LINCOLN ELECTRIC®

IM-301

TEMPORARY
Jan. 1985
Ram

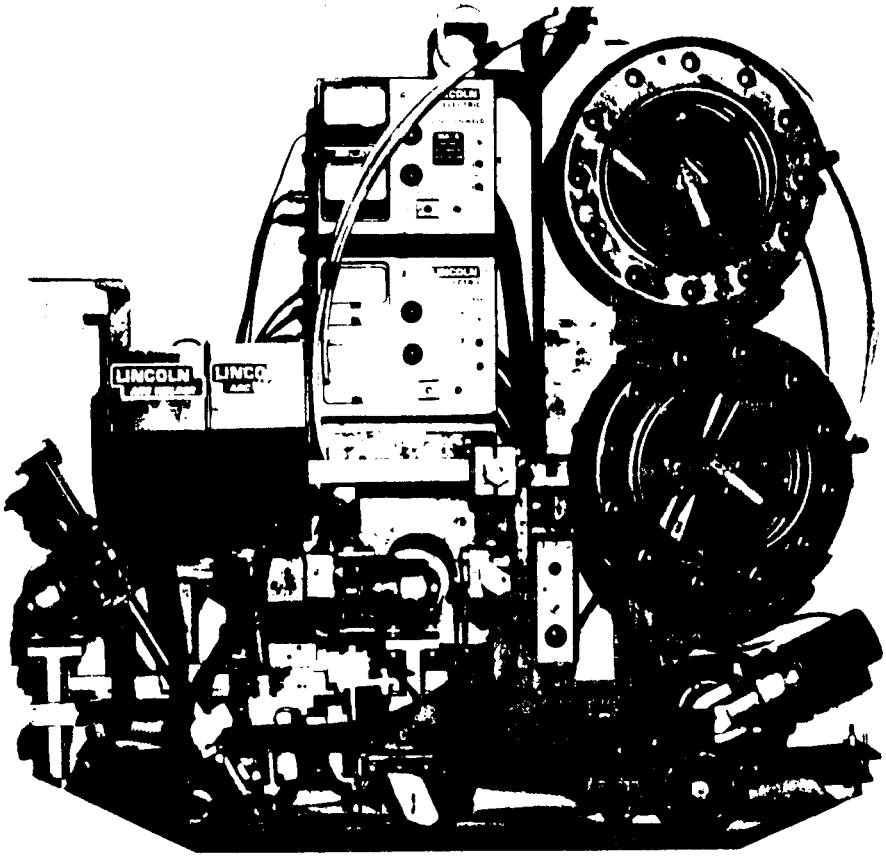
OPERATING MANUAL

This manual covers equipment which is no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

LT-6S6

TRIPLE ARC TRACTOR FOR SUBMERGED ARC WELDING

IM301
January 1985
LT-6S6 Tractor
8183; 8229; 8430; 8431; 8886; 8887



SAFETY DEPENDS ON YOU

Lincoln arc welding equipment is designed and built with safety in mind. However, your overal safety can be increased by proper installation ... and thoughtful operation on your part. DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS OPERATING MANUAL AND THE ARC WELDING SAFETY PRECAUTIONS ON THE INSIDE FRONT COVER. And, most importantly, think before you act and be careful.

SHIPPING DAMAGE CLAIMS

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

LINCOLN ELECTRIC **THE LINCOLN ELECTRIC COMPANY**
World's Largest Manufacturer of Arc Welding Products • Manufacturer of Industrial Motors
Cleveland, Ohio 44117 U.S.A.

ARC WELDING SAFETY PRECAUTIONS

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. READ AND UNDERSTAND BOTH THE SPECIFIC INFORMATION GIVEN IN THE OPERATING MANUAL FOR THE WELDER AND/OR OTHER EQUIPMENT TO BE USED AS WELL AS THE FOLLOWING GENERAL INFORMATION.

1. HAVE ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR WORK performed only by qualified people

2. ELECTRIC SHOCK can kill.

Protect yourself from possible dangerous electrical shock:

a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Never permit contact between "hot" parts of the circuits and bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
b. Always insulate yourself from the work and ground by using dry insulation. When welding in damp locations, on metal floors, gratings or scaffolds, and when in positions (such as sitting or lying), make certain the insulation is large enough to cover your full area of physical contact with work and ground.
c. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition.
d. Never dip the electrode holder in water for cooling.
e. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
f. If using the welder as a power source for mechanized welding, the above precautions also apply for the automatic electrode, electrode reel, welding head, nozzle or semiautomatic welding gun.
g. When working above floor level, protect yourself from a fall should you get a shock.
h. Ground the work or metal to be welded to a good electrical ground.
i. Also see Item 7.

3. FUMES AND GASES can be dangerous to your health.

a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding on galvanized, lead or cadmium plated steel and other metals which produce toxic fumes, even greater care must be taken.
b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
c. Also see Item 8b.

4. ARC RAYS can injure eyes and burn skin.

a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
b. Use suitable clothing made from durable, flame-resistant material to protect your skin and that of your helpers from the arc rays.
c. Protect other nearby personnel with suitable non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

5. FIRE OR EXPLOSION can cause death or property damage.

a. Remove fire hazards well away from the area. If this is not possible cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Have fire extinguisher readily available.
b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned." For information purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1-80 from the American Welding Society (see address below).
e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
f. Also see Items 6c and 8c.

Additional Safety Precautions

6. For Welding in General.

a. Droplets of molten slag and metal are thrown or fall from the welding arc. Protect yourself with oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses when in a welding area. Use glasses with side shields when near slag chipping operations.
b. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
c. Be sure the work cable is connected to the work as close to the welding area as practical. Work cables connected to the building framework or other locations some distance from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

7. For Electrically Powered Equipment.

a. Turn off the input power using the disconnect switch at the fuse box before working on the equipment.
b. Make the electrical installation in accordance with the National Electrical Code, all local codes and the manufacturer's recommendations.
c. Properly ground the equipment in accordance with the National Electrical Code and the manufacturer's recommendations.

8. For Engine Powered Equipment.

a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.
b. Operate internal combustion engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.
c. Do not add the fuel near an open flame, welding arc or when the engine is running. Stop the engine and, if possible, allow it to cool to prevent spilled fuel from igniting on contact with hot engine parts or electrical sparks. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.
d. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.
e. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

For more detailed information it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting" — ANSI Standard Z49.1 from the American Welding Society, P.O. Box 351040 Miami, Florida 33135.

INDEX

MODIFIED SERIES ARC TRACTOR

6S6

	PAGE
General Description and Features	2
Equipment Requirements for Modified Series Arc Welding	3
Spare Parts	3
Description of the Main Components	
A. Automatic Controls	4
B. Wire Feeders	4
C. Nozzles	4
D. Straighteners	5
E. Wire Reels and Housing	5
F. (1) Travel Carriage	5
(2) Travel Control	5
G. Vertical Adjustment	5
H. Wire Feeder Mountings	6
I. Nozzle Locking Bar	6
J. Cross Beam Stabilizer Arm	6
K. Stabilizer Wheels	6
L. Flux Scraper	6
M. Front Supporting Caster	6
N. Front and Rear Guide Rolls	7
O. Flux Hoppers	7
Installation	
A. Power Source Installation	8
B. Input Cable Installation Instruction	8 - 12
C. Power Source Electrode Connections	13
D. Loading and Straightening Wire	14 - 16
E. Instructions for Setting Head Height	17 - 23
Operation - Weld Testing	24 - 26
Maintenance Instructions	27 - 29
Wire Feed Speed Meter Calibration	30
Component Positioning (All factory set)	31 - 36

GENERAL DESCRIPTION AND FEATURES

The modified series arc system is a tandem arc process for submerged arc type operation. The equipment has been specifically designed so that the "modified series type arc concept" could be applied to the one side welding technique of plate thicknesses ranging from 3/16 up to 2.00 inches.

The equipment consists of three NA-type wire feeders, each having a K-148 positive contact type nozzle, two fully automatic wire feed controls, three shrouded wire reel mounts, and the versatile rugged steel frame carriage of the LT-56.

Two units are available; namely, the K-321-B and the K-321-S. The K-321-B has all of the components preset and ready to weld beveled joints of plate thicknesses ranging from 3/8 to 2.00 inches. The K-321-S has all of its components preset for welding square edge (no preparation) plates ranging in thickness from 3/16 to 5/8 of an inch.

With a few changes in the types of nozzles used and head arrangements, either system can be converted for the other type operation (K-321-B to a K-321-S) or a (K-321-S to K-321-B).

The basic unit has two modified NA-4 type solid state controls both having start and crater P.C. boards installed. The A.C. ammeters have been replaced with "Wire Feed Speed Meters" so actual wire feed rates can be monitored with greater accuracy.

Many parts of the unit are common with the NA-4 and NA-4S4 automatic and the LT-56 tractor.

All the positioning adjustments on the tractor are so designed that they can be locked tight. This eliminates any movement of these adjustments when the tractor is moved about the shop.

The height of the unit is 54.75"; width 20.5" and length 59.5". The weight of the unit is 676 pounds with empty reels and flux hoppers.

EQUIPMENT REQUIREMENTS FOR MODIFIED SERIES ARC WELDING

			Required
1.	Modified Series Arc Tractor	K-321-B OR K-321-S (as specified)	1
2.	Power Source - AC-1200	K-1276-C	2
3.	Control and Power Input Cables	K-215-xxx	2
4.	Electrode leads for the middle head (4/0)	Same length as the K-215-xxx plus 4 feet	2
5.	Work stud jumper (machine to machine)	4/0 - length as required	1
6.	Work leads size 4/0	Length as necessary from power source to the connection point on the work piece	4
7.	Voltage pickup lead for the trail arc - Size No. 6 rubber covered cable	Same length as work leads	1
8.	Digital Wire Feed Speed Indicator	K-283	1
9.	Spare Parts		Suggested Stock
	A. Nozzle center guide	S-13769-1 & -2	3
	B. Contact tips	S-13763	6
	C. Extension guide	S-13786-3/16	2
	D. Guide support	S-13785-1	2
	E. Wire Feed Meter	S-16654	1

The LT-6S6 has been built using components which are basically common to the NA-4 automatic and the LT-56 tractor drive; many of the parts can be used interchangeably.

DESCRIPTION OF THE MAIN COMPONENTS

Description and operation of the main components of the modified series arc tractor are as follows:

A. Controls

1. A modified solid state NA-4 control for controlling the lead arc and the middle arc wire feed speed. Since both feeders are being controlled by the same NA-4 control, it was necessary to add a second wire feed motor field supply to the standard NA-4 control. Ammeter and current transformer have been replaced with a wire feed speed meter.

2. The second control is a NA-4 type and is used to control the trail arc wire feed rates. Ammeter and current transformer have been replaced with a wire feed speed meter.

VERY IMPORTANT - The wire feed speed meter in each control have been accurately adjusted for their respective wire feed units. The control boxes and wire feed units have been identified with corresponding serial numbers and these must be used as companion units. If a replacement of a control box, motor, or a speed meter has to be made, see instructions in Maintenance Section for recalibration of the equipment.

B. Wire Feeders

1. Lead arc wire feeder is an NA-4 type unit with an additional gear ratio added so that the total ratio is 254/1.

2. Middle arc wire feeder is the same as above.

3. The trail arc wire feeder is also a NA-4 type unit having a 142/1 ratio.

C. Nozzles

1. When tractor is set up for beveled plate thicknesses of .38 and up, the lead and middle arc both use a K-148-B positive contact type nozzle. The trail arc uses a K-148-B with a K-149-3/16 added. These are the proper nozzles for present solid wire procedures.

2. When tractor is set up for square edge plate thicknesses of .62 and below, the lead nozzle is a K-148-B type, the middle nozzle is a K-148-A type, and the trail arc is a K-148-B type - all three being positive contact type nozzles.

D. Straighteners

The tractor is equipped with the solid wire straightener, M-13693.

E. Wire Reels and Housing

All three wire reels have insulated shrouds protecting them from accidental grounding and also to help keep the electrode clean. Each electrode is guided through a nylon tube and is supported properly to insure uniform straightening of the wire.

F. (1) Tractor Drive

1. The unit is propelled by two six inch diameter canvas-tired wheels. Both wheels are driven by a common axle.

2. The travel gear box is an NA-3 type with a special adapter gear box between the motor and gear box proper. The assembly is a helical-spur-bevel type unit driven by a DC shunt motor. Lubrication is of a non-fluid type. Gear box ratio is 640/1. Total ratio from motor shaft to axle shaft is 1344/1.

3. The travel drive has a built in clutch which can be operated from either side of the tractor. When the gears are engaged, the travel unit drives the tractor; when the gears are disengaged, the tractor can be moved forward or backward manually.

