

OPERATING MANUAL
and PARTS LIST

Ashcraft

G70

Suprex

PROJECTION LAMP

Manufacturers of the finest in arc-light projection equipment

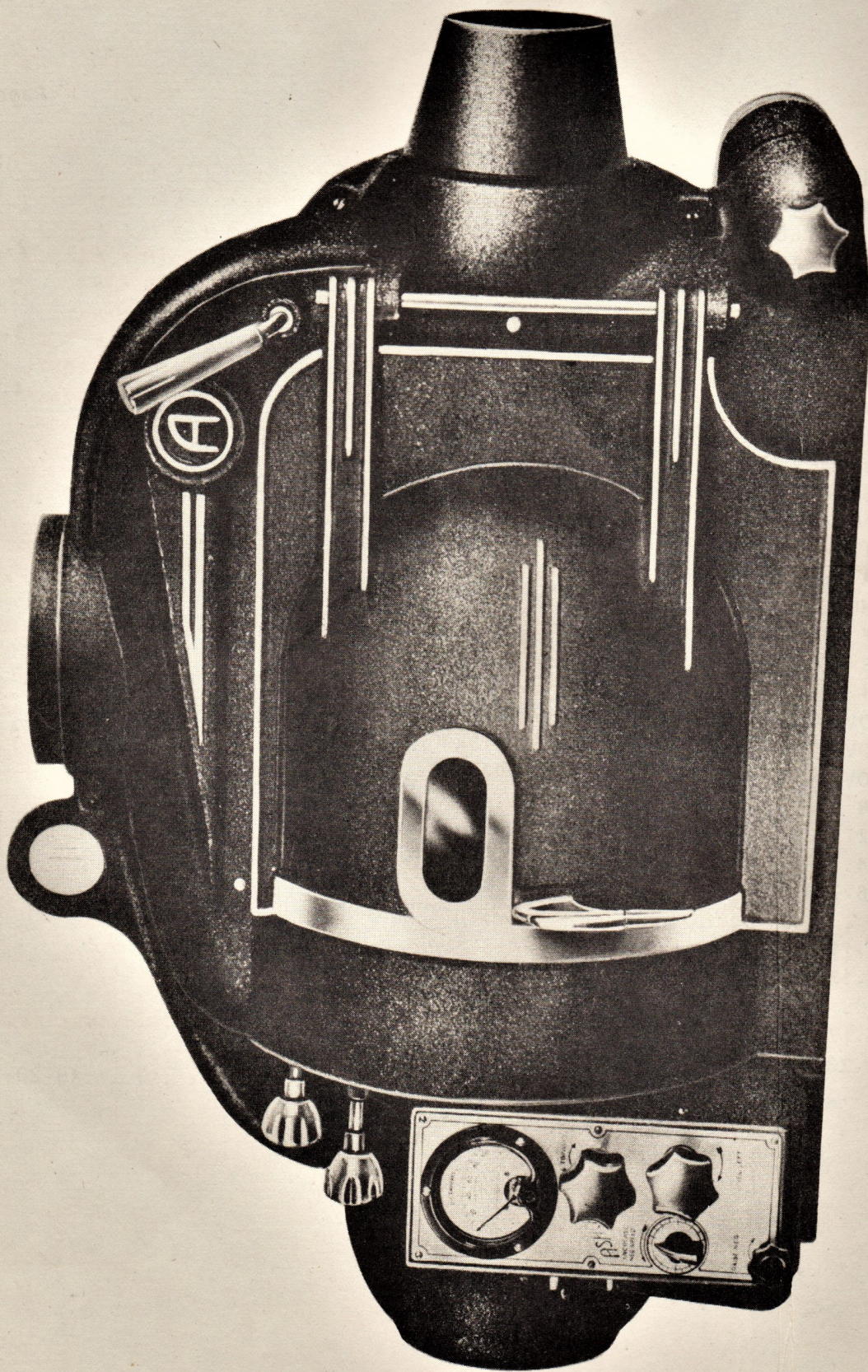
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THE ASHCRAFT C70 PROJECTION LAMP

THE ASHCRAFT C70 PROJECTION LAMP

In the design of the Ashcraft C70 projection lamp we have incorporated every good feature to be found on the best projection lamps. In addition to this many new features which are to be found only on the C70 lamp are included.

In no other lamp will be found ball bearings and roller bearings on every shaft. On no other lamp will all the controls for arc regulation and reflector adjustments be found external to the lamphouse. These and many other features place the C70 lamp in a class by itself.

The one and only real function of a projection lamp is to project a picture of maximum and uniform brilliancy. In the C70 lamp maximum brilliancy is attained by the use of the finest optical system, only genuine Bausch & Lomb reflectors made to our own specifications are used. Uniformity of brilliancy is attained by means of one of the finest arc controls ever incorporated in a projection lamp, the only arc control in which friction is eliminated by means of anti-friction bearings on each and every shaft.

We have not attempted to manufacture all component parts in our factory for the reason that the products of the following companies, specializing in their own field, cannot be questioned as to superiority:

Motors and Meters by General Electric

Motor Controls by Ohmite

Optics by Bausch & Lomb

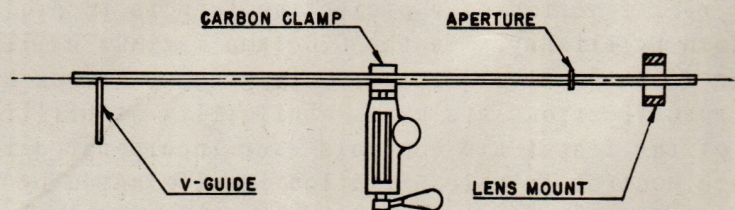
We believe you will agree that the Ashcraft C70 lamp is the finest lamp that has ever been built.

SETTING OF LAMPHOUSE ON PROJECTOR BASE

When the lamphouse is set on the projector base it should be moved as far forward as possible so that the lamphouse cone is in direct contact with the rear shutter guard of the projector mechanism. In this position the rear or silvered surface of the reflector will be approximately 32 inches from the film. Do not place the reflector in position until the optical alignment is properly made. However the bolts holding the lamp to the projector base should be put in place temporarily.

ALIGNING THE LAMPHOUSE OPTICALLY

There is only one correct method of aligning the optical center of the lamphouse with that of the projector mechanism, this method is shown below. In the lens mount of the projector mechanism a wooden or metal plug the diameter of the lens mount should be placed. In the center of this plug is a hole the diameter of the positive carbon to be used. In the aperture mount is inserted a plate having a hole in the exact center of the aperture. The diameter of this hole is also the diameter of the carbon to be used. A straight steel rod approximately three feet in length is inserted in the plug in the lens mount then through the hole in the aperture plate and extended into the lamphouse and through the positive carbon holder V block 7449. At this point it can be determined whether the lamp is too high, too low or to either side of the optical center of the projector mechanism.



METHOD OF OPTICAL ALIGNMENT

If it is found that there is a misalignment it may take some work to raise or lower the lamphouse but the results are well worth the time involved.

When the lamp is in proper alignment the rod will pass through the center of the groove of the positive carbon holder and rest properly in the V of the positive guide 7412. This alignment should be obtained without bending of the rod.

PLACING THE REFLECTOR IN THE RING

See Figs. 8-10-13

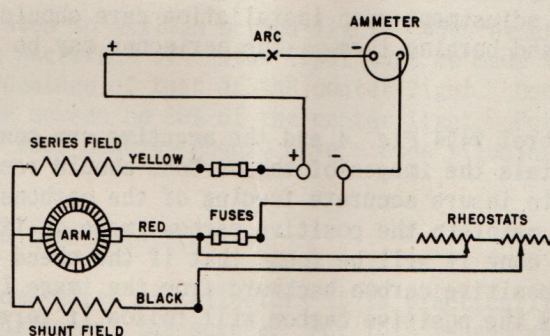
Remove the reflector retaining clip 7304 on the operating side. When placing the reflector in the reflector ring do not attempt to move the positive carbon guide 7411. This is entirely unnecessary and will disturb the carbon alignment which has been carefully made at the factory. The reflector may be easily inserted between the negative guide 7519 and the positive guide standard. If any difficulty is encountered in locating the reflector in the ring both of the red knobs 7315 which control the reflector movement and are located on the back of the lamphouse should be turned clockwise until the reflector can be located behind the left hand 7308 and upper clips on the ring. Replace third retaining clip 7304.

CONNECTING LAMP TO PROJECTOR SWITCH

See Figs. 3 - 11

Remove the casting 7408 covering the terminal board 7456 which will be found on the left hand side of the lamphouse. On the terminal board are located two heavy studs 7466, the forward

being the positive terminal. Connect these studs to the respective terminals on the lamphouse switch by means of the two asbestos covered cables 7482 shipped with the lamphouse, making sure that all connections are tight. Replace cover.

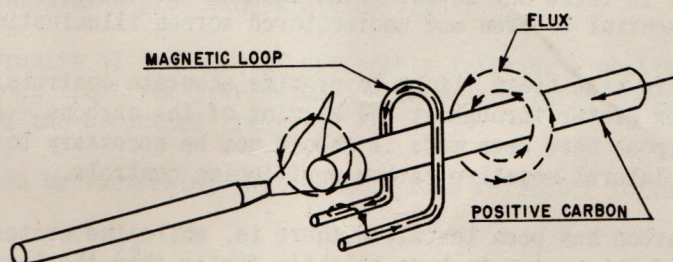


WIRING DIAGRAM

PLACING THE POSITIVE CARBON IN THE HOLDER

See Fig. 5-8

Move the positive carriage 7403 to the extreme front of the lamphouse then back toward the guide 7412 about 3/4 inch. Place the carbon in the Vee guide under the loop 7476 locating the end of the carbon approximately even with the loop extensions, then place the rear end of the carbon in the carbon clamp Vee block 7449 and tighten the clamp lever 7405 only sufficiently to hold the carbon. Extreme pressure is unnecessary.



ARC STABILIZER

PLACING THE NEGATIVE CARBON IN THE COLLET

See Fig. 10

Turn the black insulated knob 7520 on the negative carbon carriage counter clockwise to release the collect jaw 7511. The carbon may be inserted either in the rear or the forward end of the collet. If placed in the forward end the locking knob should be pressed downward which will tilt the forward end of the collet upward out of line with the positive carbon thus facilitating the operation. Limit stops are provided in all directions so that the holder cannot touch the reflector. Excessive pressure on the locking handle is unnecessary.

STRIKING AND REGULATION OF THE ARC

After the proper carbons have been placed in the carbon holders, the front end (crater end) of the positive carbon should be placed approximately even with the ends of the extensions of the magnetic loop on the positive guide. This will place the crater approximately in the focal point of the reflector. Place the tip of the negative carbon about 1/2" from the end of the positive carbon. Close the projector switch and with the mirror protecting dowser 7203 Fig. 15 down move the negative carbon forward into contact with the positive withdrawing it quickly to a distance of 1/4" or 5/16".

After the arc is established it will take about one minute for a proper crater to be formed. When a normal arc exists the arc image should be projected to the ground glass arc scope screen 7147 Fig. 20 on the lamphouse top and adjusted to the lines on the screen by means of the periscope 7101 Fig. 23. This adjustment is made at the factory but shifting may have occurred in transit so while making the adjustment upon installation care should be used in keeping the arc from contacting the guides and burning them. The periscope may be rotated by loosening screws 7101-S

With the motor rheostat control 7474 Fig. 4 and the negative cam control 7574 Fig. 9 both set at 5½ on their calibrated dials the images of the carbons should remain approximately on their respective lines. However to insure accurate feeding of the carbons the motor rheostat control should first be adjusted to maintain the positive carbon image on its line as nearly as possible. After this has been done it will be found that if the speed of the negative carbon is too fast it will chase the positive carbon backward from the image line, likewise if the negative carbon feed is too slow the positive carbon will follow it forward from the image line. The proper control of the negative carbon feed is just as important to maintaining the crater in its proper position as the positive motor rheostat control itself.

