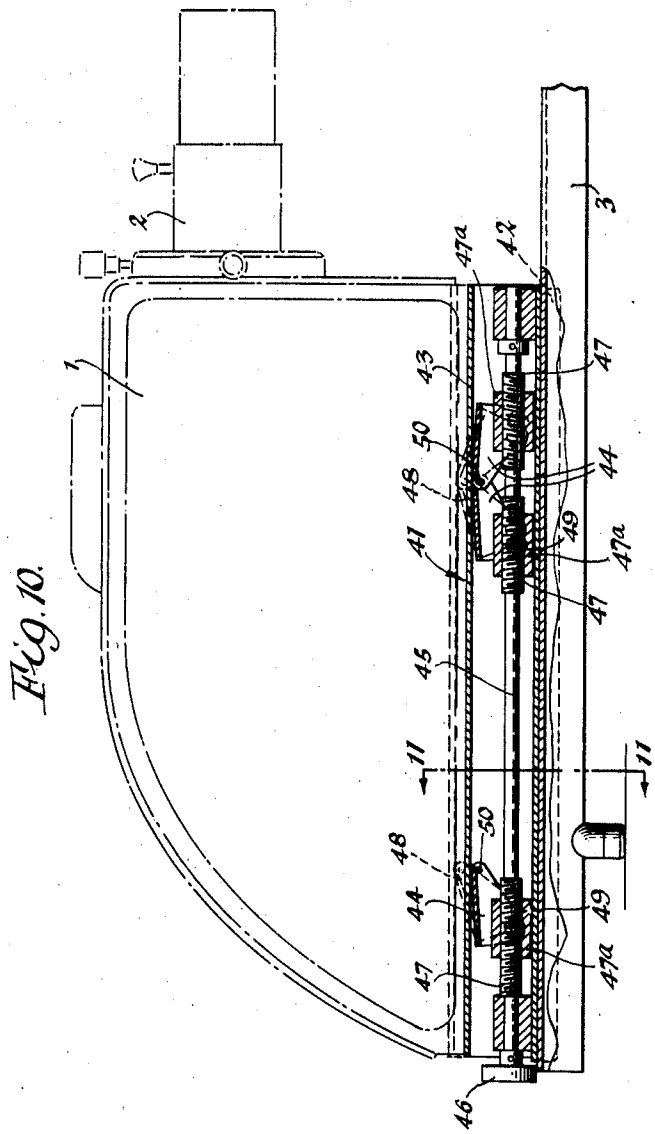


Fig. 10.

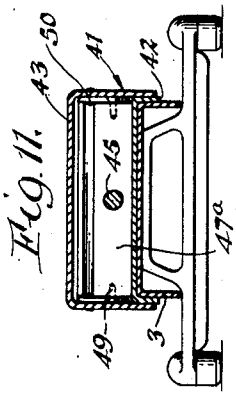


Fig. 11.

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UNITED STATES PATENT OFFICE

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MICROPROJECTION APPARATUS

Roger S. Estey, Buffalo, N. Y., assignor to Spencer Lens Company, Buffalo, N. Y., a corporation of New York

Application May 9, 1941, Serial No. 392,711

4 Claims. (Cl. 176—119)

This invention relates to improvements in projection apparatus and has particular reference to a new and improved apparatus for microprojection.

An object of this invention is to provide a new and improved arc lamp for use in microprojection.

Another object is to provide new and improved means for controlling and adjusting the carbons of a carbon arc lamp for use in microprojection.

Another object is to provide a new and improved elevating device for adjustably supporting an arc lamp for microprojection.

Another object is to provide a new and improved centering device for use in centering the condensing lens system of a microprojector.

Another object is to provide a new and improved arrangement which will allow the viewing of the carbons of an arc lamp while they are burning, and also means for indicating the correct positions of said carbons.

Another object of the invention is to provide a new and improved microscope support for use with a microprojector.

Another object is to provide a new and improved means for supporting a microscope so that it may be used in conjunction with a microprojector.

Another object is to provide a new and improved arc lamp arrangement for a microprojector whereby either of the carbons may be controlled or adjusted separately or both of the carbons may be controlled or adjusted simultaneously.