(2) Travel Control

1. Travel control box is similar to that used on the LT-56 tractor. It consists of:

   (a) Solid state circuitry packaged in its own control box.

   (b) Travel direction switch - forward and reverse travel.

   (c) Travel speed control - calibrated in inches per minute on dial (6 to 100"/min.).

   (d) Circuit breaker - for overload protection of circuit.

   (e) One-half amp slo-blow field fuse (inside travel control box on the P.C. board).

G. Vertical Adjustment

A standard K-96 vertical head lift is used for height control of the entire wire feeding system. Vertical adjustment of 4.00 inches of continuous travel as an integral part of tractor. Fixed major height adjustment provided for longer electrical stickouts.

H. Wire Feeder Mountings

Each wire feeder is mounted independently from each other onto a main cross bar which is attached to the moving mast of the vertical head lift. All three wire feeders are electrically insulated from the main frame. Each mounting has the capability of adjustable electrode stickout, electrode angle and electrode spacing.

I. Nozzle Locking Bar

The function of this bar is to maintain the position of each nozzle with respect to each other and also in respect to the tractor guide rolls.

J. Cross Beam Stabilizer Arm

This arm allows the vertical movement of the entire head assembly without losing inline position of the three electrodes with respect to the tractor guide rolls.

K. Stabilizer Wheels

Two stabilizer casters are mounted on a "U" bracket which is attached to the main frame. These wheels should never touch the plate to be welded. Normal clearance between the bottom of the wheel and top of the plate should be .090 to .120. If this is not so, then the head and frame adjustments are not correct. The principal function of the outboard wheels is to prevent the tractor from being accidentally tipped.

L. Flux Scraper

A mild steel spring loaded blade removes the flux pile between the weld puddle and the rear guide roller. This allows the rear guide wheel to ride in the seam of the weld on plate thicknesses of 3/4 and over. Scraper is not required when welding plate thickness of 5/8 or less. The scraper should be placed in the upper most position and securely tightened.

M. Front Supporting Caster

The function of the wheel and its adjustable support mounting is to maintain the exact height position of the vertex between the lead and middle electrode below the surface of the plate to be welded. The caster frame has a partial restraint put on it so that it can allow the guide rolls in the seam to control the steering of the tractor and yet not allow it to swivel into a nuisance position when the tractor is moved from one place to another.

N. Front and Rear Guide Rolls

Both the front and the rear guide rolls are heavily spring loaded to insure them staying in the groove that is to be welded. These rolls can be retracted and locked into an up position if so desired. The function of these two rolls is to guide the tractor along the seam to be welded. When welding plates 5/8 or less, lock the rear guide wheel in the up position.

O. Flux Hoppers

The two flux hoppers are the same as on the LT-56, each having a 15-pound capacity and an adjustable flow rate.

When welding beveled butt joints - both hoppers feed into a single common tube to supply flux ahead of the lead electrode.

When welding square edge butts - one hopper used to feed flux ahead of the lead electrode, and the second hopper feeds flux just behind the middle electrode to prevent excessive arc flash thru.

INSTALLATION INSTRUCTIONS

A. Power Source Installation

Refer to M-13691 - NOTE NB in regard to phase relationship of the two power sources.

B. Tractor Input Cable Installation

VERY IMPORTANT - Leads must be routed and connected as shown; otherwise, erroneous meter readings may result from extraneous induced voltages.

Check unit for any damages that may have occurred during the shipment of the unit.

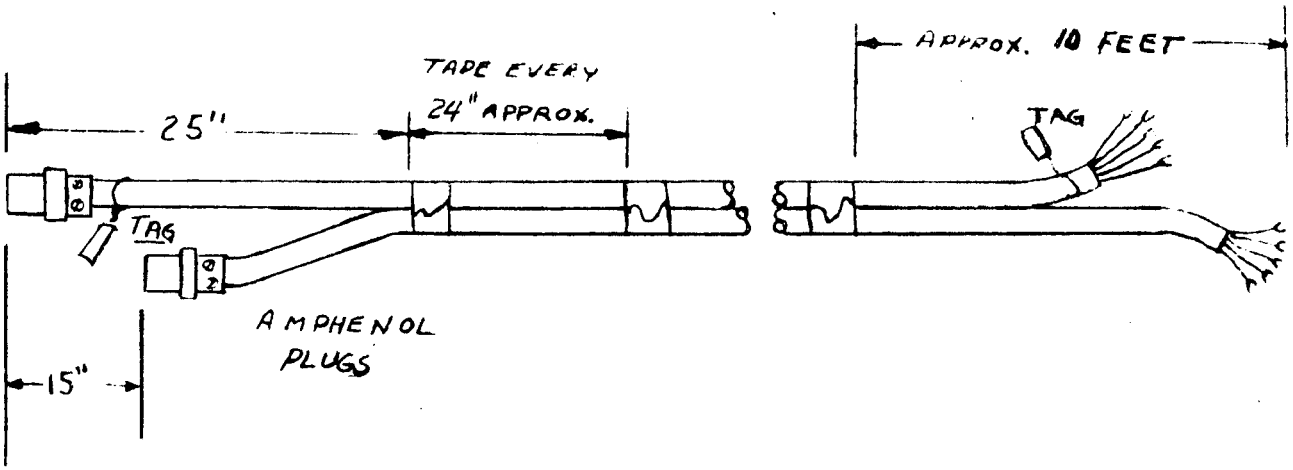
Uncrate the two K-215 cables. Check the condition of the cables, making sure that they were not damaged in shipment.

Proceed as follows:

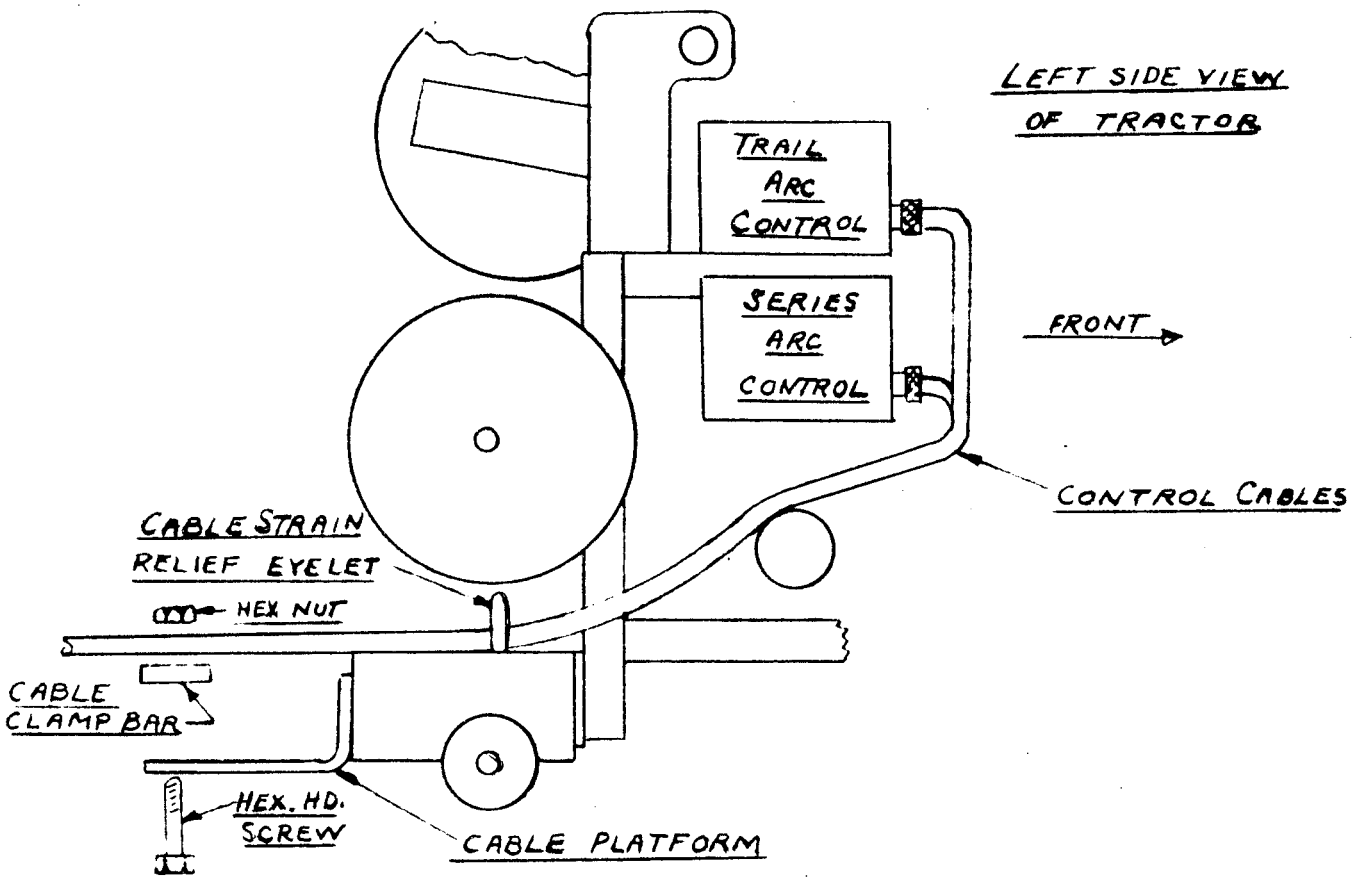
1) Uncoil the cable assemblies and lay them out in a straight line. Remove the control cable from each assembly by cutting the tape at each of the tie points along the cable.

2) Take one of the control cables and identify as "trail arc control" at each end using a tag.

3) Lay both control cables side by side with a 15" stagger as shown and then friction tape the two cables together every 24 inches (approximately) to within 10 feet of the lugged end.



4) Feed the amphenol end of the cables through the cable strain relief just under the wire reel shroud. Route the cable assembly as shown.



5) Plug the trail arc amphenol into the upper control box and the series arc amphenol into the lower control box.

6) With the power source off, hook up each control cable assembly to their respective AC-1200's per drawing M-13691. There is a cable clamp taped to each of the control cables. Remove the tape and fasten each control cable to the front of each of the AC-1200's. Leave a little cable slack between terminal strip and clamp so that there will be no strain on the lugs at the terminal strip. At each power source, do not connect lead #21 from the control cables to the terminal strip. See instructions on drawing M-13691.

7) At the rear of the tractor, remove the cable clamp bar from the cable platform.

8) Refer to Fig. on Page 11. Take two of the electrode leads which were disassembled in Step (1). Route the end of each electrode lead through the

cable strain relief eyelet and then upward between the shroud and the lower control box. Route the cables into the left side of the upper control box and then under the insulating plates surrounding the current bar. Connect each of the leads to the current bar using the hardware provided. Make sure that the flat side of the lug is against the current bar before the screw is inserted. Tag the other end of these two electrode leads as "trail arc electrode".