It should, not at all, be assumed that the positive rheostat control alone will maintain the position of the crater relative to the reflector. We cannot stress this point too strongly as this is the one point upon which we must rely upon the skill of the projectionist for the successful operation of our product.

THE IMPORTANCE OF A STRAIGHT CRATER

Under no circumstances is there any advantage in angling the crater forward or backward. A straight crater is essential to even and undisclored screen illumination.

We, at the factory, have made every effort to provide accurate controls and exact carbon line-ups to maintain an even crater throughout the burning of the carbons. After the initial adjustments for this purpose have been made it should not be necessary to continually tinker with the vertical and lateral negative carbon positioning controls.

When a new positive carbon has been installed there is, while the crater is being formed, a tendency for the top of the crater to burn slightly faster than the lower part, thus angling the crater backward. During this period do not lower the tip of the negative to correct this angling - leave it alone - it will undoubtedly straighten itself in a fraction of a minute. A correcting adjustment at that time will mean another adjustment after the crater has formed. Also during the burning of the positive carbon a point may be reached where there is, due to some imperfection in the carbon, a slight angling, the crater should be watched for a short time before the carbon positioning controls are moved to see if the crater does not straighten itself.

If adjustments of the position of the negative tip are necessary, control knob 7577 and knob 7538 Fig. 9 are for vertical and lateral adjustments respectively.

HOW TO OBTAIN THE BEST LIGHT ON THE SCREEN

The following is of the utmost importance. This procedure should be followed several times before a final setting is accepted. We also recommend that it be checked from time to time in order that the best light at all times be projected by the lamps.

After the arc has been adjusted for proper feeding, with the projector shutter in operation, the light should be thrown upon the screen. Next center the arc spot on the aperture by means of reflector control knobs 7315 Fig. 13. By proper manipulation of the positive and negative manual controls move both carbons forward or backward, maintaining as uniform length of arc as possible until the brightest light appears on the screen. At this point reset periscope 7101 located on the left hand door so that the images of the carbon tips coincide with the arc scope lines. This is to be considered a rough adjustment. Next slowly move the entire arc so that the image of the positive carbon is moved slightly backward and ahead of the arcscope line.

At one certain position the whitest - brightest light will be projected. Again reset the arcscope at this particular point. The upper knob is for vertical, the lower for lateral adjustment.

GOOD DISTRIBUTION OF LIGHT

The foregoing paragraph relates to maximum screen light. When excellent distribution of screen light is required a certain sacrifice of center light must be made to illuminate the sides of the screen to a certain percentage of that of the center light. Good distribution of light requires that the sides of the screen be 80% of the center light. For instance a screen illuminated at the center with 15 foot candles should have a side illumination of at least 12 foot candles.

Three factors determine good light distribution.

1. The reflector: With some makes of reflectors it is practically impossible to distribute the light evenly over the surface of the screen. For this reason we have selected a Bausch & Lomb elliptical reflector of our own specifications (43-55-24) which simultaneously collects and projects the maximum possible amount of light generated in the arc and distributes that light more evenly over the entire surface of the screen.

2. Skill of installation engineer or projectionist in positioning arc in proper position relative to reflector.

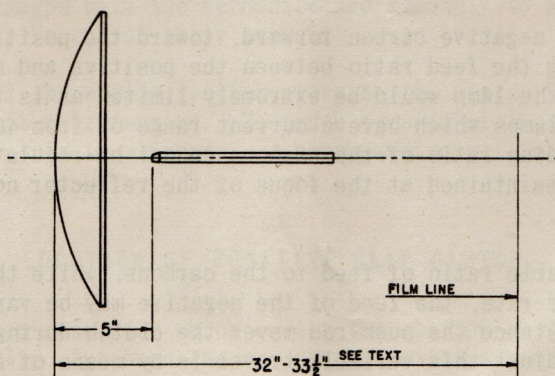
There are three possible positions of the arc relative to the reflector.

(a) Slightly too close - producing a yellowish light

(b) Slightly too far away - producing a bluish light.

(c) A correct compromise of "a" and "b" preferably favoring a position toward "a" to provide a good light yet provide an aperture spot large enough for the best distribution of the projected light.

3. Improving distribution by increasing the distance from reflector to the aperture.



OPTICAL SYSTEM

We recommend that the distance from the silvered surface (back) of the reflector to the film be 32" when a 8 mm. positive carbon is used, but that this distance be increased to 33 1/2" when a 7 mm. positive carbon is used. The reason for this is that the reflector at 33 1/2" will magnify the light source of a 7 mm. carbon to the same diameter aperture spot as it will the 8 mm. carbon at 32". In other words the greater the distance within certain limits, between the reflector and film the greater the magnification and therefore the larger the aperture spot size and the better the distribution of light over the surface of the screen. Unfortunately as the distribution is, in this way improved - the total light projected through the lens is decreased. Therefore a balance must be made between distribution and projected light. We believe that the two working distances of 32" for 8 mm. carbon and 33 1/2" for the 7 mm. carbon will suffice for all practical purposes.

NOTE: Each time the working distance is varied the position of crater relative to the projector must also be changed to the point of maximum light and distribution as described under "How to obtain the best light on the screen."

POSITIVE CARBON DRIVE

The positive carbon is fed forward continuously. The speed of rotation of the carbon feed motor, 7911 Fig. 2, through a series of gears mounted on the element base on the left hand side of the lamphouse, is reduced to such an extent that the sprocket shaft 7439 mounted at the extreme forward end of the lamphouse, rotates only once for every 60,200 revolution of the motor. Thus the chain encircling the drive sprockets moves continuously causing the positive carbon carriage to which it is connected to move toward the reflector. This forward motion, however is variable by means of the control rheostats 7472 Fig. 4 which are in series with the shunt field of the carbon feed motor. With no resistance in the motor field the speed of the motor is about 2600 RPM at which speed the forward feed of the carbon carriage is less than 2 inches in 20 minutes. This feed is less than the burning rate of a 7 mm. Suprex carbon at minimum operation (40 amperes).

To increase the speed of the motor from this minimum, resistance is placed in the shunt field by means of the control rheostats. Sufficient speed can be obtained in this manner for maximum recommended burning rate of an 8 mm. carbon and with considerable leeway.

The knob 7474 on the calibrated dial for controlling the motor speed is normally set at $5\frac{1}{2}$ for average operation of the 7 mm. positive carbon at 46 amperes and the 8 mm. at 62 amperes. This setting allows adequate latitude in either direction for increasing or decreasing the feed of the positive carbon. An auxiliary rheostat is supplied in the same case as a spare part.

HOW THE NEGATIVE CARBON IS FED FORWARD

On the positive drive gearing heretofore described but located on the inside of the element base and protected by the heavy sheet metal cover 7484 Fig. 3 on which the carbon scale is mounted, is a cam 7422 Fig. 1 which rotates continuously. The rotary action of this cam oscillates the long push rod 7448 extending to the rear of the lamphouse. This push rod merely moves back and forth continuously. The rear end of the push rod actuates the over-riding clutch 7508 Fig. 9 which rotates the negative carbon drive shaft 7535 and sprocket 7542 Fig. 10 intermittently - once each time the cam forces the push rod toward the clutch.

The purpose of driving the negative carbon forward, toward the positive, intermittently, is to provide a method of varying the feed ratio between the positive and negative carbons. Otherwise the current range of the lamp would be extremely limited as is the case of all single feed screw so-called 1 KW lamps which have a current range of from 40 - 42 amperes only. Outside of that range the feeding ratio of the carbons cannot be regulated. In consequence the positive crater cannot be maintained at the focus of the reflector nor can the arc gap be maintained at a uniform length.

In order to provide a variable ratio of feed to the carbons, while the positive is fed forward continuously but at average rate, the feed of the negative may be varied, throughout a wide range, by adjusting the distance the push rod moves the clutch during each oscillation. The means used in the C70 to adjust this variable travel is by means of a spiral cam 7534 Fig. 9 against which an arm of the clutch rests. By rotating this cam, the length of the throw, during each oscillation of the push rod may be varied throughout a very wide range. The shaft 7524 Fig. 9 by means of which the spiral may be rotated, is extended through the control panel and calibrated. Thus the forward feed of the negative carbon carriage may be as little as two thousandths of an inch or as much as sixty thousandths (about $1/16"$) for each movement of this push rod.

NOTE: On the rear end of the push rod 7448 Fig. 3 is a collar 7430 which is fastened to the push rod by means of a set screw. By loosening the set screw the collar may be moved forward or backward to further increase or decrease the throw of the clutch arm. As set at the factory the knob on the calibrated dial is set at approximately $5\frac{1}{2}$ for average operation of the 7 mm. positive carbon at 46 amperes and the 8 mm. carbon at 62 amperes. This setting allows latitude in either direction for increasing or decreasing the feed of the negative carbon.

ADJUSTMENT OF CHAIN TENSION

Both the positive and negative feeding chain are provided with means for adjusting them to the proper tension. The rear or idler sprocket of each is mounted on a stud 7434 Fig. 3 and 7529 Fig. 9 which is eccentric to the main sprocket shaft. The main shaft is 3/8" diameter with a 1/4" sprocket mounting stud. The shafts are prevented from rotating by means of hollow head set screws. The end of the shaft is slotted for insertion of a screw driver. When the set screw is loosened the shaft may be turned, which action loosens or tightens the chain. After the proper adjustment has been made the shaft should again be locked in position by tightening the set screws.

PROPER POSITIVE CHAIN TENSION

This chain can be left fairly loose, do not let it sag too much but sufficient so that it may be easily lifted about 1/4" at the center between the sprockets.

PROPER NEGATIVE CHAIN TENSION

This chain should not be too loose or too tight. Looseness may cause inaccurate feeding and tightness may cause slippage of the feeding clutch. The center sag of the bottom chain should not exceed 1/16".

SLIP CLUTCHES

See Figs. 1-9

Both positive and negative carbon drives are provided with clutches consisting of driving members clamped between hardened and ground steel plates and held under tension by heavy springs and adjusting nuts.

The purpose of these clutches is twofold. First to allow the control shafts to be turned while the driving members are engaged with the mechanism and secondly to provide a safety slip when the carbon carriages reach the end of their travel.

The nuts 7426 which control the spring tension pressing the plates 7415 against the driving members may be turned to adjust this tension. Too much tension will make the controls operate stiffly. Too little may result in slippage. A happy medium will allow ease of control and positive action.

LOCATION OF POSITIVE SLIP CLUTCH

Removal of the cast aluminum case 7407 which covers the gearing on the front of the element base will expose the positive slip clutch on the end of the positive hand control shaft 7439. Turning the nut clockwise increases the tension.

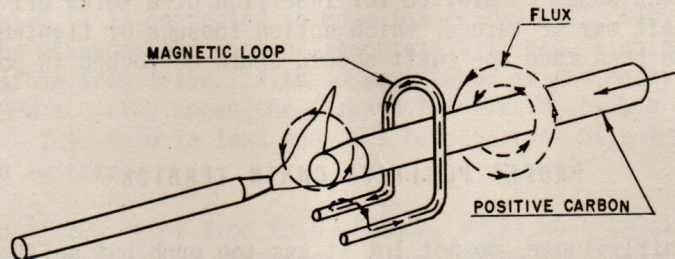
LOCATION OF NEGATIVE SLIP CLUTCH

This clutch is located to the rear of the reflector on the negative hand control shaft. Clockwise rotation of the adjusting nut increases the tension.