Another object is to provide a new and improved microprojection apparatus and means for adjusting the condensing lens system to align the optical axis thereof with the optical axis of the microscope.

Other objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings. It will be understood that many changes may be made in the details of construction and arrangements of parts without departing from the spirit of the invention as expressed in the accompanying claims. I, therefore, do not wish to be limited to the exact details of construction and arrangement of parts shown and described as the preferred form has been shown by way of illustration only.

Referring to the drawings:

Fig. 1 is a side view of a microprojector embodying my invention;

Fig. 2 is a sectional view showing the arc lamp carbon feeding mechanism;

Fig. 3 is a top plan view of the arc lamp mechanism;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3, looking in the direction of the arrows;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 3, looking in the direction of the arrows;

Fig. 6 is a view taken on line 6—6 of Fig. 3, looking in the direction of the arrows;

Fig. 7 is a sectional view taken on line 7—7 of Fig. 2, looking in the direction of the arrows;

Fig. 8 is a side view showing a horizontal microscope support for supporting said microscope in conjunction with the arc lamp;

Fig. 9 is a partial end view of the device shown in Fig. 8;

Fig. 10 is a sectional view showing an elevating support for the arc lamp; and

Fig. 11 is a sectional view taken on line 11—11 of Fig. 10 looking in the direction of the arrows.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout the several views, in Fig. 1 is shown the arc lamp casing 1 having the forwardly projecting tube 2 containing the condensing lens system. The arc lamp casing 1 is supported on the optical bench 3 and has flanges 4 adjacent the base thereof on its opposite sides adapted to fit over the sides of said optical bench to align the arc lamp on said optical bench and to firmly retain the same in said aligned position. Adjacent the opposite end of the optical bench is supported the horizontal microscope 5 which is secured to the optical bench through the set screws or the like 6. This microscope comprises the body tube 7, focusing eyepiece 8, coarse adjusting knob 9 and fine adjusting knob 10. On the horizontal microscope support 5 is an upright 11 which has pivotally mounted thereon at 12 the condensing lens support 13 carrying the condensing lens tubes 14 in each of which are suitable condensing lenses.

The arc lamp mechanism as shown in Figs. 2, 3, 4 and 5 comprises the two carbons 15 and 16 mounted in carriers 17 and 18 respectively and said carriers are adapted to advance the said carbons into the lamp house 19.

As it will be seen from Fig. 3, the two carbons 15 and 16 extend into the lamp house 19 through openings in the walls thereof.

The carriers 17 and 18 each have a clamp for engaging the carbons and have openings therethrough on which the carriers are adapted to slide on a pair of guideways 18a and are adapted to be actuated on said guideways through the chains 20 and 21 which may be actuated by the clock-

work mechanism 22 or other suitable mechanism or by means of the handles or knobs 23 and 24. The drive mechanism is so constructed that the chain 21 is advanced approximately twice as fast as chain 20. This is necessary because the carbon 16 burns at approximately twice the rate of the carbon 15 and therefore must be advanced at a more rapid rate.

It is pointed out that by turning the knob 23 that the chain 20 will be moved to correspondingly move the clamp 17 and carbon 15, and that by moving the knob 24 the chain 21 and clamp 18 will be moved to correspondingly move the carbon 16. It will be seen from the construction shown in Fig. 3 that either of the knobs 23 or 24 may be moved independently of the other knob or where it is desired to simultaneously adjust the two carbons, that the two knobs 23 and 24 may be grasped by the fingers and turned as a unit, thereby simultaneously moving both of the carbons 15 and 16 to adjusted position. There is also provided a pin hole 27 inside of the casing which is aligned with an opening in the side wall of the lamp house for viewing the carbons during the operation of the arc lamp. This viewing device comprises a ground glass screen 25 set in the side of the casing and the shield member 26 which comprises a plate having a pin hole 27 therein for imaging the carbons in the lamp house onto the ground glass screen 25. The screen 25 also has a vertical center line 28. This center line indicates the correct position of the carbons when they are burning and by aligning the image of the carbons with said center line they will then be in the correct position.