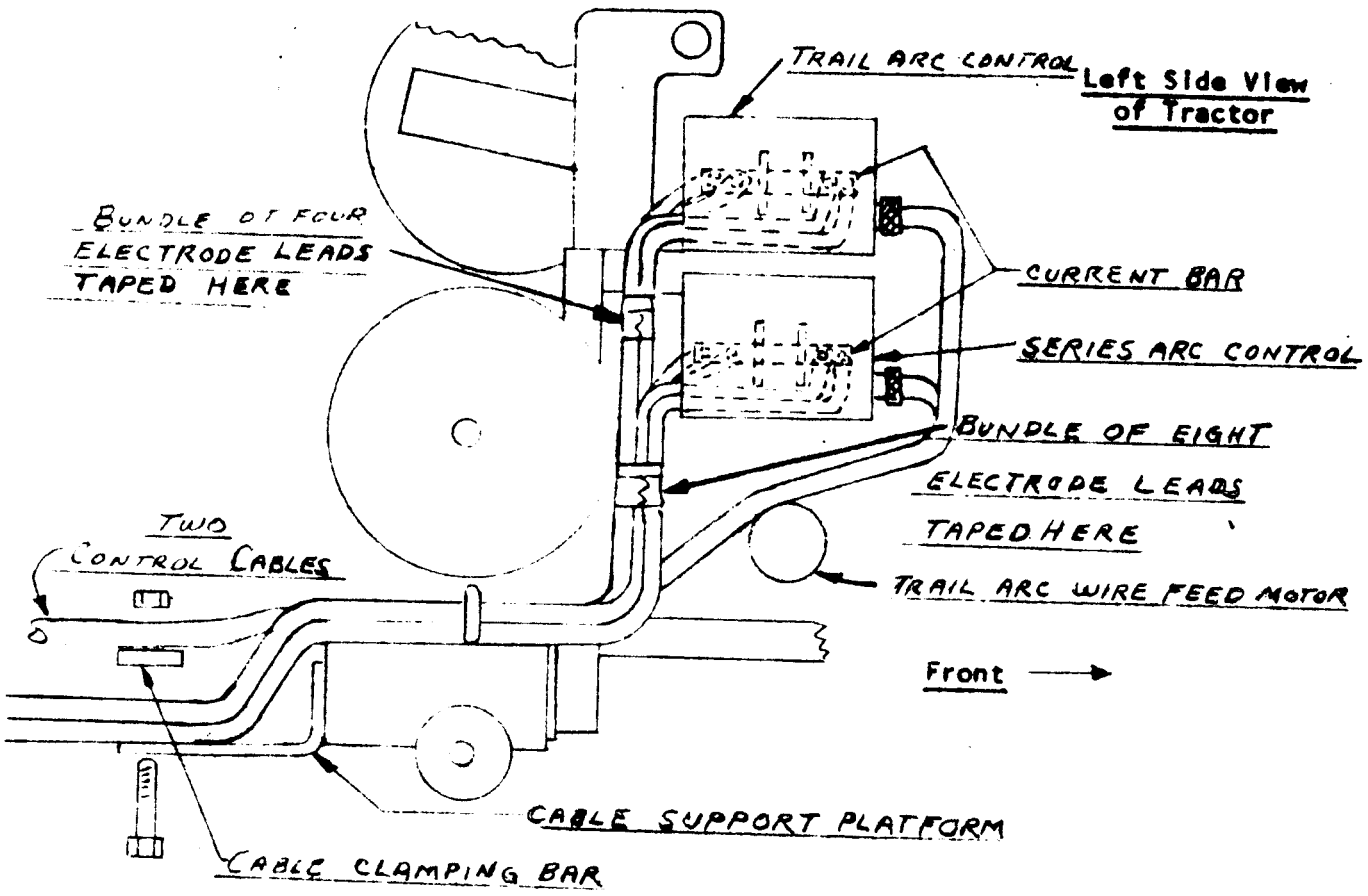
9.) Take the other two electrode leads that are left from Step (1.). Feed one end of each of the electrode leads through the cable strain relief eyelet and then upward and into the left side of the lower control box. (See figure on Page 11). Feed the electrode leads under the insulators which surround the current bar. Fasten each lead to the current bar with the hardware supplied. Tag the other ends of these two as "series arc electrode".

10.) Two 4/0 electrode leads to the middle nozzle will be required, the length of which should be the same as the K-215's which are being used plus 4 feet.

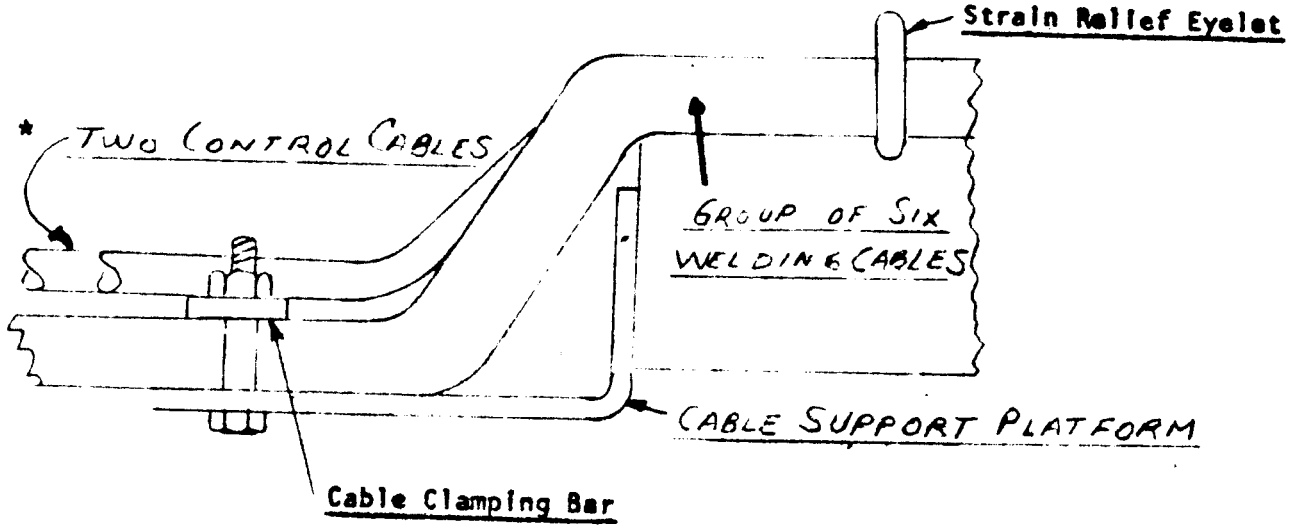
Feed the ends of these two electrode leads through the cable strain relief eyelet and then through the same opening used by the other nozzle electrode leads. Fasten one electrode lead to the top side of the middle nozzle flag, and the other lead to the bottom side of the flag making sure that the flat side of the lug is against the flag. The voltage pickup lead is to remain part of this bolted connection. Tighten the bolt securely.

Identify the other end of these two leads as "series arc work leads".

11.) Dress the leads into a neat package shifting any excess length back through the strain relief eyelet. Group the leads into neat bundles and tape the bundles as shown on Page 11.



12.) Clamp all six electrode leads down to the cable platform using the hardware supplied.



*Do not clamp the control cables under the clamping bar.

13.) Group all six electrode leads into a neat bundle and lay them out straight behind the tractor. Using 1½ inch wide friction tape, tie this group of cables together every 24 inches (approximately to within 10 feet of the other end of the cables - do not include control cables in this bundle.)

14.) At the two power sources connect the tagged electrode leads, "trail arc electrode" and "series arc electrode", to the proper terminals. See Page 13 for proper "Current tap range".

The two leads which are tagged "series arc work leads" should be connected to the work terminal of the series arc power source. Finish connecting the remainder of the installation per M-13691.

C. Power Source Electrode Connections

1.) For square edge butt joints on plate thicknesses of 5/16 or less (trail arc not used):

a.) At the series arc power source, connect the two electrode leads to the medium range 385-895 ampere tap.

b.) Trail arc power source not used.

2.) For square edge butt joints on plate thicknesses of 3/8 through 5/8:

a.) At the series arc power source, connect the two electrode leads to the maximum range 735-1500 ampere tap.

b.) At the trail arc power source, connect the two electrodes to the medium range 385-895 ampere tap.

3.) For beveled plates 3/8 and above:

a.) At the series arc power source, connect the two electrode leads to the medium range 385-895 ampere tap.

b.) At the trail arc power source, connect the electrode leads to the medium range 385-895 ampere tap.

D. Loading and Straightening Wire

1. Remove the three wire reels from the tractor. Remove the wire reel cover from each of the reels by unscrewing the large wing nut.

2. Remove the filler wire of the proper size and alloy from the carton. Leave all tie wires in place.

3. Load two reels so that they pay off in a counter clockwise direction; load the third reel so that it pays off in a clockwise direction. Put the covers back on each reel and tighten securely.

4. Place the two reels with the counter clockwise coils onto the right* side of the tractor; place the third reel on the left side of the tractor.

5. Starting with the left side coil (back side) find the start end of the coil and the tie wire which holds this end. This will be the last tie wire cut. Cut and remove all other tie wires.

   Caution: Hold the start end of the coil when cutting the last tie wire. Allow the wire reel and coil to spin backwards until it stops by itself. Remove the tie wire. Cut off any kink or sharp bend that may be on the start end of the coil.

   Remove the nylon tube from the take-off arm and its upper support. Allow it to take its natural shape. Feed the start end of the coil up through the hole in the take-off arm. Do not attempt to straighten at this time, just feed it into the nylon tube. The wire and the nylon tube have approximately the same curvature so that this is the best condition for loading. After the start end of the wire is through the nylon tube, push the tube back along the wire until it seats back into the take-off arm. Route the nylon tube into the first slot away from the lift bale of the upper support arm. The hose clamp should be on the rear side of the slot and will prevent the nylon tube from moving forward.

6. Turn the power sources on, and the "power switch" on the control boxes to the "on" position.

7. Open the front cover of each control box and set the inch speed to maximum.

8. By hand, straighten the first 10 to 15 inches of the start end of the coil. Turn the straightener knob back to the minimum position. (The adjusting knob of each straightener must be toward the reels.) Pass the straightened coil end through the straightener into the wire feeder until it touches the drive roll. Push the inch button and inch the wire through the system.

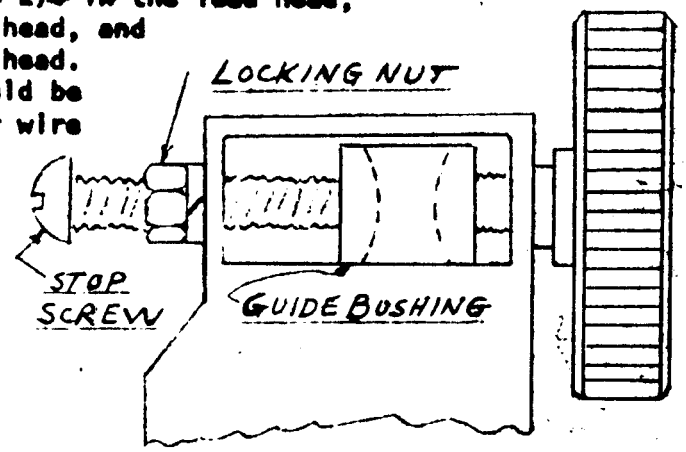
(*) Looking at front of tractor.

9. Repeat the above procedure for the upper right reel into the middle head wire feeder. (The nylon tube should be in the middle slot of the upper support.) After the wire has been inched through the middle wire feeder system, block the idle open or release its tension arm so that it will not feed wire when the inch button is depressed.

10. Repeat Step No. 8 for the lower right reel and the lead arc wire feeder. (The nylon tube should be in the front slot of the upper support.) Do not release the idle pressure on this wire feeder.

11. Using a crane, lift the tractor 2 to 3 feet from the floor.

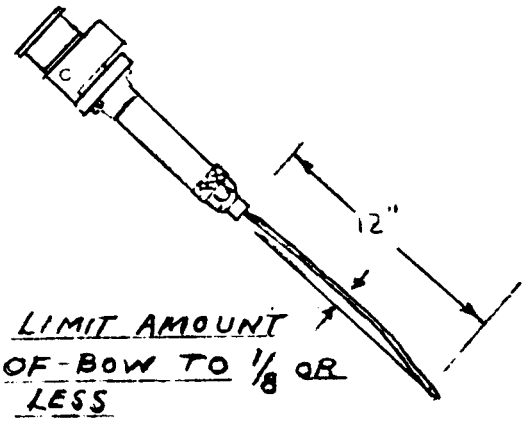
12. Each of the wire straighteners have an adjustable "stop" built into the frame. This allows the operator to return the straightener to the proper position so that it will feed straight wire. These positions are factory set. The "stop" position may have to be moved periodically due to the wear in the upper guide or the ingoing guide tube. **On the "M-B" model tractor, the stop position is factory set using 3/16 L70 in each of the heads. On the "M-S" model, the stop position is factory set using 3/16 L70 in the lead head, 1/8 L70 in the middle head, and 5/32 L70 in the trail head. The stop position should be reset when using other wire diameters or alloy composition. See figure for adjusting.**



13. To set - loosen the locking nut and back the stop screw out. Set the straightener guide for straight wire and then turn the stop screw in until it just touches the guide bushing. Hold the stop screw and tighten the locking nut.

14. With the guide bushing of all straighteners against their stop screws, push the inch button of the series arc control box. Feed at least three 18-inch sections of wire. This will get rid of all the kinks and bends that may have occurred during the loading, and also gives an opportunity to check the straightness of the wire.

The wire should have no more than a 1/8" bow in a 12" length. If there is a side bow in the wire then the entire straightener assembly has to be rotated slightly. If the bow is to the right (looking from the front of the unit), the straightener should be rotated in a clockwise direction. If the bow is to the left, then the straightener should be rotated counter clockwise.



15. (a) Block open or release the idle roll tension on the lead arc wire feeder.

(b) Unblock or apply proper idle roll tension to the middle arc wire feeder so that it will feed wire.

(c) Set the straightening of the wire as in **Steps 12 and 13.**

(d) Unblock or apply the proper tension to the lead arc head. The lead and middle heads are now ready to weld.

16. Straighten the wire in the trail arc wire feeder by using the same procedure as in **Steps 12 and 13.**

17. Open the door on both control boxes far enough to reset all of the knobs on the start and crater boards to the proper setting per procedural instructions.

18. Cut all electrodes so that they are approximately a 1.00 inch electrical stickout.

19. Lower the unit to the floor.

E. Instructions for Setting Head Height

The nozzle angles, electrical stickouts and electrode spacings have been correctly set and all units completely locked into their respective positions at the factory. The correct positioning, stickout and spacing are shown in Figure on Page 18 **(for beveled plates 3/8 and above) or Page 19(for square edge plates 5/8 and under).** The only time a major change in the height of the entire wire feed assembly is required is when the unit is to be used on a different plate thickness. Minor height adjustments may have to be made depending upon the accuracy of the joint preparation.