ARC STABILIZER

An illustration of the arc stabilizer used on the C70 lamp is shown on page . The purpose of this stabilizer is to maintain the arc flame in its proper position relative to the positive crater. As illustrated this stabilizer or magnetic loop consists of a loop of steel surrounding carbon near the crater end and has two bent projections extending beneath the arc. The

loop itself is not magnetized until current flows through the positive carbon. Magnetization of the loop is caused by the normal magnetic flux always surrounding the positive carbon when the arc is in operation, inducing a magnetic flux in the steel of the loop. This magnetism flows through the loop and emerges across the two open ends directly beneath the arc. This flow of magnetism between the ends of the loop reacts upon the normal flux surrounding the arc, forcing the arc itself upward. In this way the arc will always operate at its highest efficiency.



ARC STABILIZER

HOW TO REMOVE THE ENTIRE NEGATIVE ASSEMBLY

See Fig. 9-12

Should it at any time be necessary to remove the entire negative assembly for inspection of the clutch or any other part it will be found to be a very simple matter if the following instructions are implicitly observed.

1. Remove the negative control knob 7570.
2. Unhook the spring 7568 from the bottom of the negative feeding clutch arm.
3. Remove the 1/4" cap screw holding the negative lead to the carbon holder.
4. Remove the reflector.

The entire negative assembly is mounted upon a single 1/2" vertical rod 7522 at the upper part of which is a heavy coiled spring 7540 and retaining collar 7539. Do not remove the collar but loosen the 1/4" Allen set screw 7459 in the casting 7506 which holds the lower end of the shaft - the set screw bears on a flat on the vertical shaft - when the set screw is loosened the shaft with spring and collar may be easily lifted out.

5. Pull out on the small red control knob 7574 on the panel which action will remove the shaft 7524 from the coupling 7427.
6. Move the entire assembly as far to the right as possible pushing the negative control shaft 7535 further out through the hole in the panel.
7. Pull the clutch end out of the rear of the housing until it is clear then move the entire assembly to the left until the control rod is out of the hole.

NOTE: When replacing put the control shaft in the slotted hole in the panel first. Then exactly reverse the aforementioned operations.

HOW TO REMOVE THE CLUTCH FROM THE NEGATIVE CONTROL SHAFT

See Fig. 9

After the negative assembly has been removed, unscrew the clutch tension nut 7426 onto the control shaft. Two #8 Allen set screws 7458 set at 90° will be found on the clutch spindle securing the spindle to the shaft. Remove these set screws, which are seated in socket holes in the shaft. The entire clutch may then be pulled off the shaft.

NOTE: When replacing clutch see that no burrs exist around socket holes in shaft. If so, smooth down with a very finely cut file or fine emery paper.

HOW TO REMOVE MAIN BURNER (ELEMENT BASE)

See Fig. 3-4-11-9

The entire burner, which forms a part of the left hand side of the lamphouse may be easily removed for inspection or repair by following the instructions in the order noted:

1. Remove terminal cover 7408.
2. Disconnect negative (rear) lead 7475 pushing it through the porcelain bushing.
3. Unhook clutch return spring 7568 from screw 7567.
4. Move positive carriage 7402 Fig. 5 forward to guide 7412.
5. Remove sheet metal cover 7116 Fig. 14 on lamphouse front.
6. Remove 11 screws 7401 S holding element base to lamphouse.
7. Pull front of base away from lamphouse about 1/2". Pin in shaft 7117 will slide out of coupling 7427.
8. Pull rear of base away so that negative mounting shaft 7537 will drop out of bearing in element base.
9. Lift entire element base away from lamphouse with a motion toward the lamphouse front to clear positive guide base 7411.

LUBRICATION

Since a great number of rotor and ball bearings are used in the mechanism of the C70 lamp, there are only a few points which will need occasional lubrication. The only oil holes on the mechanism are in negative frame 7501 for oiling control shaft 7535. A drop of SAE 20 oil once per week will be sufficient. In clutch housings 7507 and 7508 are two small oil holes. We must caution against using too much lubrication in the clutches. One drop of light oil once every two weeks is adequate.

On the inside of the lamphouse element chain cover 7484 should be removed once every two weeks and the slide rods 7432 inspected. All gum and grit should be removed and a light oil applied. This also applies to the slide rods 7526 on the negative assembly.

Do not at any time place any lubricant whatever on the drive chains or sprockets. These should be kept dry and clean.

