

Cost Saving Application Ideas For Cutting And Welding



Bug-O Systems

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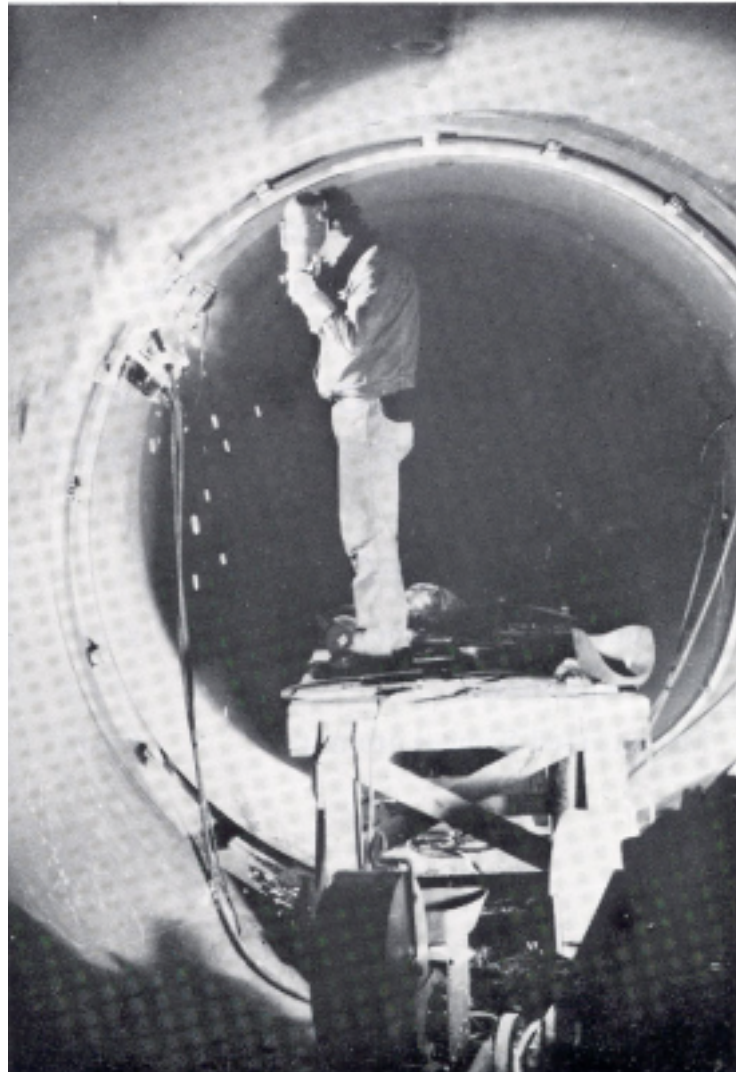
Applications

Economic Analysis of Mechanized Weiding with Flux Cored Wire.

(Manual Stick Electrode Welding Compared To Manual Semi-Automatic Welding And Mechanized Semi-Automatic Welding).

IF YOU FABRICATE METAL, YOU KNOW THAT FABRICATION AND LABOR COSTS CONTINUE TO INCREASE.

- Manufacturing companies must address the problem of increasing costs and the need to remain competitive in the world market.
- Fabrication costs can be reduced by using new technologies and new manufacturing processes.
- These new approaches are the key to remaining competitive in the world market.
- A large West German manufacturer of pressure vessels and large pipe systems has made an analysis of their welding costs which we are pleased to present herewith.
- This report uses the actual figures from the manufacturer. They show that the use of a semi-automatic welding process mechanized with Bug-O Systems equipment produces impressive cost reductions in fabrication. The analysis includes purchasing costs for the semi-automatic equipment and the Bug-O equipment.
- The comparison was made between the following processes:
 1. manual stick electrode welding
 2. manual semi-automatic welding with flux cored wire
 3. mechanized semi-automatic welding with flux cored wire



THE PURCHASE COSTS OF THE EQUIPMENT WERE AS FOLLOWS:

- 1. For Manual Stick Welding;**
A power source, eletrode holder, ground clamp and the necessary cables Price; \$1,694.92
- 2. For Semi-Automatic Welding;**
A power source, wire feeder and smoke exhaust system with the necessary cables to connect the equipment. Price; \$6,779.66
- 3. For Mechanized Semi-Automatic Welding;**
Same equipment used in item 2 plus a ROL-O Weaving Kit. Price; \$11,864.40

PURCHASE COSTS OF CONSUMABLES:

Stick Electrode	\$1.00/pound
Flux Cored Wire	\$2.00/pound

WELDING CAPACITY BASED ON THE OPERATING FACTORS SHOWN:

Manual Stick Electrode	(25% Operating Factor)	.88 lbs./hr.
Manual Semi-Automatic Welding	(30% Operating Factor)	1.32 lbs./hr.
Mechanized Semi-Automatic Welding	(70% Operating Factor)	3.09 lbs./hr.

ONE THOUSAND HOURS WAS USED AS THE OPERATING BASE PER YEAR FOR EACH OF THE THREE PROCESSES.

LIFE OF THE EQUIPMENT:

Manual Stick Electrode	10 years
Semi-Automatic Welding	5 years
Mechanized Semi-Automatic	5 years



Automatic innershield welding with DCD ROL-O and Speed Weaver of a Penstock - 6 to 12 o'clock position, vertical up, overhead.

The following table shows that even with a cost factor of seven to one for the mechanized semi-automatic versus manual stick welding, and with a consumable costing twice as much, the pay back on the mechanized semi-automatic is less than six months.

This analysis points to the urgent need to change

from manual to fully mechanized processes. Mechanized welding should be a prime consideration in the design phase.

At first, it would appear that the initial investment is high but, in fact, it results in maximum efficiency and savings.

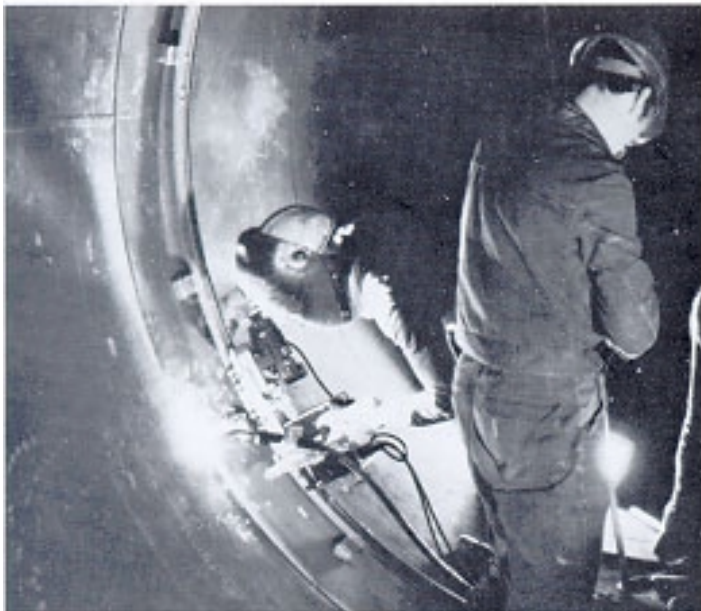
COST ANALYSIS			
Operating Expenses	Manual Stick	Manual Semi-Automatic	Mechanized Semi-Automatic
1. Purchase Price	\$1,694.92	\$6,779.676	\$11,864.41
2. Accessories	-----	1,016.95	1,355.93
3. Total Investment (1+2)	1,694.92	7,796.61	13,220.34
4. Working Life	10 years	5 years	5 years
5. Yearly Operating Hours	1000 hours	1000 hours	1000 hours
6. Labor & Overhead	20.40	20.40	20.40
7. Calculated Depreciation Per Year	169.49	1,559.32	2,644.07
8. Calculated Interest Rates Per Year (Based on 8% interest rate)	67.80/yr.	311.86/yr.	528.81/yr.
9. Yearly Investment Expenses (7+8)	237.29/yr.	1,871.19/yr.	3,172.88/yr.
10. Maintenance	67.80/yr.	423.73/yr.	423.73/yr.
11. Spare Parts	33.90/yr.	423.73/yr.	423.73/yr.
12. Machine Costs Per Hour (9+10+11): (5)	.34/hr.	2.72/hr.	4.02/hr.
13. Operating Time JFor 1433.25 lbs. (650 kg) Deposited Metal	1625 hours	1083 hours	464 hours
14. Manufacturing Costs (6 x 13) + 12 x 13)	33,601.70	24,971.53	11,302.71
15. Costs/Consumables For 1433.25 lbs. (650 kg) Deposited Metal	1,4323.20	2,864.41	2,864.41
16. Total Costs (14 + 15)	35,033.90	27,835.93	14,167.12
17. Total SAVINGS Compared To Manual Stick	-----	\$7,197.97	\$20,866.78
18. SAVINGS In Percent (%)	-----	20.5%	59.5%