Before making any height adjustments it is important that all the wires are coming out of their respective nozzle and are straight.

Changing from one plate thickness to a plate of greater thickness should proceed as follows:

1. Set the tractor into the joint that is to be welded. Make sure that the front and rear guide wheels are properly in the seam.

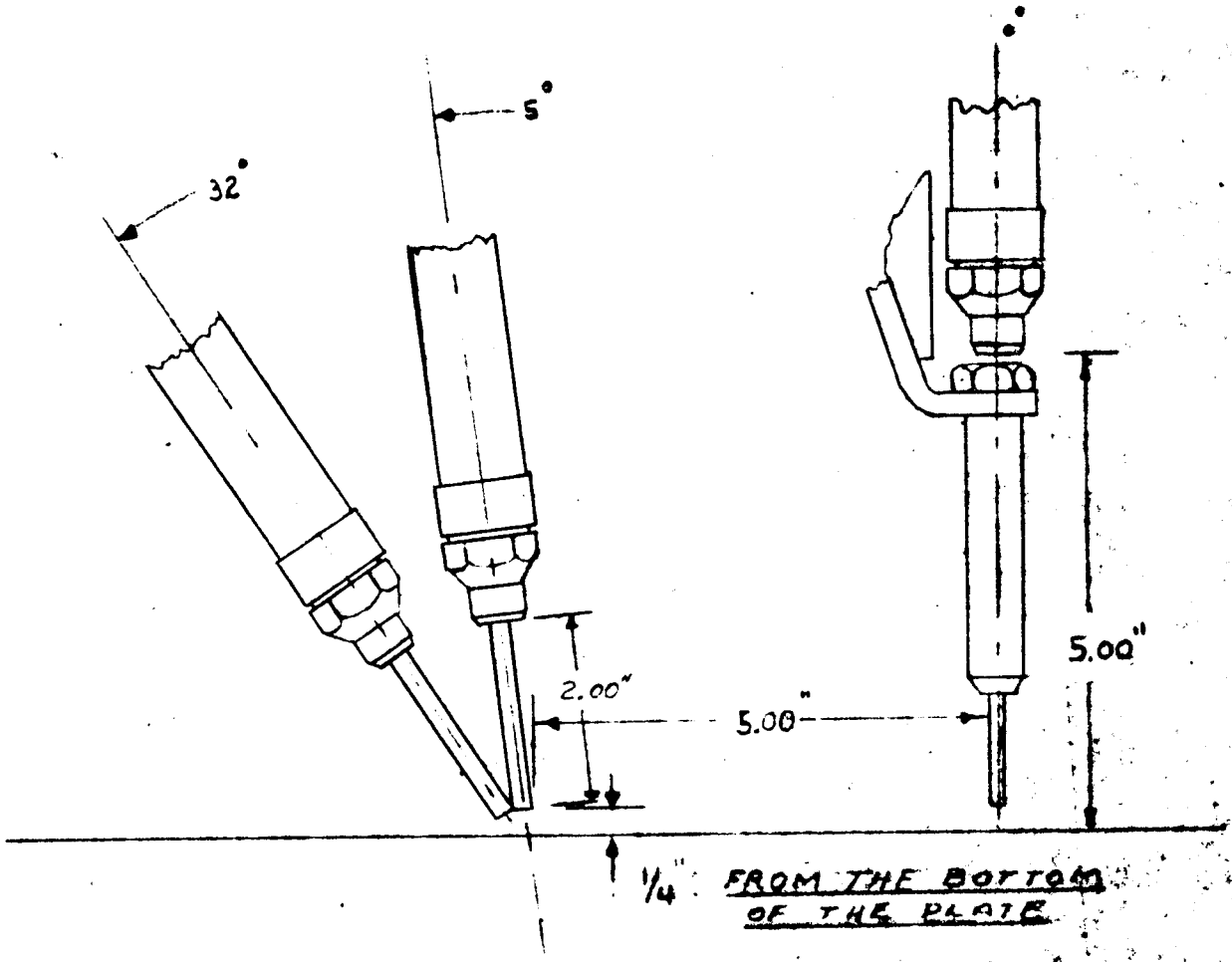
2. Loosen (approximately one turn) the allen locking screw which is on the right side of vertical head lift. Give the screw head a slight tap inward. This will loosen the locking wedge so that the vertical adjuster can be easily adjusted.

3. At the front castor support loosen the clamping block which locks the hexagon bar to which the castor is mounted. This will allow the bar to be raised and lowered with the rotation of the large hexagon nut at the top of the support housing.

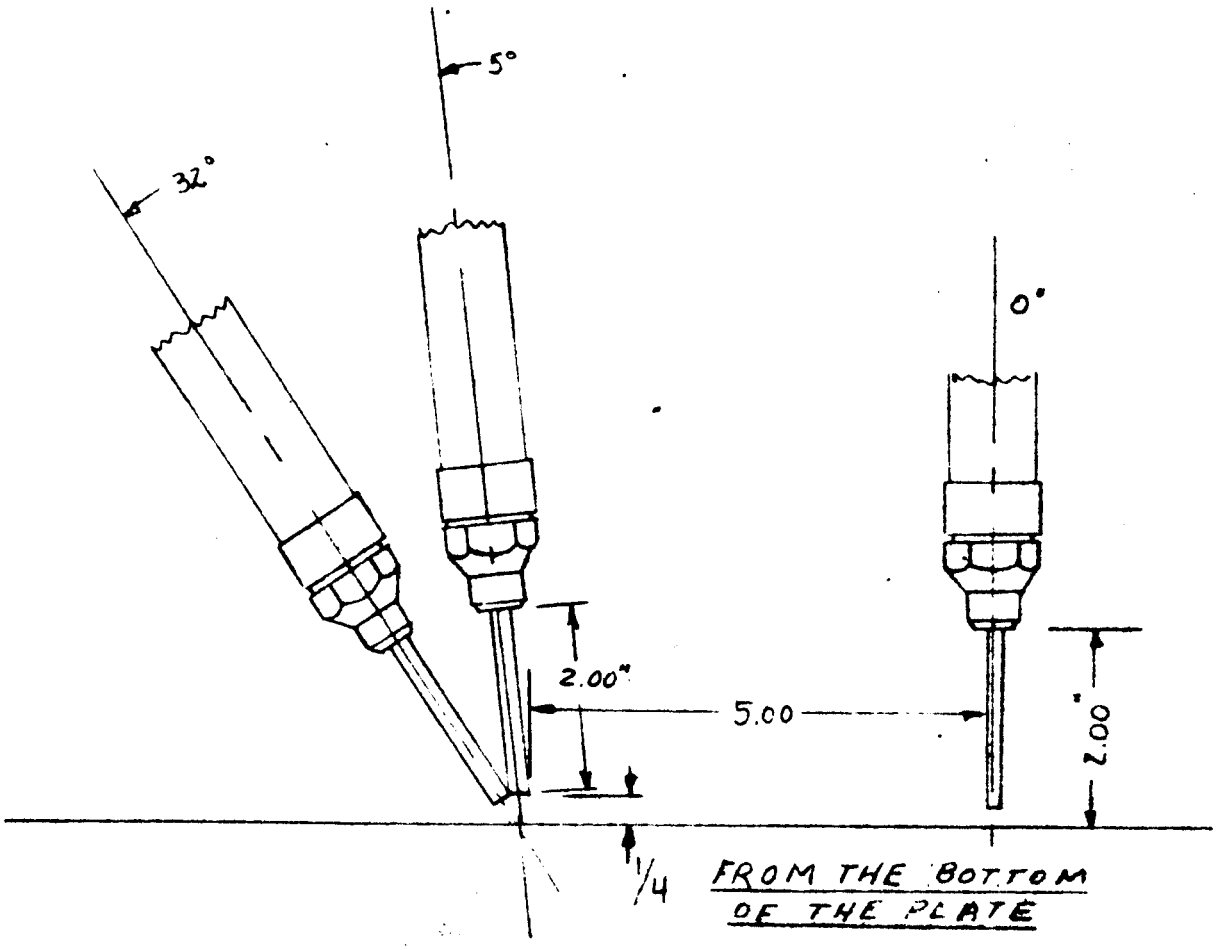
4. Since the change is going from a given plate thickness to one of greater thickness it is necessary to lower the entire wire feeding system with the vertical head lift by the difference in plate thickness. The support castor also moves down with the above assembly so it is necessary to raise the castor by turning the large nut in a clockwise direction. **Both of the above adjustments effect the clearance height of the stabilizer wheels and when a change is made in the vertical head lift height a corresponding change must be made in the front castor height adjustment to maintain this .090 to .120 clearance. These changes should be made a little at a time at both places until the conditions shown** on Page 20 **are attained.**

5. **The vertex height above the plate bottom is a very important parameter to the welding procedure and care should be taken to measure it accurately. A method of checking this value is as follows:** (For prepared plates)

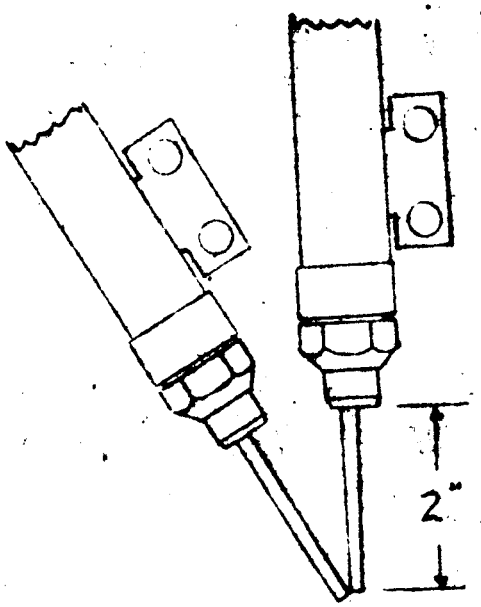
   (a) Cut the ends of the lead and middle arc electrodes to the appropriate length so that when the two electrodes come together the middle arc electrical stickout is 2.00".



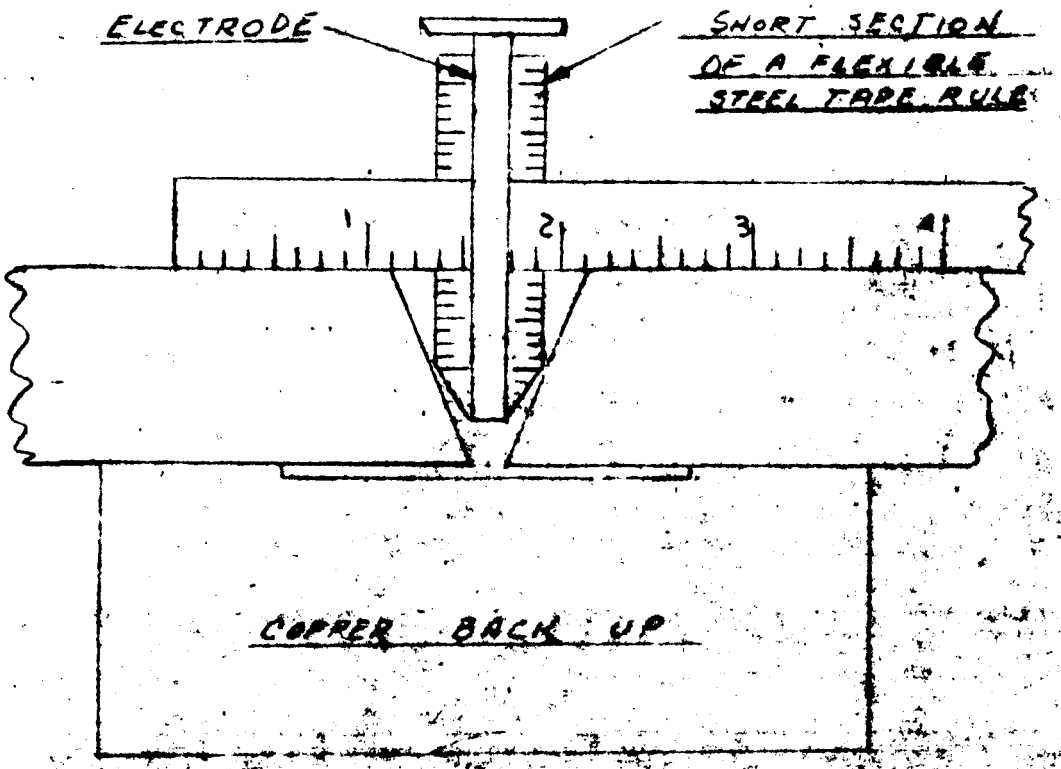
PROPER ELECTRODE SETTINGS FOR WELDING BEVELED PLATES



PROPER ELECTRODE SETTINGS
FOR WELDING SQUARE EDGE PLATES



(h) Push the wires down into the groove to be welded and measure the distance from the vertex to the top of the plate. By sticking the short thin section of a rule into the vertex point and by holding it against the middle electrode with a six inch scale, read the dimension on the thin rule which is on the bottom edge of the six inch scale. Subtract this value from the actual measurement of plate thickness and this will be the distance that the vertex is above the bottom of the plate.