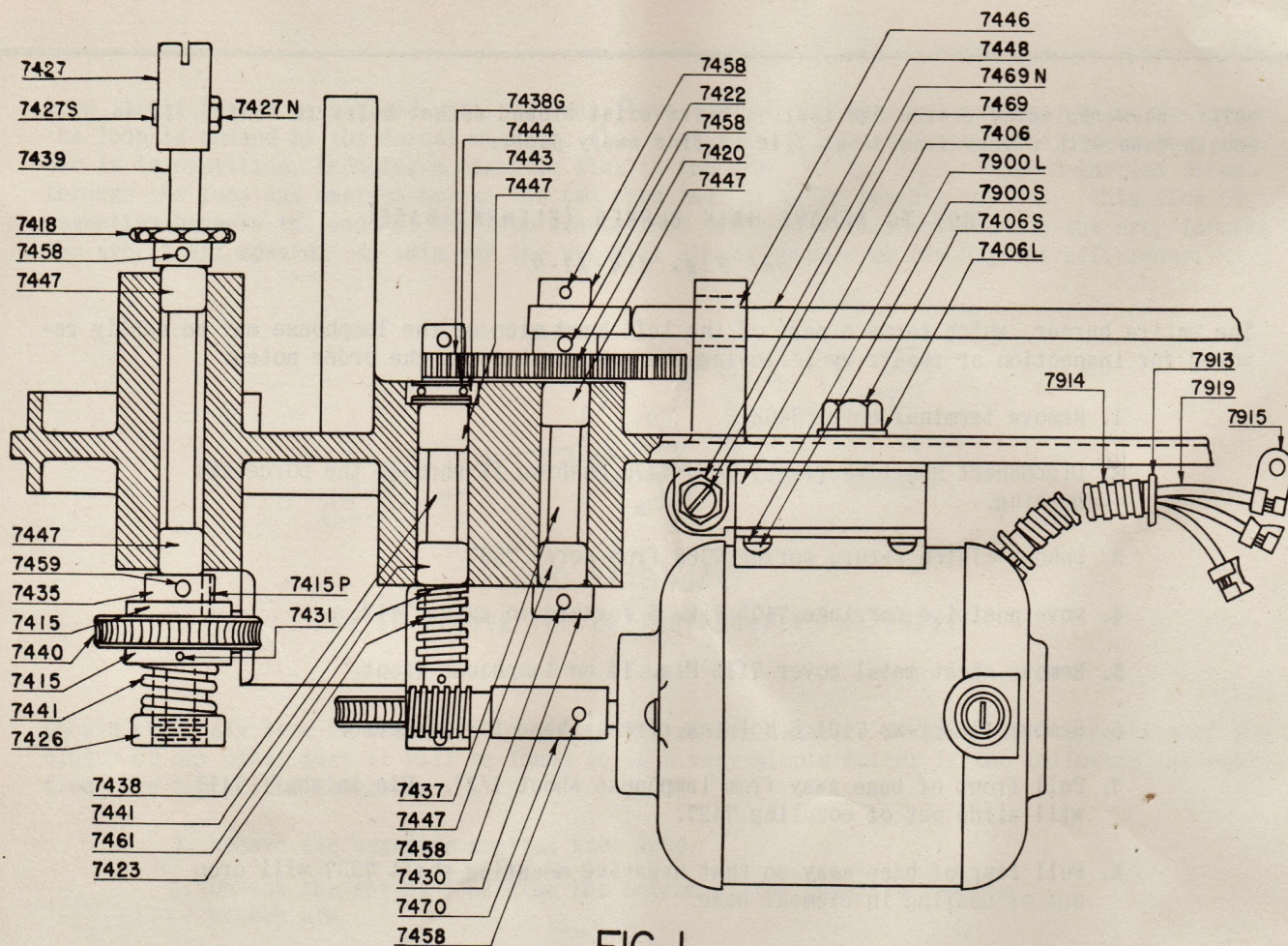


FIG. 1

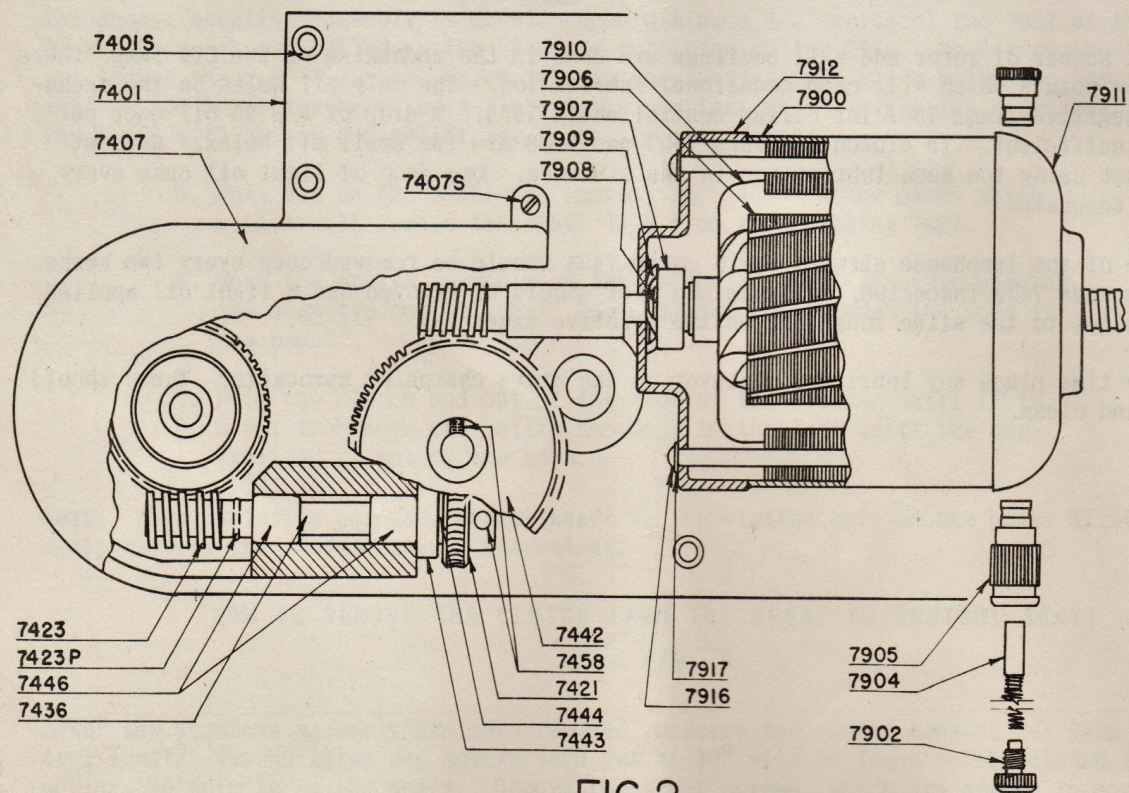
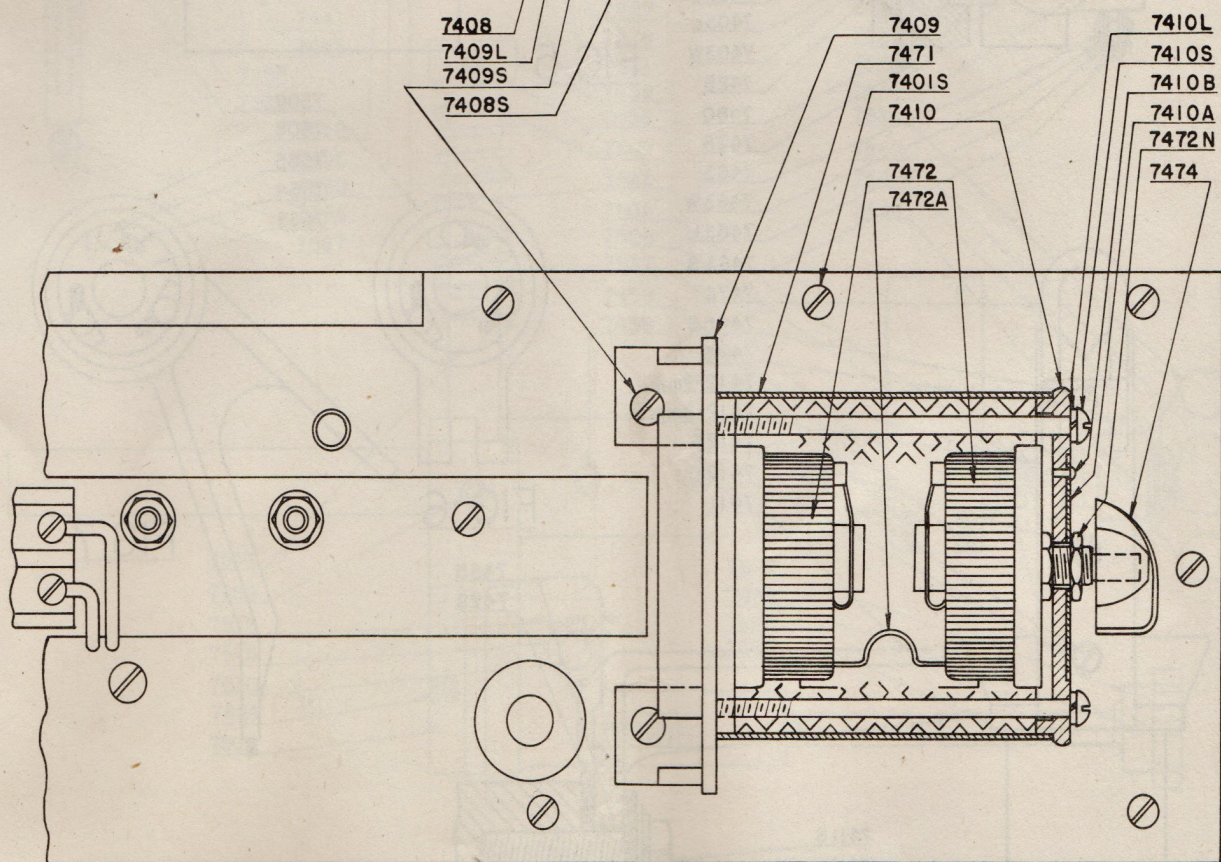
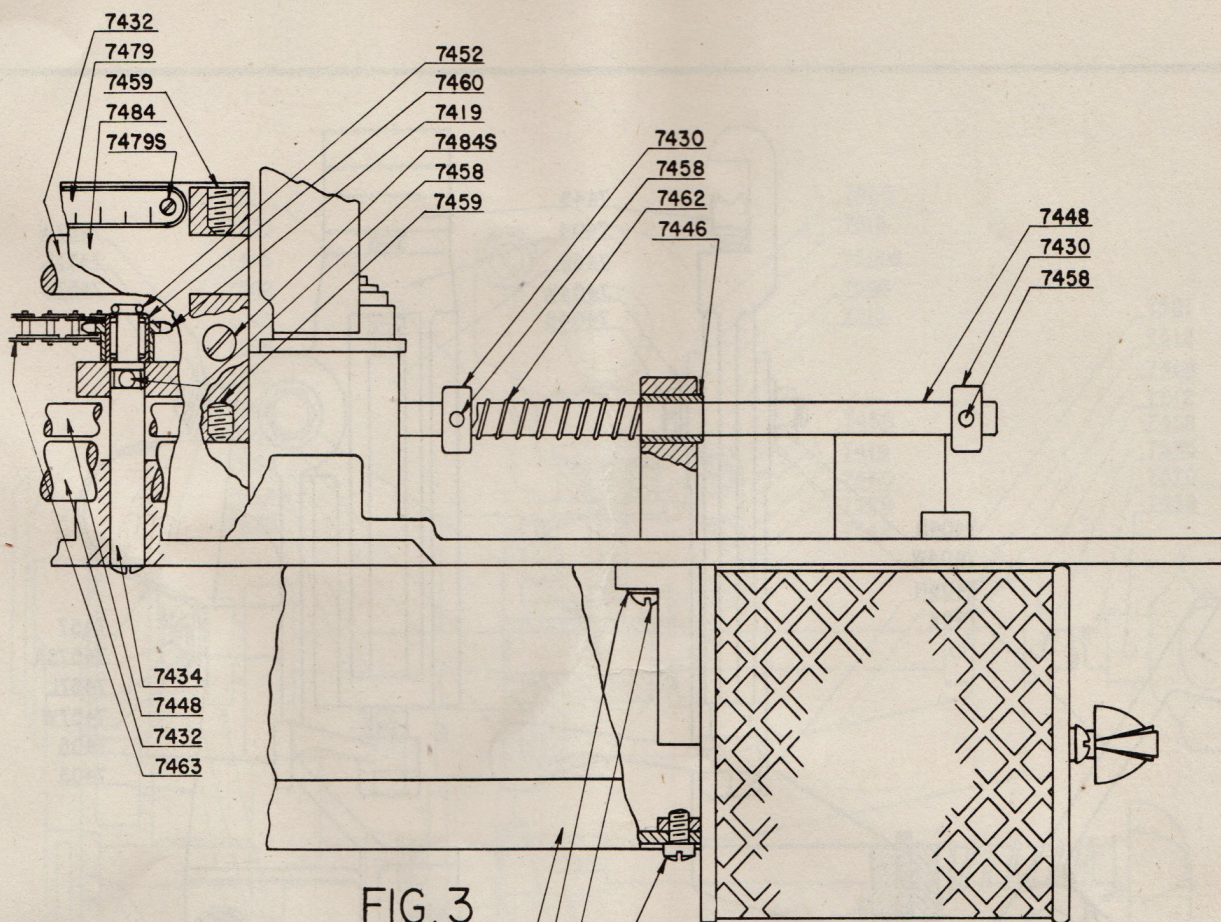
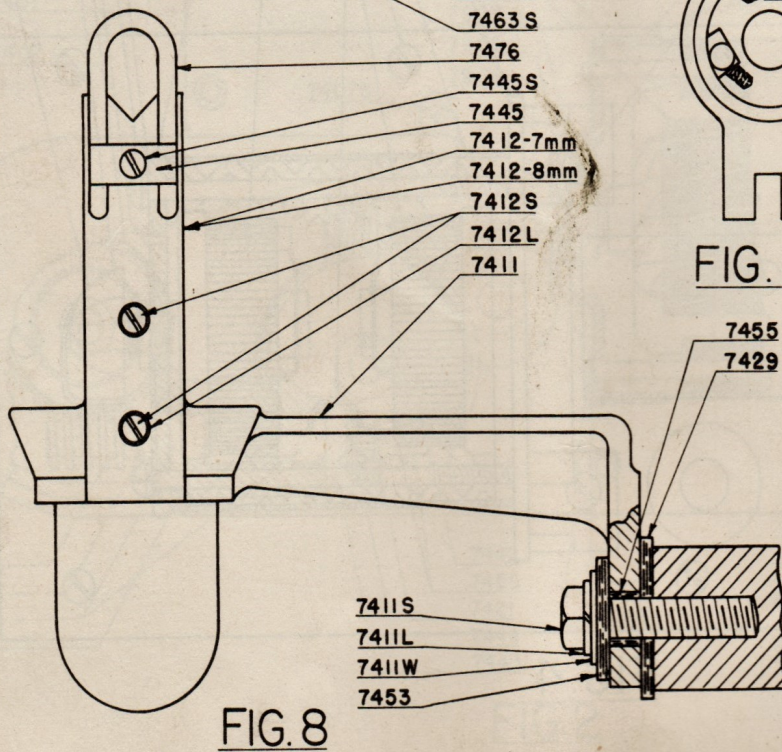
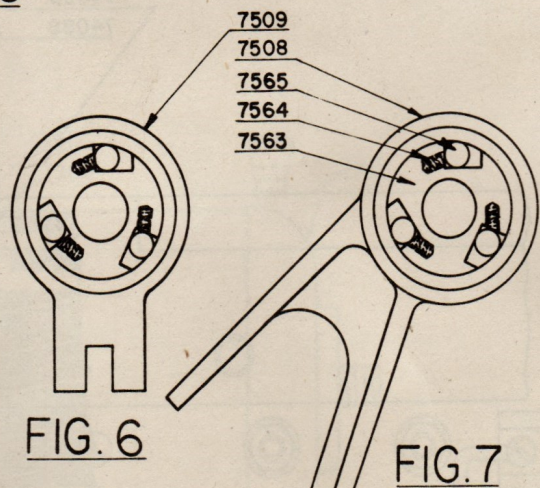
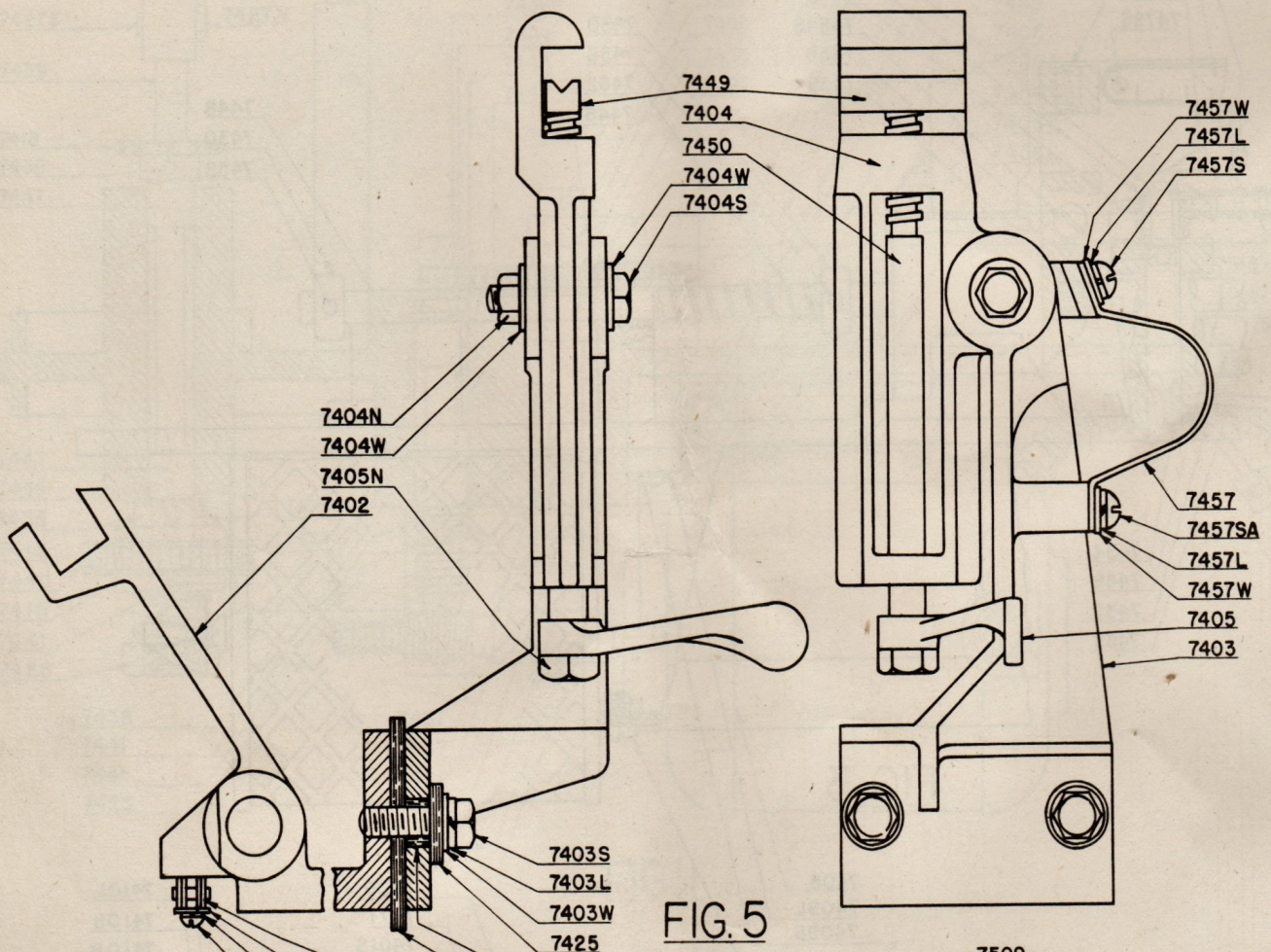