It is pointed out that in the mechanism shown for operation of the arc lamp, there is provided a main gear 51 driven from the clock gear 52. The power from the main gear 51 is transmitted to the fast carbon by means of the clutch 53, the gear 54 and the chain 21. The power is transmitted from the main gear 51 to the slow carbon 15 by means of the clutch 55, the gear 56 and the chain 20. Idlers 57 and 58 cause the chains 20 and 21 to wrap tightly around the power gears 54 and 56 and thereby contribute to the reliability of their operation. The gear 56 is positively connected through the shaft 60 to the knob 23. The gear 54 is positively connected through the hollow shaft 61 to the knob 24. Knobs 23 and 24 are separated by the ball thrust bearing 62 which in cooperation with certain nuts on shaft 60 serve to adjust the tension of the friction clutches 53 and 55. Thus, although the spring motor or clockwork 22 normally drives the carbons 15 and 16, this driving influence can be superseded by manual control through the knobs 23 and 24 which positively move the carbons 15 and 16 by means of the chains 20 and 21 without disturbing the clockwork 22 by means of slipping action in the clutches 53 and 55.

There is also provided means for centering the condensing lens system of the arc lamp to align the same with the axis of the horizontal microscope or the reflector of a vertical microscope. This means for centering the arc lamp condensing lens unit comprises an annular channel member 29 on the front of the arc lamp casing 1. In the channel member 29 is a circular apertured or annular disc member 30 and the condensing lens mount 2 projects from the interior of the casing through this member 30. In the lower side of the channel member 29 is placed a leaf spring 31 which fits between the channel 29 and the annular member 30 and resiliently urges the annular member 30 upward in the channel. There is provided two set screws 32 and 33 which are positioned at such different angles to each other that each will move the annular member 30 in a different direction to the movement caused by the other of said set screws so that said annular plate 30 may be moved in either direction or both vertically and horizontally by adjusting the set screws. With the above construction the condensing lens system may be moved to practically any desired adjustment so that the condensing lens member 2 may be adjusted to align the axis thereof with the axis of the horizontal microscope or the axis of the reflector 39 on the vertical microscope when that is in use.

It will be seen from Fig. 7 that because of the open top on the carbon clamp 18, the carbon may be inserted or removed without the necessity of threading the carbon into and out of an enclosing type of clamp, thus facilitating the replacing of carbons in the arc lamp. The clamping screw 64 is so positioned that it makes contact with the carbon through the blunt conical end of the screw at a point above the horizontal diameter of the carbon thus clamping the carbon 16 against both the bottom and side walls of the holder 18. The dimensions of the parts and angle of the screw 64 are so chosen as to achieve this same effect with the complete range of carbon diameters to which the arc lamp is adapted.

In Fig. 8 is shown the arc lamp in conjunction with a vertical microscope. This construction is produced to allow the owners of regular vertical microscopes who desire to use the same in connection with an arc lamp for observing visually or with a camera lucida for sketching or by using a right angle prism to project to a screen the object that is on the stage of the microscope. In this construction there is provided the support 34 for the horizontal microscope. This support is adapted to be secured on the upper surface of the optical bench 3 by means of the set screws 35 and has the clamping members 36 for securing the microscope in adjusted position. These clamping members 36 are positioned one on either side of the microscope and as they extend through slots in the upper face 37 of the support 34 they may be adjusted to fit any microscope. These clamping members 36 have wedge shaped blocks thereon. Thus by loosening the screw members 36 they may be moved in the slots and adjusted to engage the sides of the microscope and then by tightening the screws 36 the wedge blocks 38 will be caused to firmly engage the sides of the microscope to securely lock it in adjusted position.

In using this construction the regular microscope mirror is removed and the support 34 carries the mirror 39 which may be adjusted by means of the set screws 40 to desired angle to reflect light from the arc lamp through the vertical microscope body tube.