(c) An alternate method of checking the vertex height is to build the gaging system right into the starting platform. (See Page 23.) (For prepared plates.)

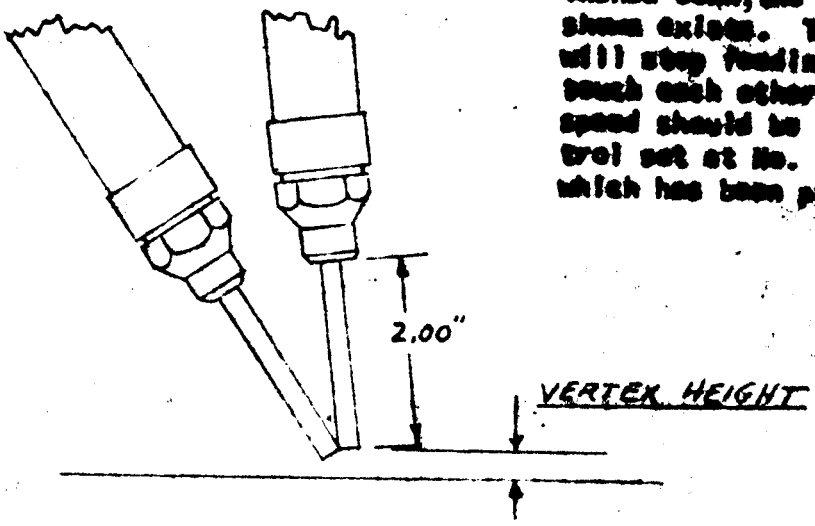
1. Starting platform should be made of the same thickness plate as the one which is to be welded.

2. Gaging pad must also be the same thickness as the plate to be welded.

3. Periodically it is advisable to check the vertex height of the series arc electrodes. To check this height, proceed as follows:

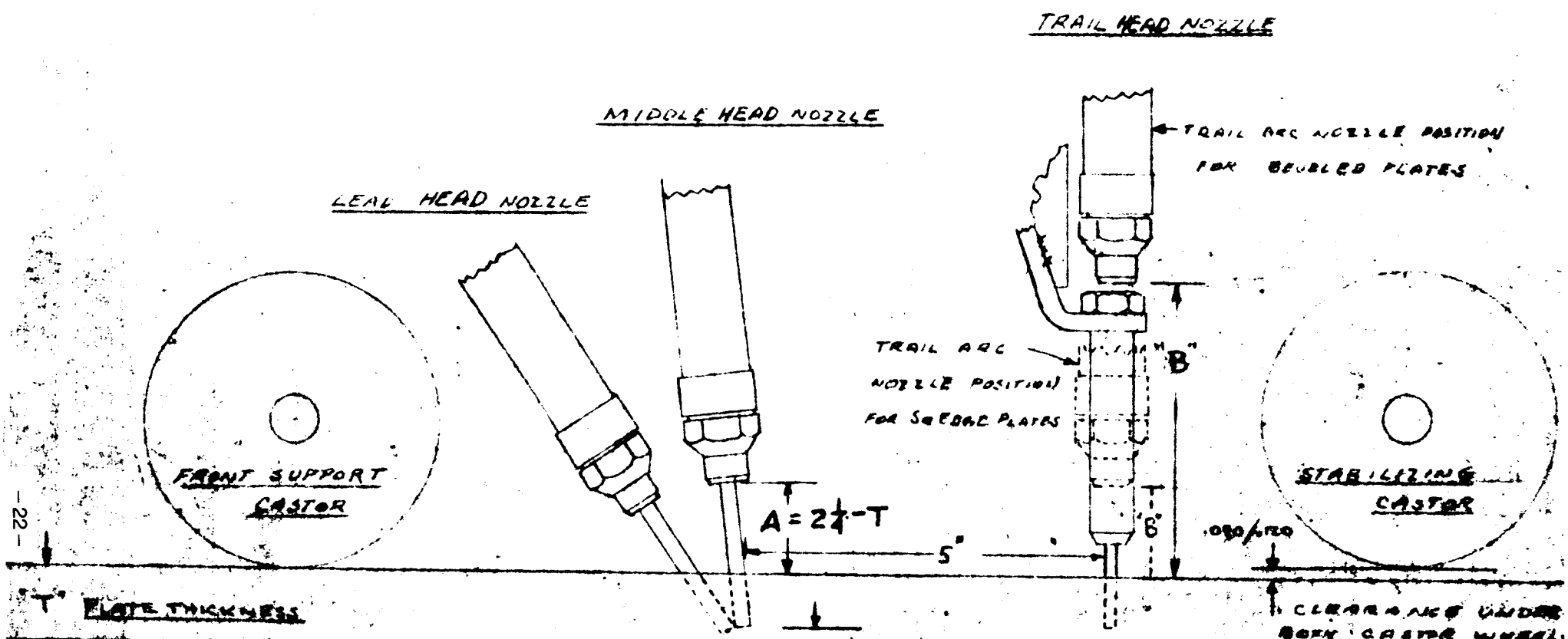
3.a Set the tractor up on the checking pads. Make sure that there is nothing under any of the wheels when it is set down on to the checking pads.

3.b Cut the lead and middle electrode so that when they are inclined down, the condition shown exists. The electrodes will stop feeding when they touch each other. The lead speed should be slow (control set at No. 3 position, which has been proved).



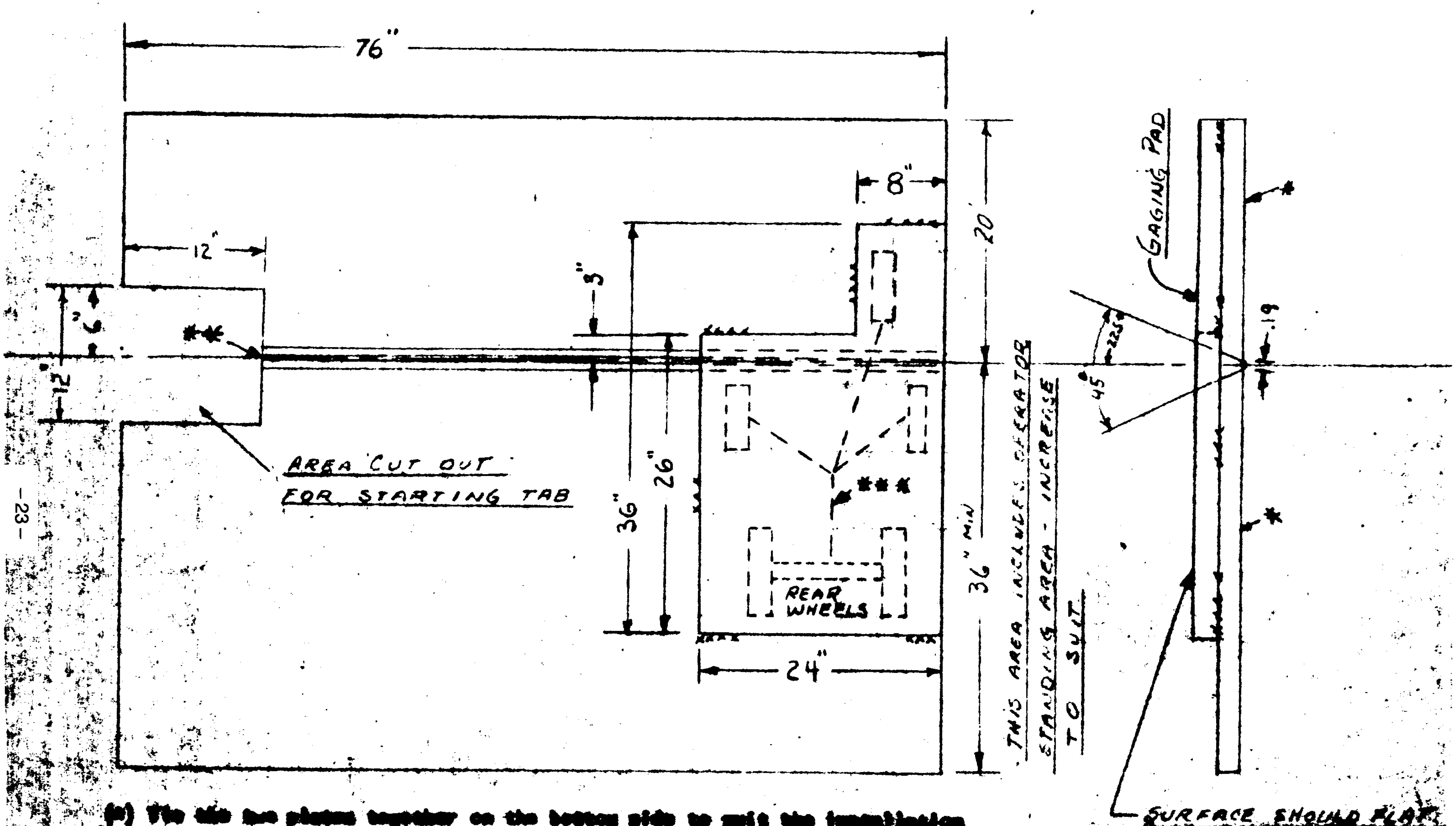
3.c Measure the electrode vertex height from the top of the starting platform surface to the point at which the electrodes meet.

3.d If there are any adjustments to be made, see Manipulation Instruction, Section E, Page 17.



T	A	B		V
		BEVELED	SQUARE EDGE	
3/8	1 7/8	4 5/8	1 5/8	
1/2	1 3/4	4 1/2	1 1/2	1/4
5/8	1 5/8	4 3/8	1 3/8	1/4
3/4	1 1/2	4 1/4		1/4
1	1 1/4	4		1/4
1 1/4	1	3 3/4		1/4
1 1/2	3/4	3 1/2		1/4
1 3/4	1/2	3 1/4		1/4
2	1/4	3		1/4

* DIMENSIONS IN THE TABLE DO NOT ACCOUNT FOR PLATE THICKNESS VARIANCES WHICH DO HAVE TO BE CONSIDERED



(*) Tie the two plates together on the bottom side to suit the installation
(**) Platform seam must be "in line" with the seam to be welded.
(***) Set [illegible] up on pad shims when clamping electrode position.

STARTING AND GAGING PLATFORM

OPERATION - WELD TESTING

A. Set the tractor into the joint or test plate that is to be welded. Engage the tractor clutch.

B. Turn both the AC-1200 power sources on and set the toggle switch to the 'remote control' position on each power source.

C. At the tractor - all control knob settings are a preset condition and may have to be changed slightly to meet actual procedural values required.

1.) Travel control

a.) See procedure sheet for proper travel speed and set the travel speed knob accordingly.

b.) Set the direction of travel switch to the forward position.

2.) Modified series arc control box (lower control box)

	Sq. Edge 5/16 Plate & Under	Sq. Edge 3/8 Plate Thru 5/8	For Beveled Plate 3/8 & Over
a.) Set Wire Feed Speed control to:	8 (50"/min.)	5 (75"/min.)*	7 (45"/min.)
b.) Set Voltage Control to:	6 (35 volts)	3 (36 volts)	5 (32 volts)

c.) Set travel switch to "off" position. This switch is used to control tractor travel. Partially open the door of the control box and set the knobs to the numbers shown in the sketch.

	Beveled	Sq. Edge
Open Circuit Voltage	(8)	(8)
Inch Speed set for 8 to 10"/min. on speed meter	(3)	(2)
Contactor & Electrode Backup Time Delay	(6)	(6)

Beveled	Sq. Edge	START BOARD
(3)	(6)	Start Current
(7.5)	(5)	Start Voltage
(.75)	(1)	Time in Seconds
		CRATER CONTROL
(6)	(4)	Crater Current
(9)	(8)	Crater Voltage
(.5)	(1.5)	Time in Seconds

d.) Close and secure the door.

* Shift wire feed speed meter switch to the high range.

3.) Trail arc control box (upper control box)

	Sq. Edge 5/16 thru 5/8 Plate	For Beveled Plate 3/8 & Over
a.) Set Wire Feed Speed control to:	4 (35"/min.)	4.5 (35"/min.)
b.) Set Voltage Control to:	8 (41 volts)	6 (32 volts)

c.) Travel switch (position of this switch has no effect on travel)

Partlally open the door of the control box. (It may be necessary to move the electrode leads slightly in order to get into the box.) Set the knobs to the number shown in the sketch.