FIG. 2





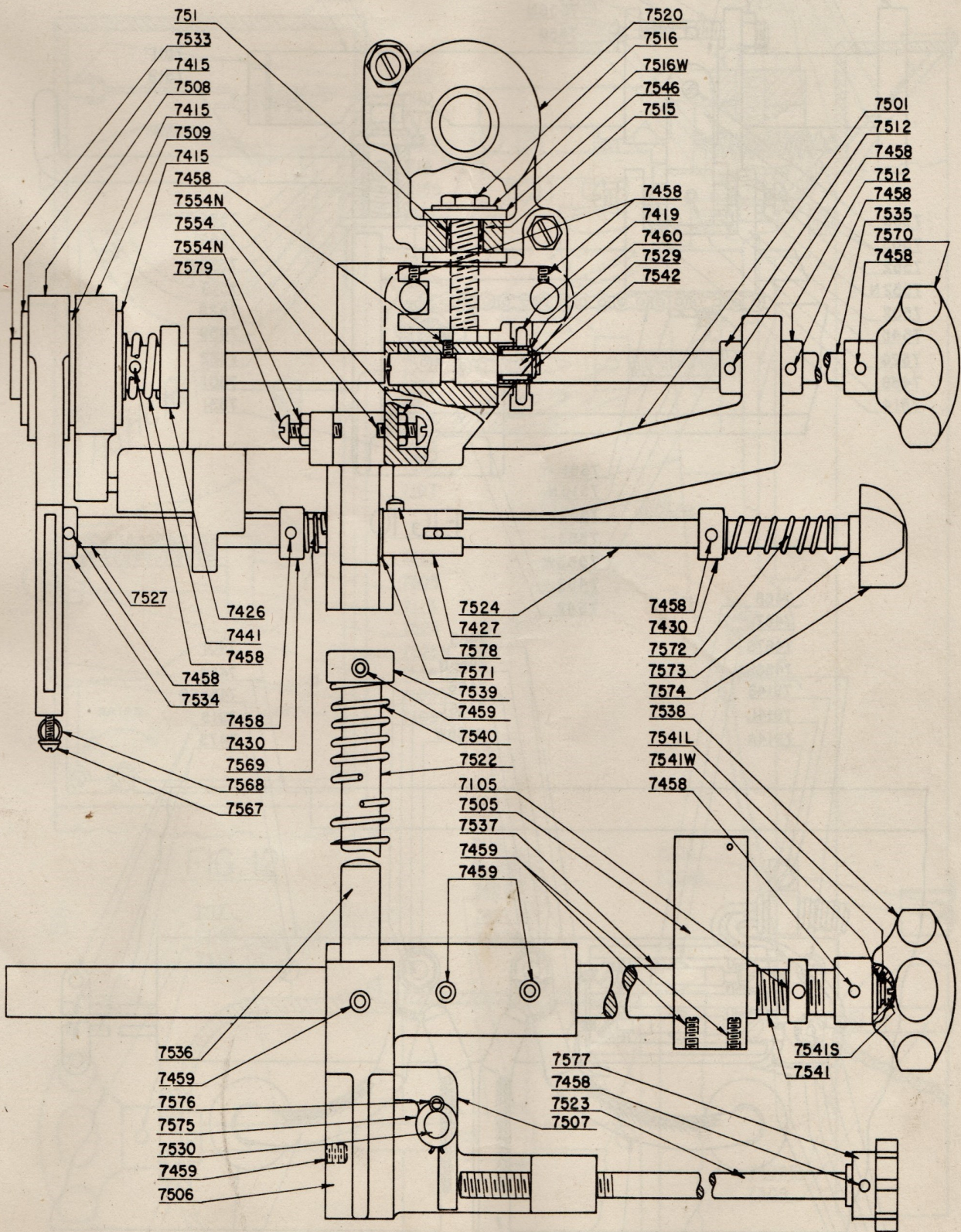
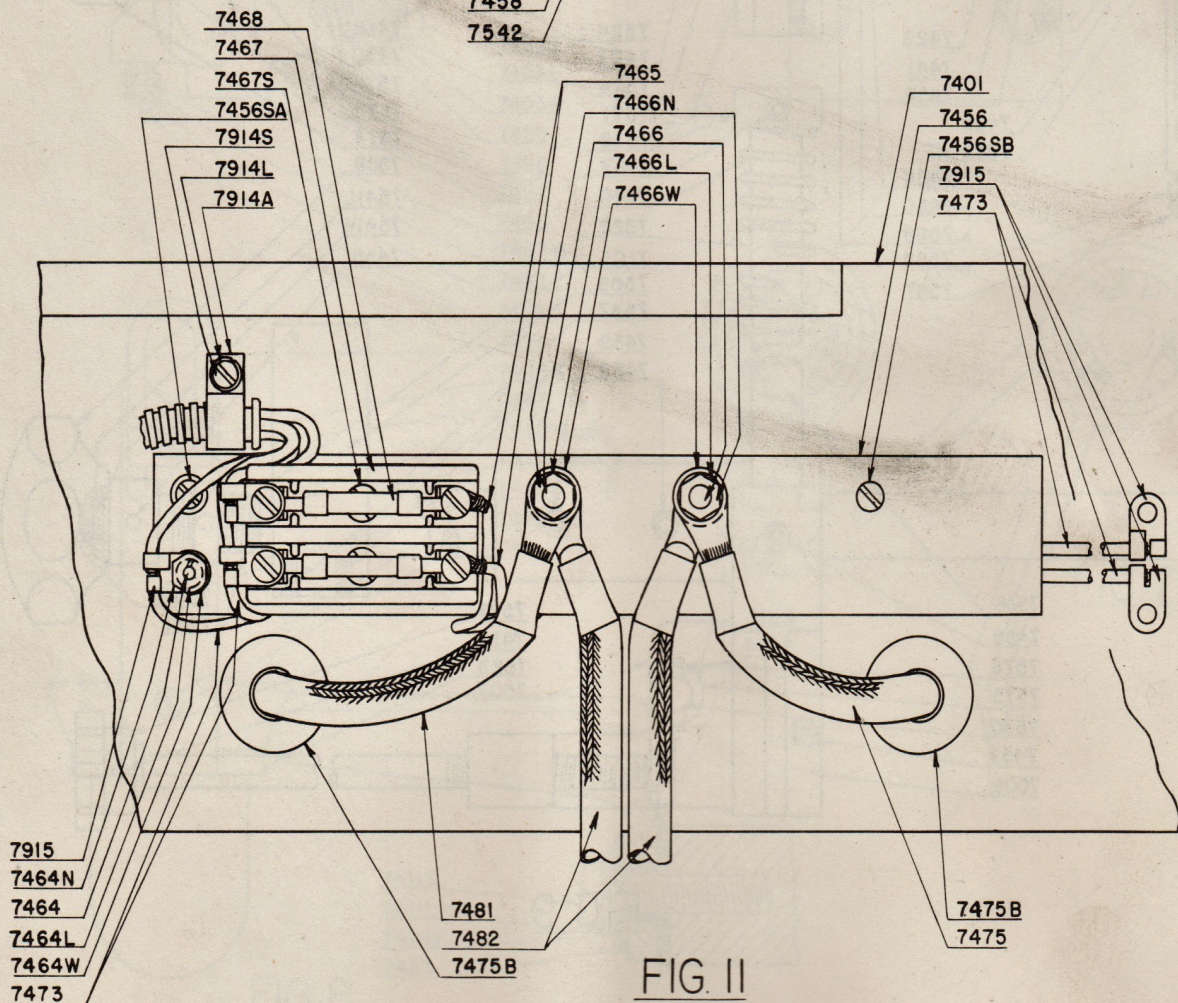
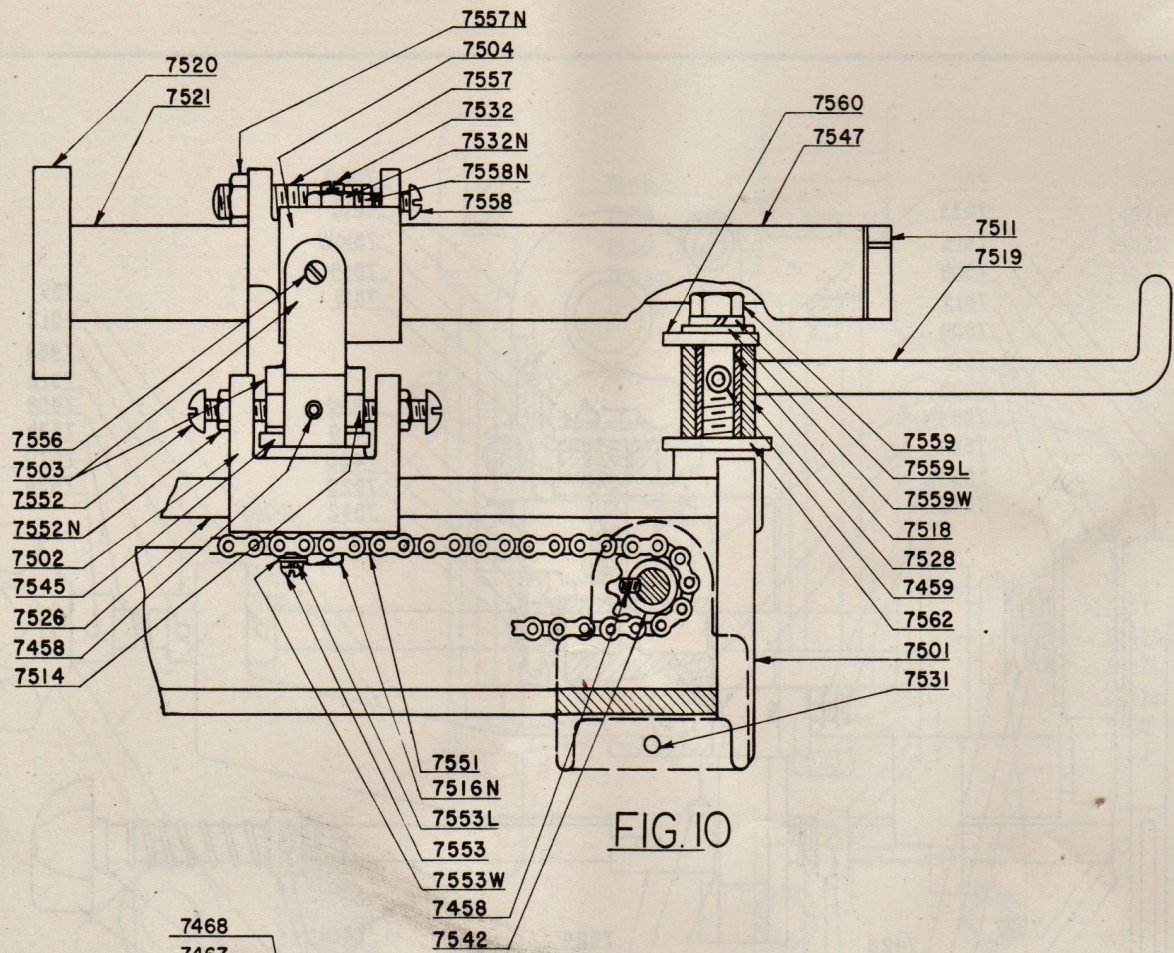