This finely adjustable mirror provides a more close control of the alignment between the arc lamp condensing system and microscope than would be practical with the ordinary microscope mirror. This mirror 39 is also at a height adapted to the arc lamp which may not happen to be the same as the height of the mirror with which the selected microscope is ordinarily supplied.

In the arc lamp raising and lowering mechanism shown in Figs. 10 and 11 there is provided the elevating member **41** having the flange **42** adapted to fit over the top of the optical bench to retain the elevating member thereon in aligned position. The upper member **43** adapted to support the arc lamp is adapted to be raised or lowered on the lower member or base **42** by means of the parallel motion mechanism **44** which is raised or lowered by turning the knob **46** attached to the screw **45**. It will be seen that by turning the knob **46**, the threaded portions **47** of the rod member **45** will threadedly engage with the threaded portion of the supports **47***a* of the parallel motion members **44** and cause them to pivot on their pivots **49** and **50** and raise the upper platform **43** as shown in dotted lines at **48** in Fig. 10 to raise the arc lamp or when the bar **45** is turned in the other direction the movement is reversed and the parallel members **48** will be lowered to lower the position of the arc lamp.

It will be noted that the double lifting elements **44** are opposed to one another and operate on left and right hand threads respectively. By this means the double or right hand mechanism permits the platform to move up and down but prevents said platform from moving longitudinally. The single or left hand mechanism **44** includes a thread **47** and nut **47***a* of the same pitch as the corresponding parts in the right hand mechanism. Thus the left hand end of the platform is raised or lowered at the same rate as the right hand end. Thus this mechanism is characterized by the ability to raise or lower a heavy load such as the arc lamp in a strictly level manner without tilting up or down or without moving the arc lamp forwardly or backwardly, which movement would disturb the optical adjustments.

It will be pointed out that with this raising and lowering mechanism for the arc lamp, the same can be raised or lowered to position it as desired for use with a microscope. This facilitates the adjusting of the arc lamp as by merely turning the knob or hand wheel **46** the lamp can be raised or lowered as desired and as the elevating mechanism therefor remains parallel throughout the raising or lowering, the arc lamp also will remain parallel.

From the foregoing it will be seen that I have provided simple, efficient and economical means for obtaining all of the objects and advantages of the invention.

Having described my invention, I claim:

1. In a device of the character described, a casing, a light housing in said casing, said housing having openings in the walls thereof, a pair of carbons movably mounted in said casing and extending into said light housing through said openings, means for moving said carbons, said means comprising a pair of telescoping shafts, a gear on the end of each of said shafts, an endless member adapted to be moved by rotation of its respective gear, said telescoping shafts having superimposed handles thereon, whereby said handles may be turned separately or simultaneously for moving said carbons, said gear means having frictional means producing a braking effect against a member whose function is common to both said gear means.

2. In a device of the character described, a casing, a pair of carbon supports movably mounted in said casing, endless members for moving said carbon supports, a pair of telescoping shafts having gear means thereon for moving said endless members, said shafts having a portion extending out of said casing and handle members on each of said telescoping shafts whereby said shafts may be turned simultaneously or separately, said gear means having frictional means producing a braking effect against a member whose function is common to both said gear means.

3. In a device of the character described, a casing, a pair of carbon supports slidably mounted in said casing, a pair of endless members for advancing said carbon supports, a clockwork mechanism, a gear train connecting said clockwork mechanism with said endless members for advancing said carbon supports, means for manually moving and adjusting said carbons, said means comprising a pair of telescoping shafts extending out of said casing, gear means in said casing on said shafts for advancing said endless members and handles adjacent the ends of said shafts, outside of said casing whereby said shafts may be moved independently or simultaneously to move said carbon supports.

4. In a device of the character described, a casing, a pair of carbon supports slidably mounted in said casing, a pair of endless members for advancing said carbon supports, a clockwork mechanism, a gear train connecting said clockwork mechanism with said endless members for advancing said carbon supports, means for manually moving and adjusting said carbons, said means comprising a pair of telescoping shafts extending out of said casing, gear means in said casing for advancing said endless members and superimposed handles adjacent the ends of said shafts outside of said casing whereby said shafts may be moved independently or simultaneously to move said carbon supports.

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