	Beveled	Sq. Edge
Open Circuit Voltage	(7)	(7)
Inch speed set for 8 to 10"/min. on Speed Meter	(3)	(3)
Contactor and Electrode Backup Time Delay	(5)	(5)

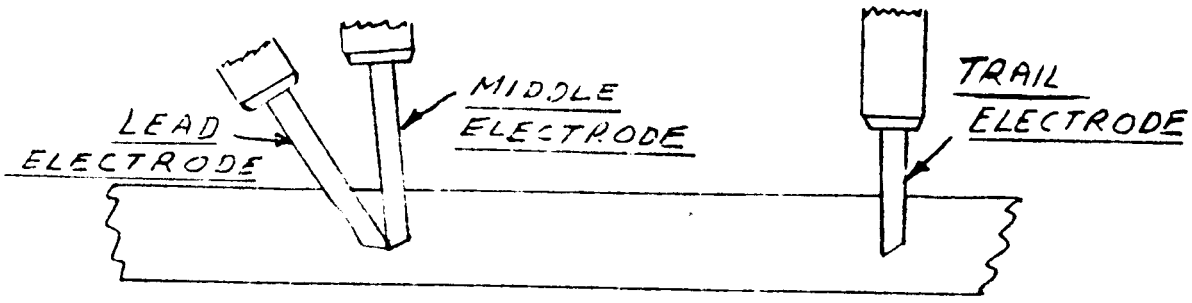
Beveled	Sq. Edge	START CONTROL
(4.5)	(4)	Start Current
(9)	(9)	Start Voltage
(.75)	(1)	Time In Seconds
		CRATER CONTROL
(5)	(5)	Crater Current
(8)	(8)	Crater Voltage
(1)	(2)	Time In Seconds

d.) Close and secure the door.

e.) Return electrode sheaths to proper position if they were moved in Step (c.).

D. Electrode preparation for arc starting (two conditions)

1. Condition (A) Starting in a prepared groove.



Cut all electrodes to a sharp point.

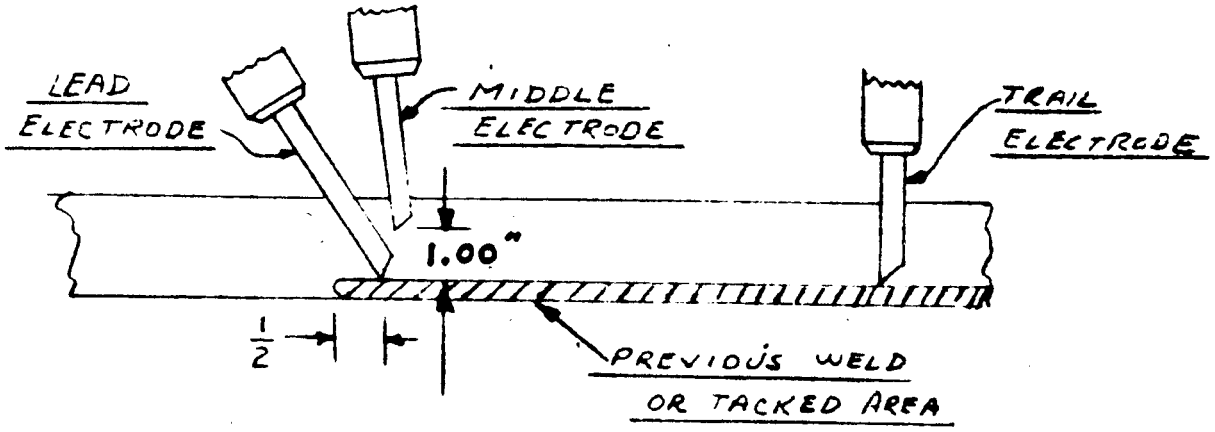
Inch the lead and middle arc electrodes down until they touch each other.

Inch the trail arc wire down until it is approximately 3/4 inch above the bottom of the plate.

With the above condition existing, switch the lower control box travel switch to the "Automatic Travel" position. Open the flux hopper valves allowing the flux to cover the arc zone. Press the 'start' button on the lower control box. When the tractor has traveled far enough so that the trail electrode is over the spot where the lead arc started, the start button of the trail arc (upper control) can be depressed.

2. Condition (B) Starting on a tack or restarting in a joint that has been partially welded.

Position the tractor so that the lead arc electrode is in the position shown in the figure:



The middle arc electrode should be cut shorter than the lead arc electrode by approximately 1.00 inch. All electrodes should be cut to a sharp point.

With the above conditions existing, switch lower control travel switch to "Automatic Travel" position. Open the flux hopper valves allowing the flux to cover the arc zone. Press start button on both controls.

E. After both arcs have started, observe the meter readings, make any minor adjustments in the control settings to meet the procedural requirements. During the welding cycle, the wire feed speeds and the rate of travel speed may be checked periodically with the aid of a Lincoln K-283 digital speed indicator. Wire feed rates should be checked at the top of the wire straighteners, and the travel speed can be checked by monitoring the O.D. of the rear tractor drive wheel.

At the end of the weld, the lower control box travel switch has to remain in the "Automatic Travel" position. Shut the lead arc off first, allow the tractor to travel approximately 5" and then shut the trail arc (upper control box) off. If a run off tab is used, then both arcs and travel can be shut off at the same time.

During the welding operation, the input cables should be moved along with the tractor so that the unit is not pulling more than 10 to 15 foot of the cable assemblies. The control cable bundle (two cables) should be kept away from the electrode bundle (six cables) by at least 2 feet. This will prevent stray pickup and erroneous meter readings.

MAINTENANCE INSTRUCTIONS

A. Wire Feed Motors and Gearboxes

Once a year, recoat all the gear teeth with a non-fluid moly grease, such as a "Non Fluid Oil Corp." lubricant A29 Special/MS. Check the motor brushes every six months. Replace the brushes if they are less than 1/4" long. For high usage applications, check the motor brushes more often.

B. Wire Drive Rolls

Check the sharpness of the driving teeth on the drive rolls periodically. When the rolls no longer put indentations into the wire surface, it is time to reverse them. Each drive rol has two driving surfaces so that maximum life can be obtaineq from each roll. After both sets of teeth are worn then replace the set. The wire guide tubes should be periodically inspected for signs of milling in which case they should be rotated or replaced.

C. Control Boxes

Every three months, inspect and blow out the control boxes with "dry" low pressure air. No other maintenance is required.

D. Wire Straightener

The top slide bushing and the incoming guide should be inspected periodically for signs of milling. The slide bushing can be reversed. Remove the cross adjustment screw, flip the slide bushing over and reassemble the adjustment screw. Add a drop of machine oil to each of the adjustment screw threads.

E. Vertical Head Lift

Periodically add several drops of SAE 90 grade oil into the oil cup which is on the back side of the vertical adjuster.

F. Wire Reel Mounting

To prolong the life of the wire reel shafts, periodically coat them with a thin layer of grease.

G. Travel Drive Gears

Periodically blow the gear surfaces clean, relube the intermediate gear shaft, and all gear surface with a dry lubricant such as a moly disulfide powder (Lincoln E-1281).

H. Travel Motor - Gear Box

Check the brushes periodically and replace them when 3/16 of an inch or shorter.

The gear box gear teeth should be recoated with a non-fluid moly grease, such as a "Non-Fluid Oil Corp.", lubricant A29 Special/MS after each 2,000 hours of operation.

I. Contact Nozzle

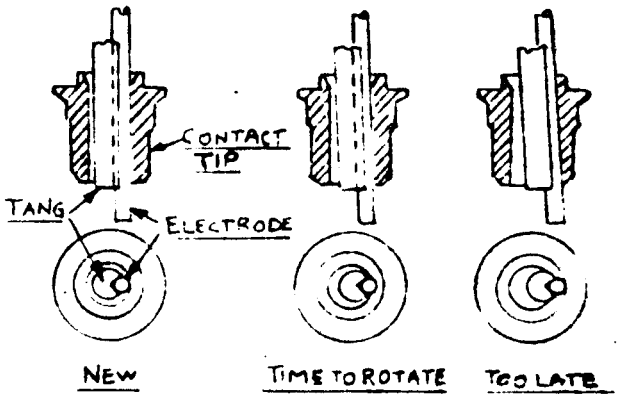
The life of the contact nozzle tips depends largely on the size, surface condition of the wire and the welding current. The wire straightener should be set so the electrode is completely straight. Rusty or dirty wire is especially bad for contact wear.

The same contact tip is used for 3/32" through 3/16" diameter electrodes.

Feed the electrode into the nozzle. When the electrode enters the contact tip it is automatically held against the contact tip with a preset pressure to assure a good electrical contact.

Because the electrode is held against one point of the contact tip, it wears a groove at that point. When the groove is about one half the diameter of the electrode rotate the contact tip to a new position per the instructions below. Careful positioning of the contact tip will provide four to six wear spots depending upon the electrode size.

If the groove is allowed to wear until the tang touches the ID of the contact tip, welding current passes through the tang. This causes electrical wear and overheating of the tang and contact tip.



To rotate the tip, clip the end of the electrode and inch it up until it is free of the contact tip. Loosen the locking nut about

one-half turn and pull the nozzle body to relieve the pressure of the tang against the inside of the contact tip hole. At this moment rotate the tip the proper amount and then retighten the locking nut.

To install a new contact tip proceed as follows:

1. Clip the end of the electrode and push it up until it is free of the tip.

2. Remove the contact tip locking nut.

3. Relieve the spring pressure of the contact tip against the steel tang in the hole of the contact tip. To do this, push the nozzle body so the steel tang is approximately centered in the 3/8" hole in the contact tip. Under these conditions the contact tip can be easily removed from the nozzle body.

4. (a) Before installing the new tip, make sure the threads and the bottom surface of the nozzle are clean and bright. These surfaces are current carrying areas and must be clean.

   (b) Push the nozzle body to one side and insert the new contact tip.

5. (a) Check the locking ring threads making sure they are free of any foreign material. A small application of high temperature anti-sieze compound on these threads insure a longer thread life of the two mating parts. Suggested anti-sieze compounds are Graphite grease, "Go-go No-Lok" made by Gojer Corporation, Akron, Ohio, and "Anti-Sieze and Lub. Compound" made by Never Seez Compound Corporation, 2910 S. 18th Ave., Broadview, Illinois.

   (b) Replace the locking ring and tighten securely.

6. Check the contact tip to be certain it is tight in the nozzle body. If the tip is not tight, arcing will take place between the tip contact surface and the nozzle contact surface which will damage the nozzle body.

Wire Feed Speed Meter Calibration

Whenever a replacement of a control unit, wire feed motor, or a wire feed speed meter must be done, it will be necessary to re-trim the wire feed speed meter so that the meter is reading accurately. After the replacement of the component has been made, turn on the power source and the "Power On" switch of the NA-4 control. Allow at least 20 minutes for the wire feed motor to warm up before proceeding. The "Modified Series Arc Control" should be trimmed with both the lead arc wire feed motor and the middle arc wire feed motor plugged into the control unit. At the lead and the middle arc wire feeder, block open or reduce the idle roll pressure so that no wire will feed when the inch down button is depressed. Mark a line on the face of the drive roll so that the RPM can be counted. Set the "HI-Lo" switch, which is just under the speed meter, to the "Lo" position. Open the control box door, press the inch down button, and set the "Inch Speed Control" so that the wire drive output shaft is rotating exactly 6 RPM. Leave the "Inch Speed Control" at this setting. Press the inch down button and set the "Lo" trimmer which is on the back side of the wire feed speed meter so that the meter reads 30 inches per minute on the low scale of the meter. Set the "Hi-Lo" switch to the "Hi" position, press the inch button and set the "Hi" trimmer so that the meter reads 30 on the upper scale of the meter.