FIG. 9



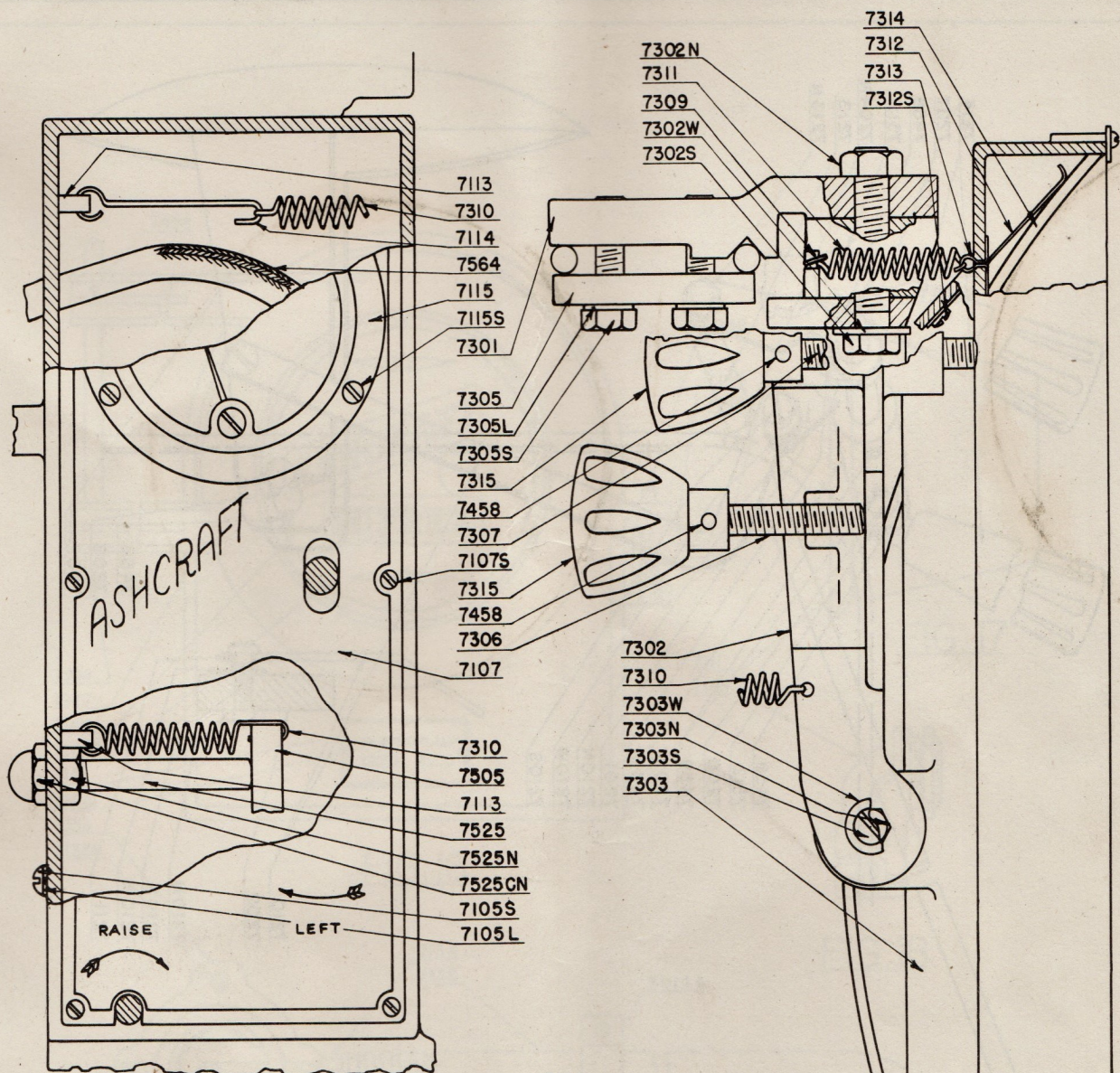


FIG. 12

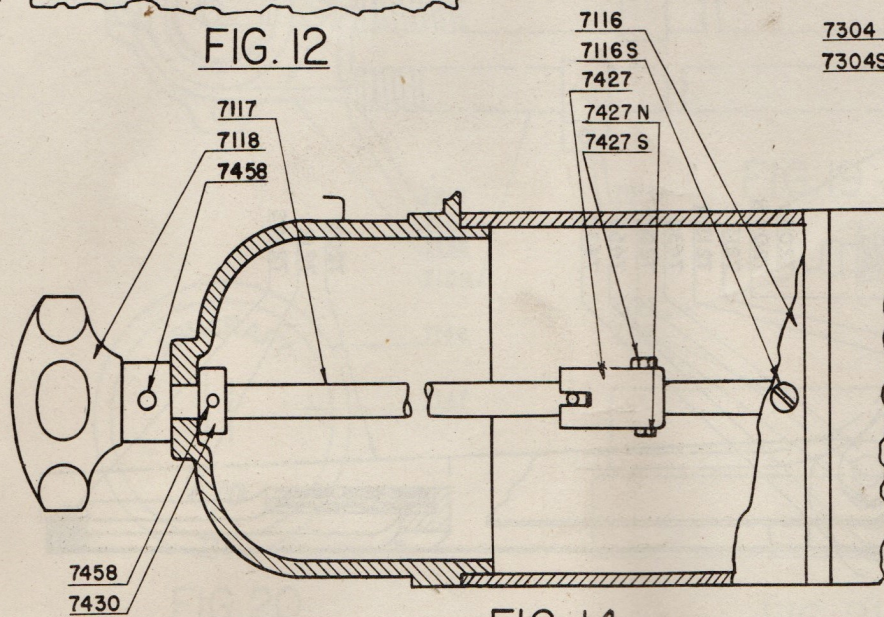


FIG. 14

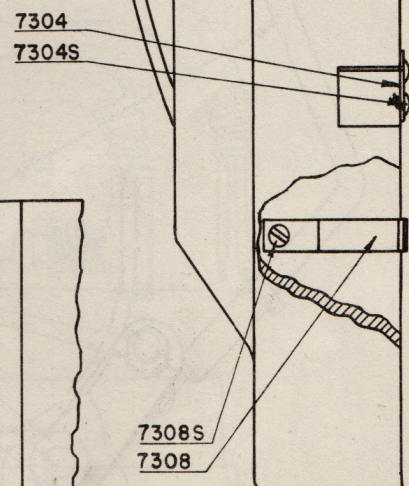


FIG. 13

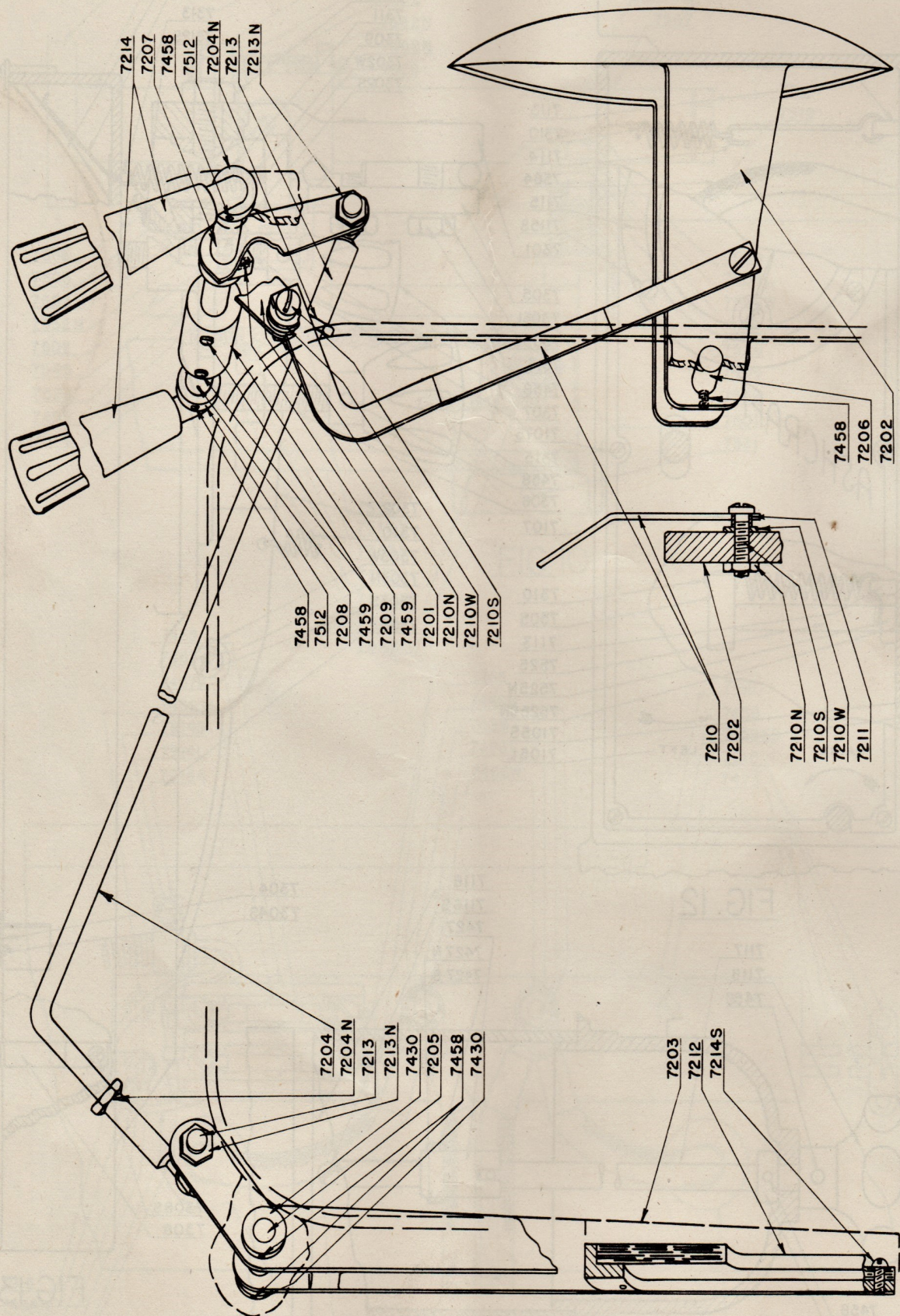


FIG.15

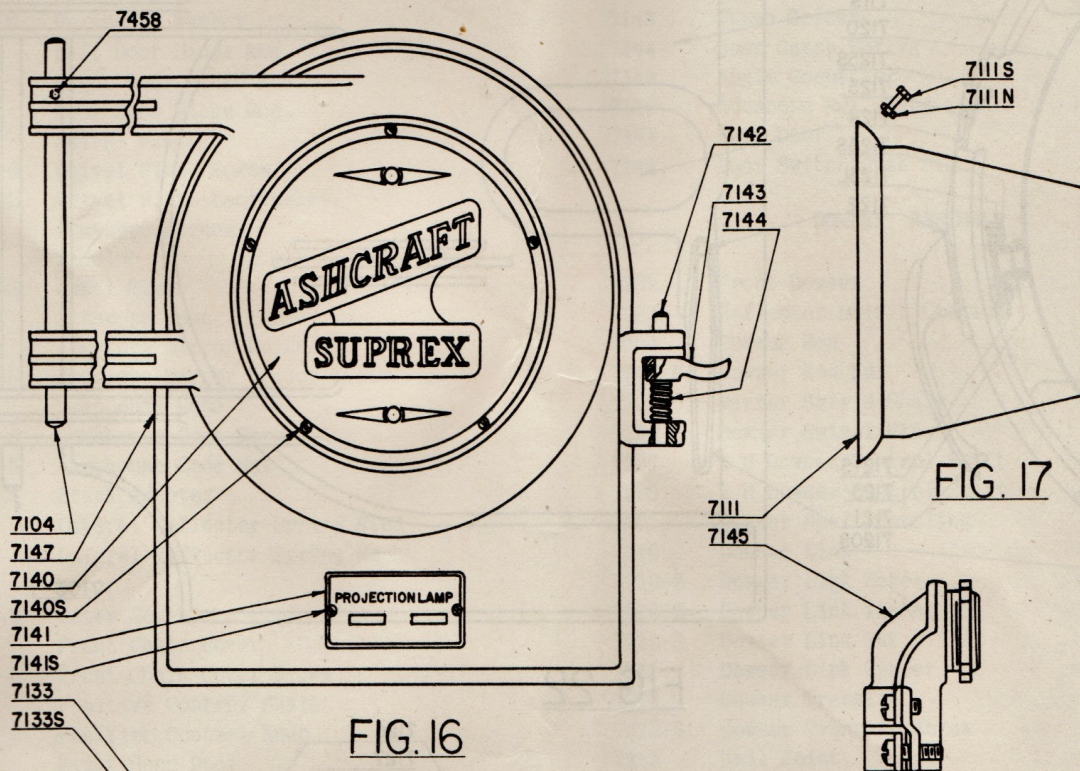


FIG. 17

FIG. 18

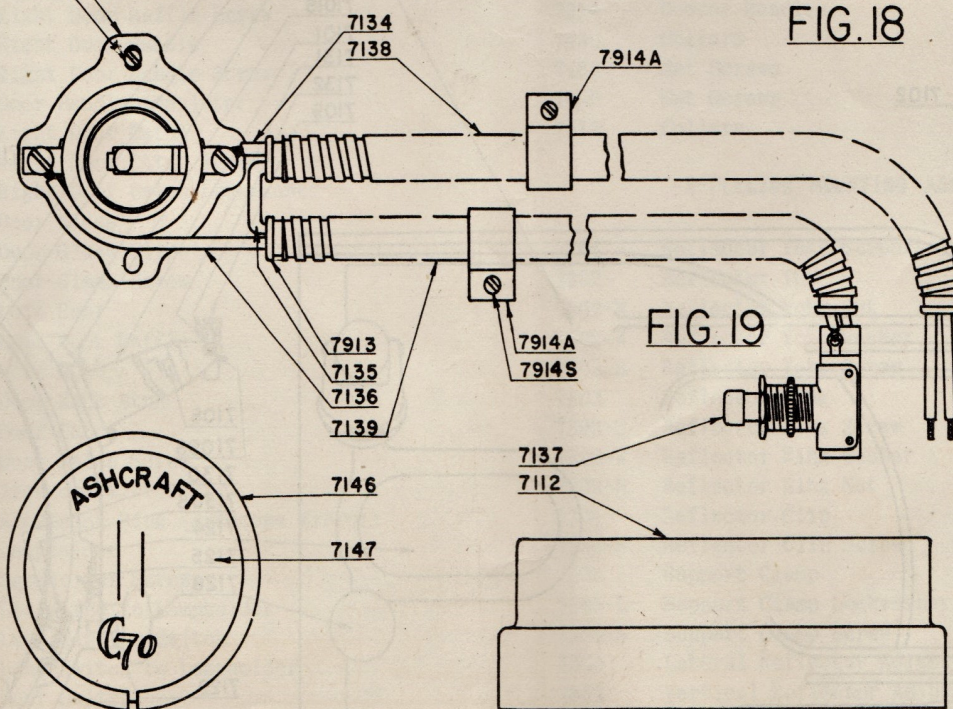


FIG. 20

FIG. 21

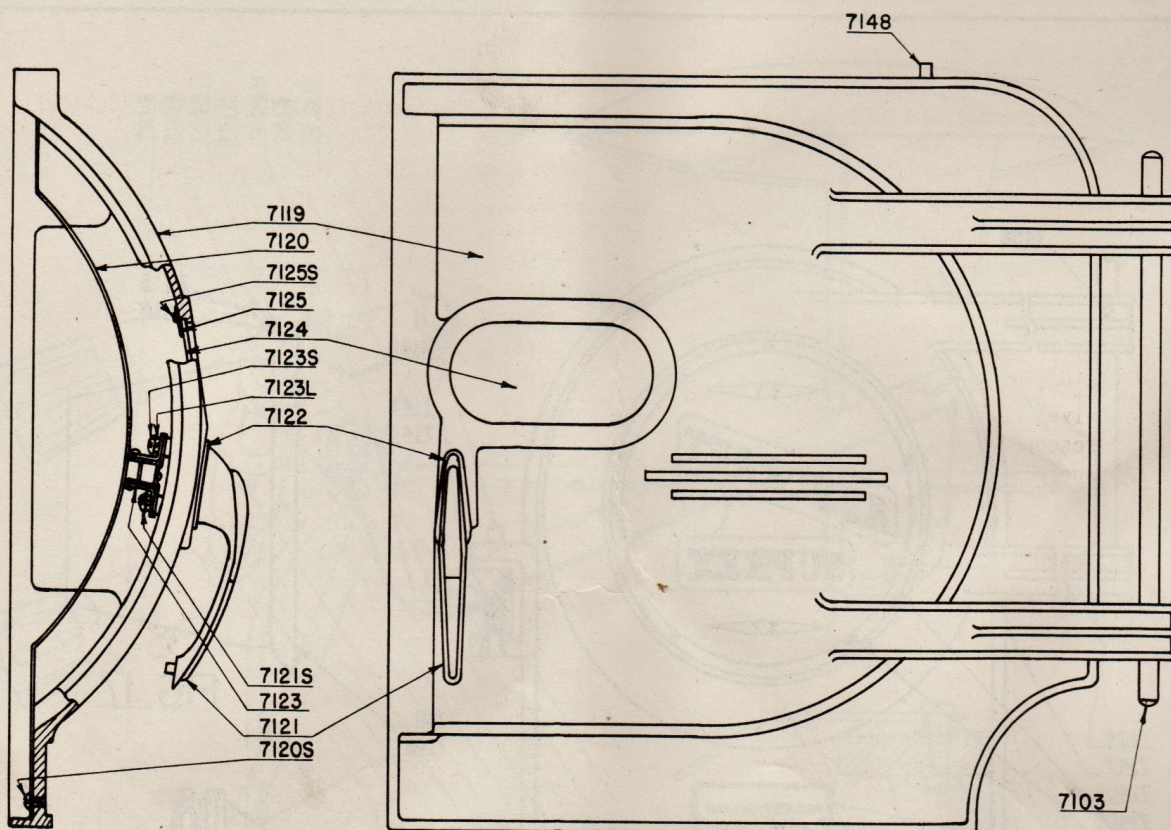


FIG. 22

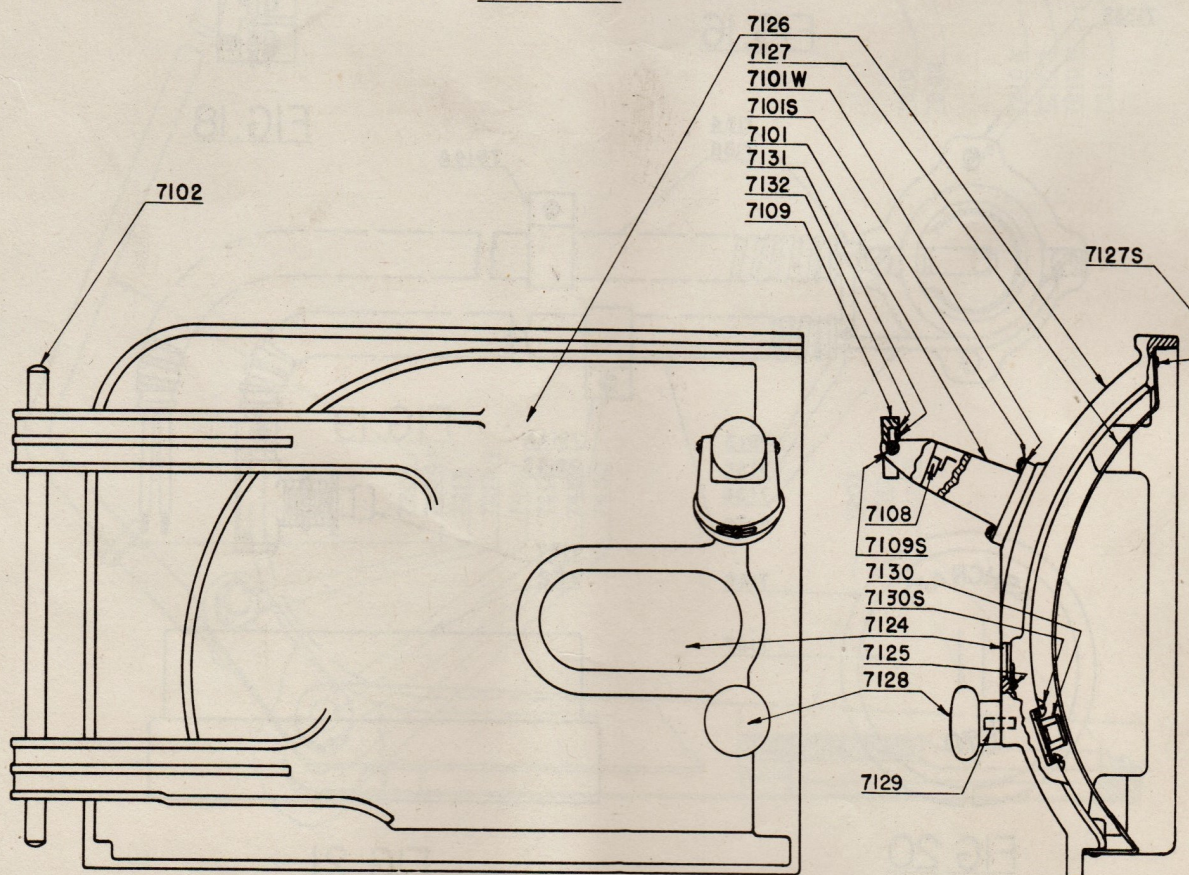


FIG. 23

LAMPHOUSE AND DOOR ASSEMBLY

7101 Periscope
 7101-S Periscope Screw
 7101-W Periscope Washer
 7102 Left Door Hinge Rod
 7103 Right Door Hinge Rod
 7104 Rear Door Hinge Rod
 7105 Swivel Plate
 7105-S Swivel Plate Screw
 7105-L Swivel Plate Lockwasher
 7106 Arcscope Screen
 7107 Panel
 7107-S Panel Screw
 7108 Arcscope Lens
 7109 Arcscope Mirror Holder
 7109-S Arcscope Mirror Holder Screw
 7111 Lamphouse Cone
 7111-S Lamphouse Cone Screw
 7111-N Lamphouse Cone Nut
 7112 Stack Adapter
 7113 Lateral Reflector Spring Stud
 7114 Lateral Reflector Spring Hook
 7115 Meter
 7115-S Meter Screw
 7116 Front Chain Cover
 7116-S Front Chain Cover Screw
 7117 Positive Control Shaft
 7118 Positive Control Knob
 7119 Right Hand Door
 7120 Right Door Baffle
 7120-S Right Door Baffle Screw
 7121 Right Door Handle
 7121-S Right Door Handle Screw
 7122 Door Handle Insulator
 7123 Right Door Catch
 7123-S Right Door Catch Screw
 7123-L Right Door Catch Lockwasher
 7124 Door Glass
 7125 Door Glass Clips
 7125-S Door Glass Screw
 7126 Left Door
 7127 Left Door Baffle
 7128 Door Knob
 7129 Door Knob Stud
 7130 Door Catch
 7130-S Door Catch Screw
 7131 Arcscope Mirror
 7132 Retaining Ring (Arcscope Mirror)
 7133 Lampholder
 7133-S Lampholder Screw
 7134 Lead-Line to Lampholder
 7135 Lead-Line to Switch
 7136 Lead-Switch to Lampholder
 7137 Door Switch
 7138 Flexible Tube to Line
 7139 Flexible Tube to Switch
 7140 Name Plate
 7140-S Name Plate Screw
 7141 Serial Plate