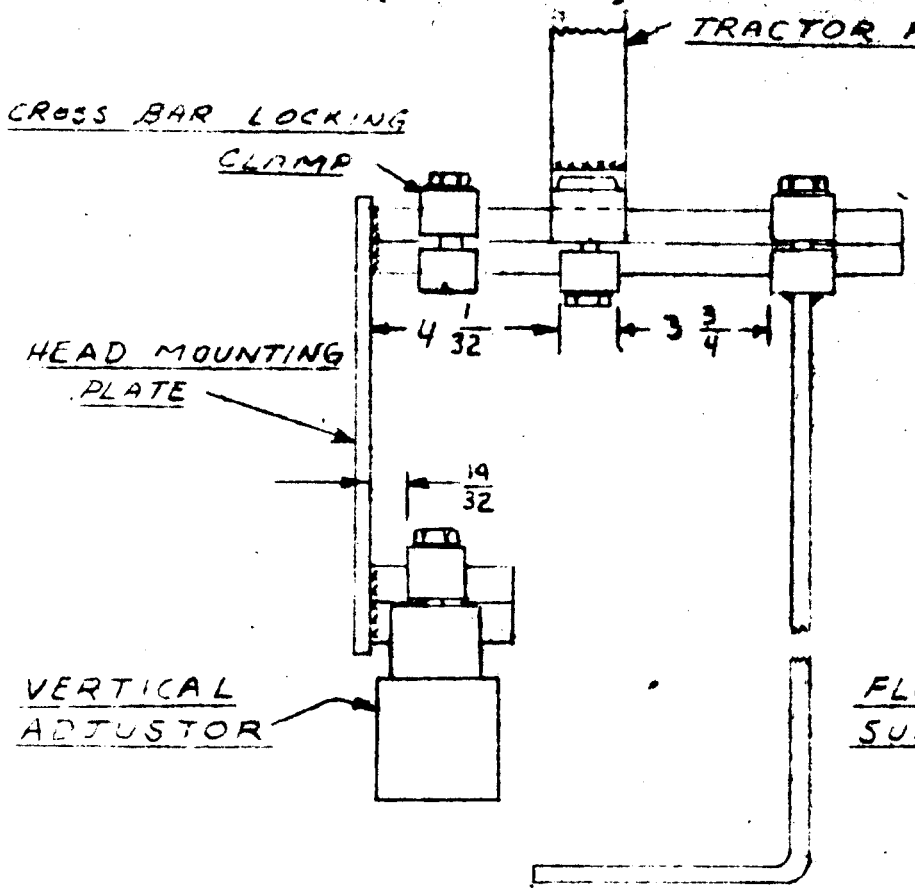
To Calibrate the "Trail Arc System"

Block open or reduce the idle roll pressure so that no wire will feed when the inch down button is depressed. Mark a line on the face of the drive roll so that the RPM can be counted. Set the "Hi-Lo" switch, which is just under the speed meter, to the "Lo" position. Open the control box door, press the inch down button, and set the "Inch Speed Control" so that the wire drive output shaft is rotating exactly 10 RPM. Leave the "Inch Speed Control" at this setting. Press the inch down button and set the "Lo" trimmer which is in the back of the meter so that the meter reads 50 inches per minute on the low scale of the meter. Set the "Hi-Lo" switch into the "Hi" position, press the inch button, and set the "Hi" trimmer on back of the meter so that the meter reads 50 inches per minute on the high scale of the meter.

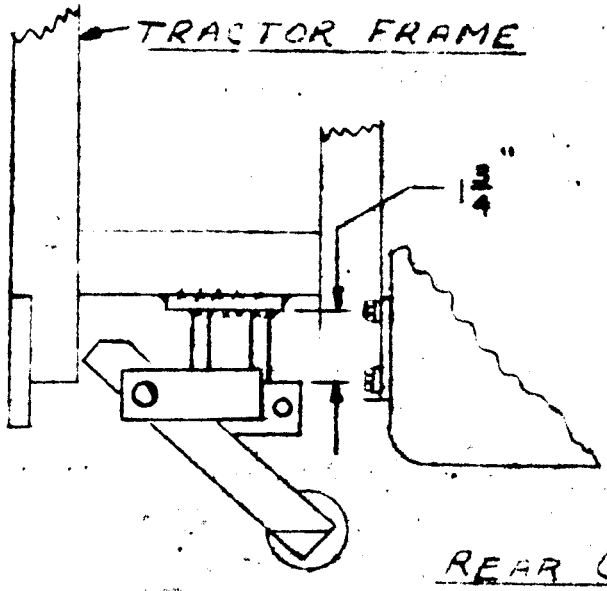
After calibration in either wire feed system, release or apply proper idle pressure to the wire for feeding.

Trimming of the speed meters must be done in this sequence (low speed trimmer first).

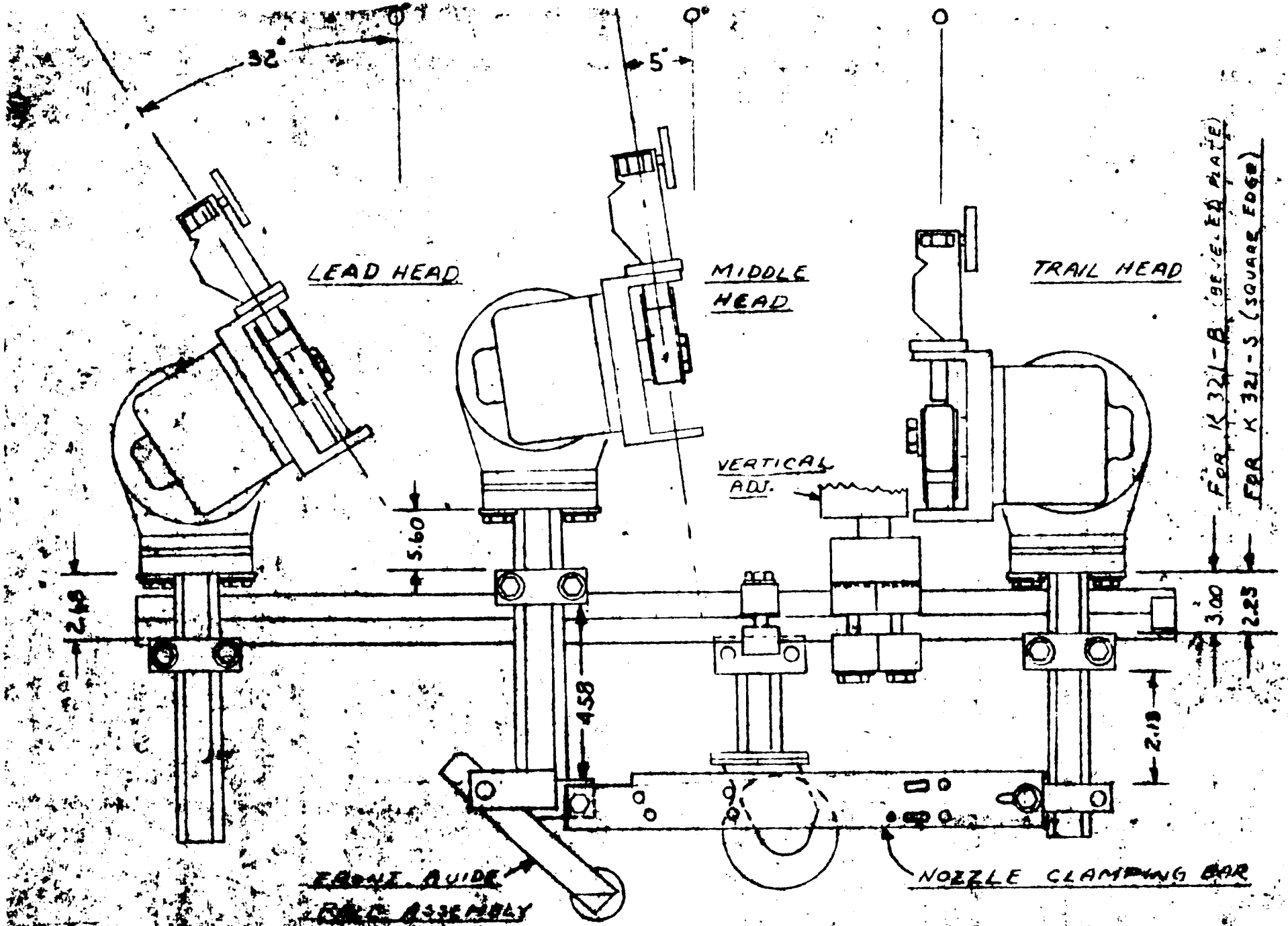
CROSS THE SEAM SETTINGS
(FACTORY SET)