LAMPHOUSE AND DOOR ASSEMBLY (Cont'd)

7141-S Serial Plate Screw
 7142 Door Catch Pin
 7143 Thumb Release
 7144 Door Catch Spring
 7145 Angle Connector
 7146 Arcscope Ret. Ring
 7147 Rear Door
 7148 Door Switch Push Pin

DOWSER ASSEMBLY

7202 Front Dowser
 7203 Reflector Shield Casting
 7204 Dowser Rod
 7204-N Dowser Rod Nut
 7205 Mirror Shield Shaft
 7206 Dowser Swivel Pins
 7207 R H Dowser Control Shaft
 7208 L H Dowser Control Shaft
 7209 Dowser Shaft Coupling
 7210 Dowser Link
 7210-S Dowser Link Screw
 7210-W Dowser Link Washer
 7210-N Dowser Link Nut
 7211 Dowser Link Spacer
 7212 Dowser Transite
 7212-S Dowser Transite Screw
 7213 Ball Joint
 7213-N Ball Joint Nut
 7214 Dowser Handles
 7430 Collars
 7458 Set Screws
 7459 Set Screws
 7512 Collars

REFLECTOR MOUNTING ASSEMBLY

7301 Reflector Yoke Support
 7302 Reflector Yoke
 7302-N Reflector Yoke Nut
 7302-W Reflector Yoke Washer
 7302-S Reflector Yoke Screw
 7303 Reflector Ring
 7303-S Reflector Ring Screw
 7303-W Reflector Ring Washer
 7303-N Reflector Ring Nut
 7304 Reflector Clip
 7304-S Reflector Clip Screw
 7305 Support Clamp
 7305-L Support Clamp Lockwasher
 7305-S Support Clamp Screw
 7306 Lateral Reflector Adjusting Shaft
 7307 Vertical Reflector Adjusting Shaft
 7308 Fixed Clip
 7308-S Fixed Clip Screw
 7309 Spring Post
 7310 Spring
 7311 Vertical Reflector Spring

REFLECTOR MOUNTING ASSEMBLY (Cont'd)

7312 Reflector Spring
 7312-S Reflector Spring Screw
 7313 Cotter Pin
 7314 Reflector
 7315 Reflector Control Knob

ELEMENT BASE

7401 Main Element Base
 7401-S Main Element Base Screw
 7402 Positive Slide
 7403 Positive Standard
 7403-S Positive Standard Screw
 7403-L Positive Standard Lockwasher
 7403-W Positive Standard Washer
 7404 Positive Carbon Clamp
 7404-S Positive Carbon Clamp Screw
 7404-W Positive Carbon Clamp Washer
 7404-N Positive Carbon Clamp Nut
 7405 Positive Release Lever
 7405-N Positive Release Lever Nut
 7406 Motor Base
 7406-S Motor Base Screw
 7406-L Motor Base Lockwasher
 7407 Gear Cover
 7407-S Gear Cover Screw
 7408 Terminal Cover
 7408-S Terminal Cover Screw
 7409 Rheostat Mounting Bracket
 7409-S Rheostat Mounting Bracket Screw
 7409-L Rheostat Mounting Bracket Lockwasher
 7410 Rheostat End Casting
 7410-S Rheostat End Casting Screw
 7410-L Rheostat End Casting Lockwasher
 7410-A Rheostat End Casting Dial Plate
 7410-B Rheostat End Casting Drive Pin
 7411 Positive Guide Standard
 7411-S Positive Guide Standard Screw
 7411-L Positive Guide Standard Lockwasher
 7411-W Positive Guide Standard Washer
 7412 Positive Guide 7 mm. - 8 mm.
 7412-S Positive Guide Screw
 7412-L Positive Guide Lockwasher
 7415 Slip Clutch Washer
 7415-P Slip Clutch Washer Pin
 7418 12 T Sprocket
 7419 10 T Sprocket
 7420 60 T Spur Gear
 7421 20 T Worm Gear
 7422 Push Rod Cam
 7423 24 P Worm
 7423-P 24 P Worm Pin
 7425 3/4 Insulating Washer
 7426 Slip Clutch Nut
 7427 Drive Coupling
 7427-S Drive Coupling Screw
 7427-N Drive Coupling Nut

ELEMENT BASE (Cont'd)

7428 Positive Slide Insulator
 7429 Guide Standard Insulating Washer
 7430 5/16 ID Collar
 7431 Slip Clutch Washer Pin
 7432 Positive Slide Rod
 7434 Positive Rear Sprocket Shaft
 7435 Positive Slip Clutch Spindle
 7436 Horizontal Drive Shaft
 7437 60 T Gear and Cam Shaft
 7437-G Gear
 7438 70 T Worm Gear Shaft and Pinion
 7439 Front Sprocket Shaft
 7440 43 T Worm Gear
 7441 Slip Clutch Spring
 7442 70 T Worm Gear
 7443 Thrust Bearing
 7444 Thrust Bearing Spacer
 7445 Magnetic Loop Retaining Strap
 7445-S Magnetic Loop Retaining Strap Screw
 7446 5/16 Oilite Bearing
 7447 B 51 Needle Bearing 5/16
 7448 Push Rod
 7449 Contact Block
 7450 Clamp Screw
 7452 Rear Sprocket Retaining Ring
 7453 Insulating Washer
 7455 Positive Guide Standard Insulator Bushing
 7456 Terminal Block
 7456-SA Terminal Block Front Screw
 7456-SB Terminal Block Rear Screw
 7457 Spring Leads
 7457-S Spring Lead Upper Screw
 7457-W Spring Lead Washer
 7457-L Spring Lead Lockwasher
 7457-SA Spring Lead Lower Screw
 7458 8-32 x 3/16 Allen Set Screw
 7459 1/4 - 20 x 1/4 Allen Set Screw
 7460 B 47 Needle Bearing
 7461 5/16 Fibre Washers
 7462 Push Rod Spring
 7463 Positive Drive Chain
 7463-S Positive Drive Chain Screw
 7463-L Positive Drive Chain Lockwasher
 7463-W Positive Drive Chain Washer
 7464 Terminal Screw
 7464-N Terminal Screw Nut
 7464-L Terminal Screw Lockwasher
 7464-W Terminal Screw Washer
 7465 Motor Line Wires
 7466 Terminal Screw
 7466-N Terminal Screw Nut
 7466-L Terminal Screw Lockwasher
 7466-W Terminal Screw Washer
 7467 Fuse Block (Cutout)
 7467-S Fuse Block Screw
 7468 Fuse
 7469 Motor Base Adjusting Screw

ELEMENT BASE (Cont'd)

7469-N	Motor Base Adjusting Screw Nut
7470	Motor Drive Worm
7471	Rheostat Guard Cover
7472	Rheostat
7472-A	Rheostat Series Connection
7472-N	Rheostat Nut
7473	Rheostat Leads
7474	Rheostat Knob
7475	Lead - Terminal to Meter
7475-B	Bushing
7476	Magnetic Loop
7479	Scale
7479-S	Scale Screw
7480	Insulating Bushing
7481	Positive Lead - Cable
7482	Lead - Switch to Terminal
7484	Element Chain Cover
7484-S	Element Chain Cover Screw

NEGATIVE ASSEMBLY

7501	Negative Frame
7502	Negative Slide
7503	Negative Lateral Casting
7504	Negative Vertical Casting
7505	Vertical Adjusting Lever
7506	Negative Mounting Bracket
7507	Elevating Lever
7508	Drive Clutch Housing
7509	Duplex Clutch Housing
7511	Collet
7512	Collar
7514	Negative Swivel Insulating Rod
7515	Negative Lateral Insulating Tube
7516	Negative Swivel Bolt
7516-W	Negative Swivel Washer
7516-N	Negative Swivel Nut
7518	Negative Guide Base Insulating Tube
7519	Negative Guide
7520	Fibre Locking Handle
7521	Collet Nut
7522	Vertical Mounting Shaft
7523	Negative Elevating Screw
7524	Cam Control Shaft
7525	Vertical Adjusting Stop
7525-N	Vertical Adjusting Stop Nut
7525-CN	Vertical Adjusting Stop Cap Nut
7526	Negative Slide Rod
7527	Spiral Cam Shaft
7528	Negative Guide Base
7529	Negative Rear Sprocket Shaft
7530	Elevating Lever Shaft
7531	Duplex Clutch Stop Pin
7532	Pin Screw
7532-N	Pin Screw Nut
7533	Negative Clutch Spindle
7534	Negative Clutch Cam
7535	Negative Control Shaft
7536	Negative Guide Post
7537	Negative Mounting Rod
7538	Negative Lateral Adjusting Knob
7539	Spring Retaining Collar
7540	Negative Vertical Spring

NEGATIVE ASSEMBLY (Cont'd)

7541	Negative Lateral Adjusting Tube
7541-S	Negative Lateral Adjusting Tube Screw
7541-L	Neg. Lateral Adjusting Tube Lockwasher
7541-W	Negative Lateral Adjusting Tube Washer
7542	Negative Drive Sprocket
7545	Insulating Washer
7546	Negative Swivel Insulating Washer
7547	Collet Tube
7551	Negative Chain
7552	Negative Slide Limit Screw
7553	Chain Screw
7554	Frame Lateral Limit Screw
7554-N	Frame Lateral Limit Screw Nut
7556	Swivel Pin Screw
7556-L	Swivel Pin Lockwasher
7556-W	Swivel Pin Washer
7557	Vertical Limit Screw
7557-N	Vertical Limit Screw Nut
7558	Limit Screw
7558-N	Limit Screw Nut
7559	Negative Guide Base Cap Screw
7559-L	Negative Guide Base Lockwasher
7559-W	Negative Guide Base Washer
7560	Insulating Washer
7562	Insulating Washer
7564	Lead - Meter to Negative
7567	Clutch Arm Screw
7568	Negative Clutch Return Spring
7569	Negative Cam Shaft Drag Spring
7570	Negative Control Knob
7571	Washer Shaft Coupling
7572	Cam Control Shaft Spring
7573	Knob Spacer
7574	Negative Cam Adjusting Knob
7575	Washer Elevating Lever
7576	Cotter Pin
7577	Negative Elevating Knob
7579	Frame Lateral Limit Screw

MOTOR

7900	Motor
7900-S	Motor Screw
7900-L	Motor Lockwasher
7902	Brush Cap
7904	Motor Brush
7905	Brush Holder
7906	Armature
7907	Ball Bearing
7908	Bearing Plain Washer
7909	Bearing Spring Washer
7910	Field Coil
7911	Motor End Bell (Commutator End)
7912	Motor End Bell (Shaft End)
7913	Anti-short Bushing
7914	Motor Flexible Tubing
7914-A	Motor Flexible Tubing Clamp
7914-S	Motor Flexible Tubing Screw
7914-L	Motor Flexible Tubing Lockwasher
7915	Terminal
7916	End Bell Screw
7917	Spring Washer
7919	Motor Leads