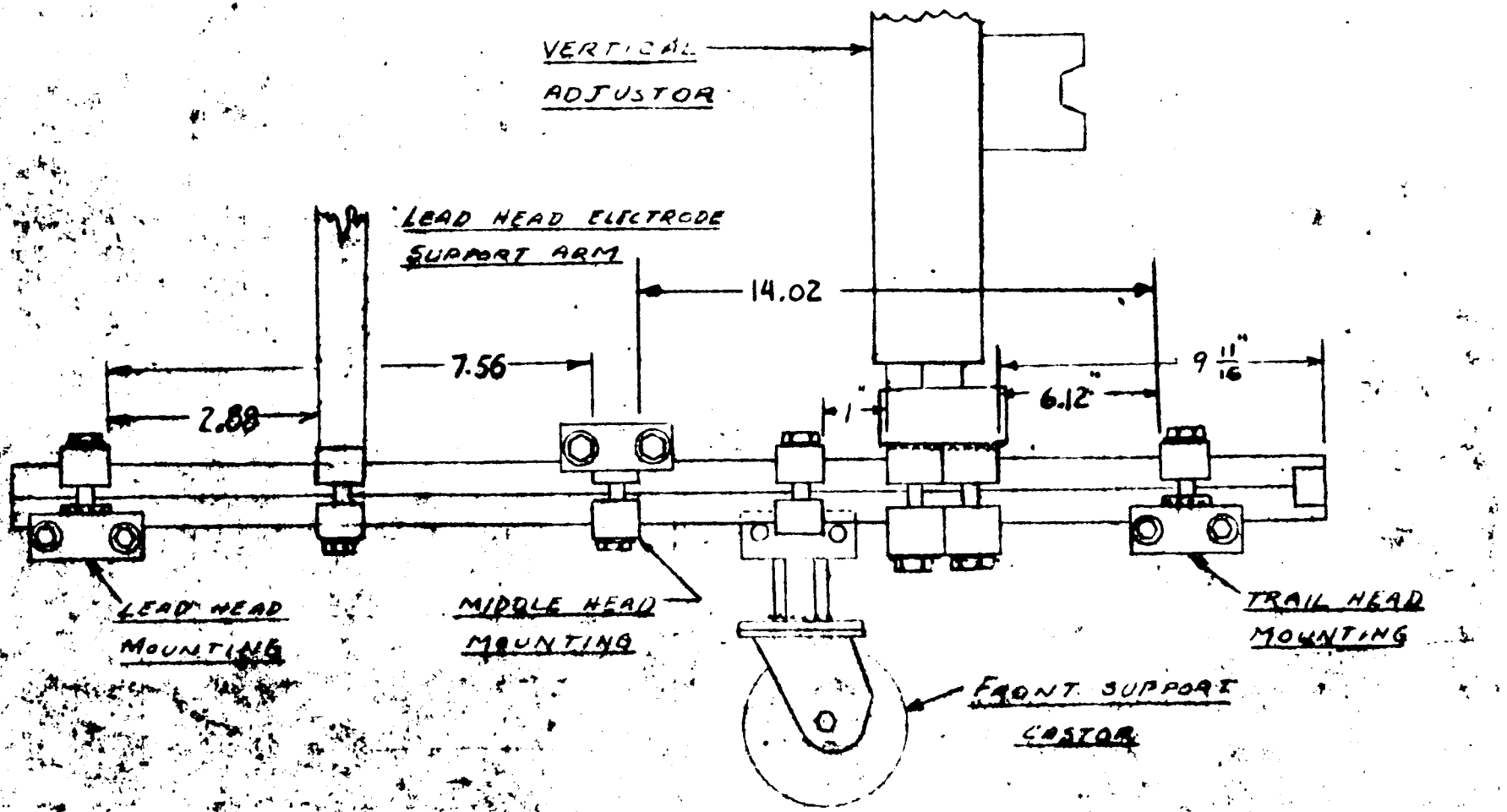
TOP VIEW



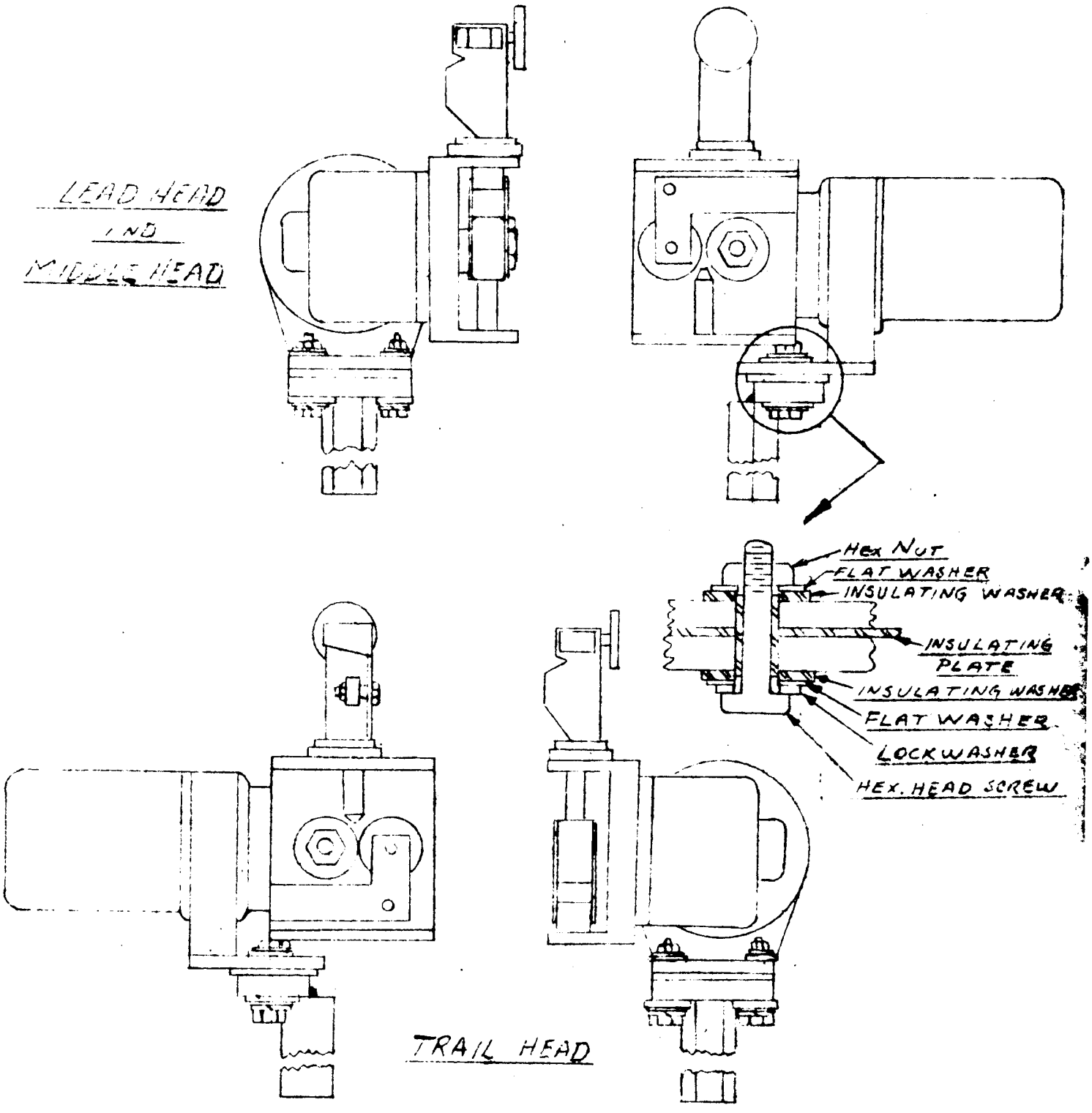
REAR GUIDE WHEEL SETTING



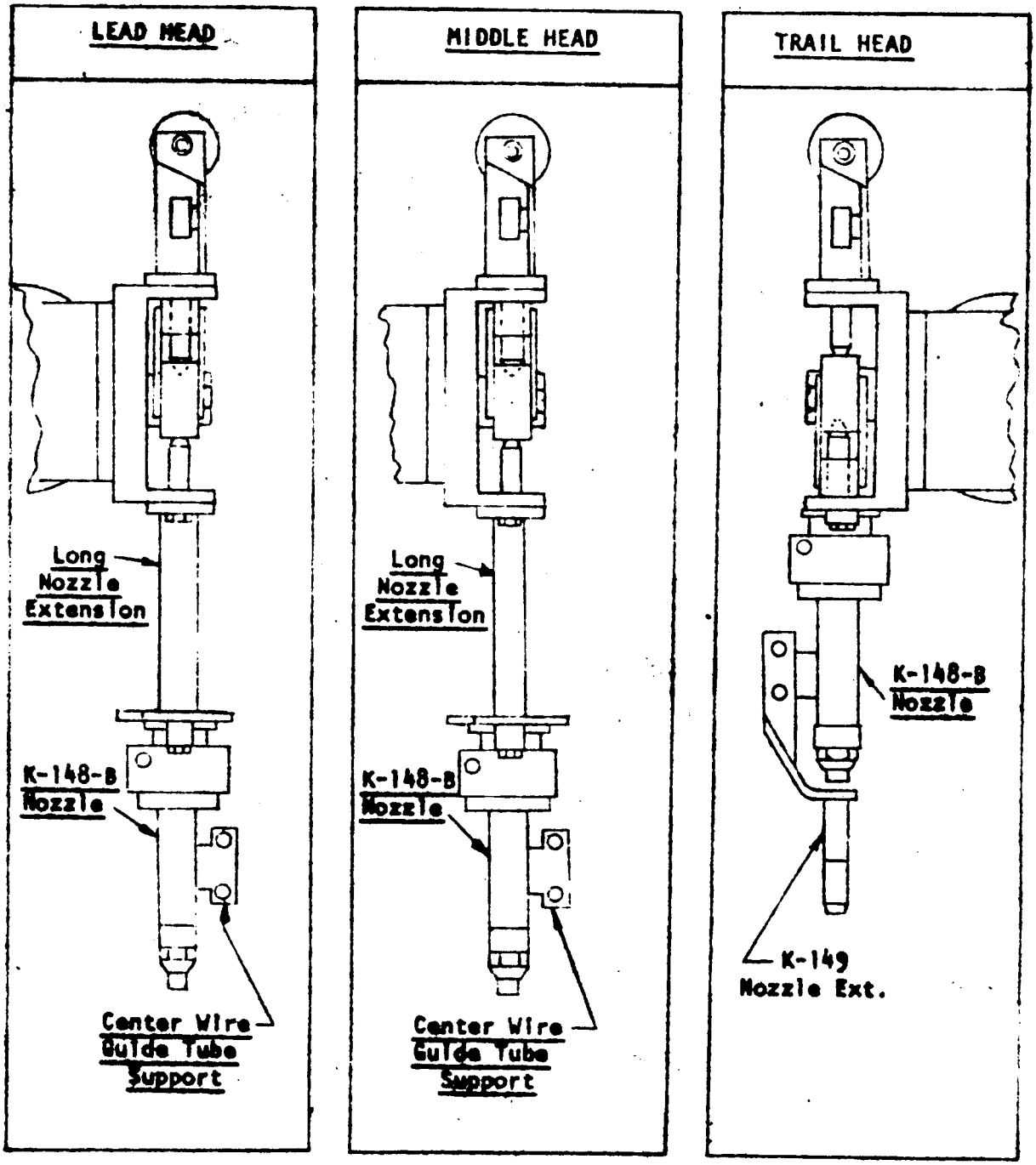
VERTICAL SETTINGS



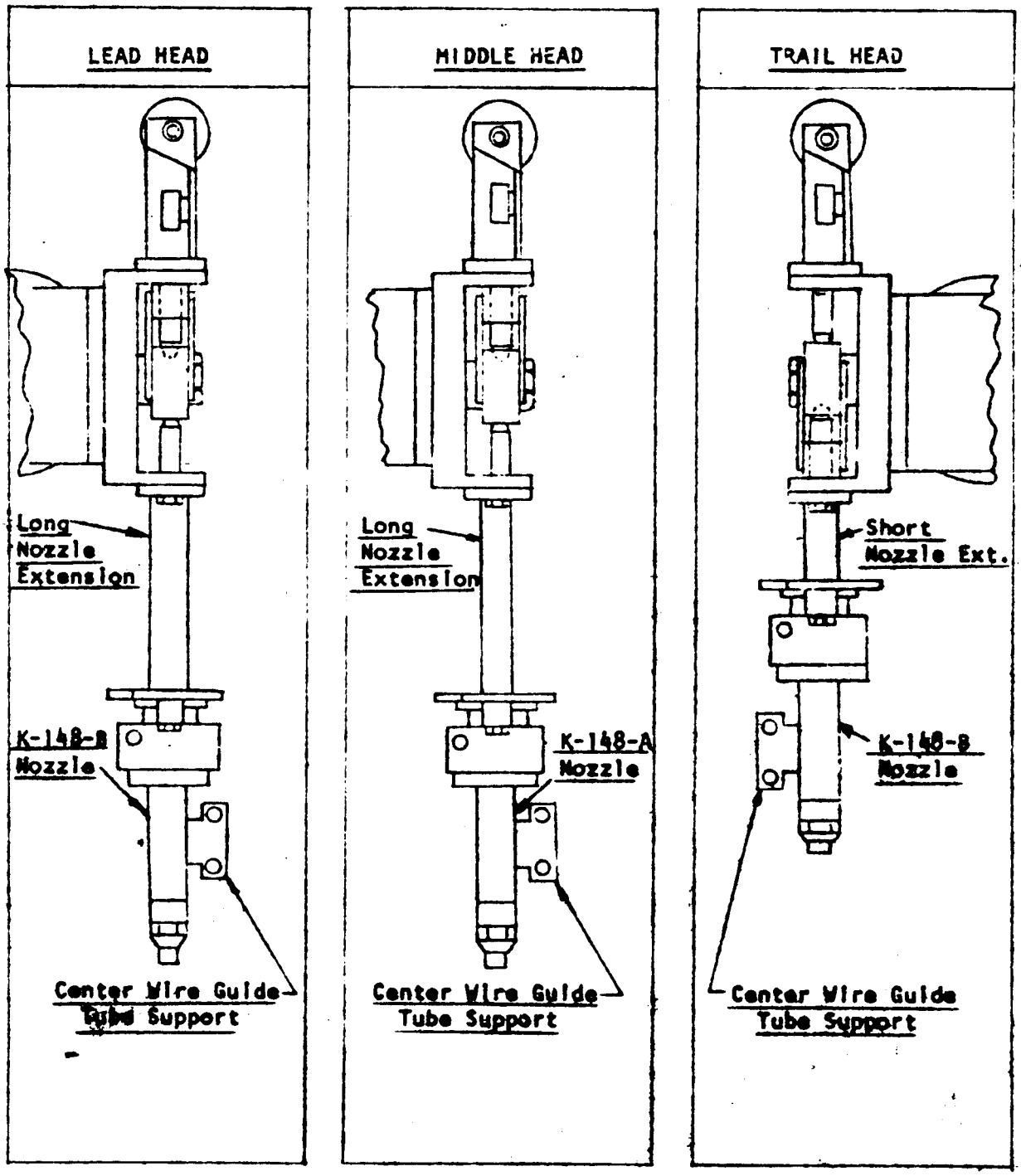
K-321 B & K 321 S
HORIZONTAL SETTINGS
(FACTORY SET)



WIRE FEEDER MOUNTINGS



NOZZLE MOUNTING FOR
BEVELED PLATES 3/8 AND OVER



Nozzle Mounting For
Square Edge Plates 3/4 and Under

HOW TO ORDER REPLACEMENT PARTS

Order parts only from Lincoln offices or from the Authorized Field Service Shops listed in the "Service Directory". Give the following information:

(a) From the nameplate — machine model, code and serial numbers.
(b) From this manual — complete part name and description, item number, quantity required and the number of the list used to get this information.

Any items indented in the "Parts Name" column are included in the assembly under which they are listed. The indented items may be ordered separately. If the entire assembly is needed, do ***not*** order the indented parts.

GUARANTEE

The Lincoln Electric Company, the Seller, warrants all new equipment except engines and accessories thereof against defects in workmanship and material for a period of one year from date of shipment, provided the equipment has been properly cared for, and operated under normal conditions. Engines and engine accessories are warranted free from defects for a period of ninety days from the date of shipment.

If the Buyer gives the Seller written notice of any defects in equipment or electrode or flux within any period of warranty and the Seller's inspection confirms the existence of such defects, then the Seller shall correct the defect or defects at its option, either by repair or replacement F.O.B. its own factory or other place as designated by the Seller. The remedy provided Buyer herein for breach of Seller's warranty shall be exclusive.

No expense, liability or responsibility will be assumed by the Seller for repairs made outside of the Seller's factory without written authority from the Seller.

The Seller shall not be liable for any consequential damages in case of any failure to meet the conditions of any warranty. The liability of the Seller arising out of the supplying of said equipment or electrode or its use by the Buyer, whether on warranties or otherwise, shall not in any case exceed the cost of correcting defects in the equipment or replacing defective electrode in accordance with the above guarantee. Upon the expiration of any period of warranty, all such liability shall terminate.

The foregoing guarantees and remedies are exclusive and except as above set forth. There are no guarantees or warranties with respect to engines, accessories, equipment, electrodes, or flux, either express or arising by operation of law or trade usage or otherwise implied, including without limitation the warranty of merchantability, all such warranties being waived by the Buyer.

LINCOLN ELECTRIC®

THE LINCOLN ELECTRIC COMPANY

World's Largest Manufacturer of Arc Welding Products • Manufacturer of Industrial Motors
Sales and Service Worldwide — Cleveland, Ohio 44117-1199 U.S.A.
Toronto M4G 2B9 – Canada • Sydney 2211 – Australia • Rouen 76120 – France

Eff. Nov. '82 Ram 5-84 Litho in U.S.A.