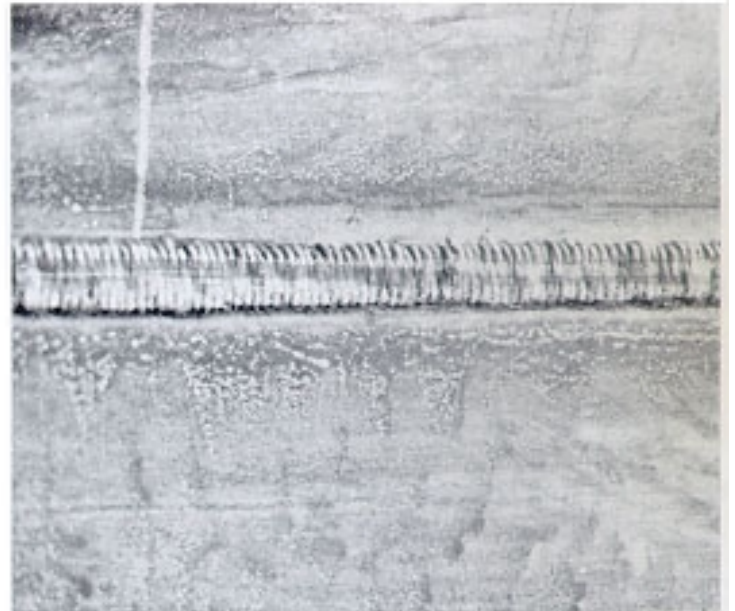
12 o'clock position, overhead.



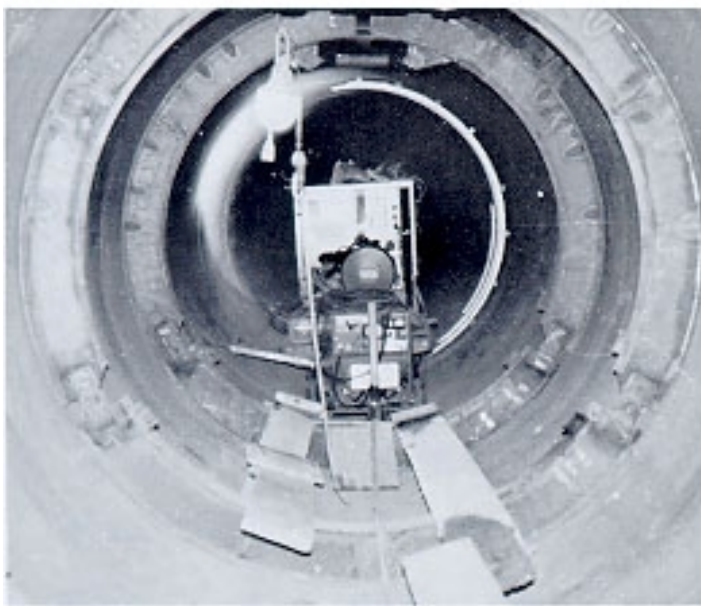
Weld position, vertical up.



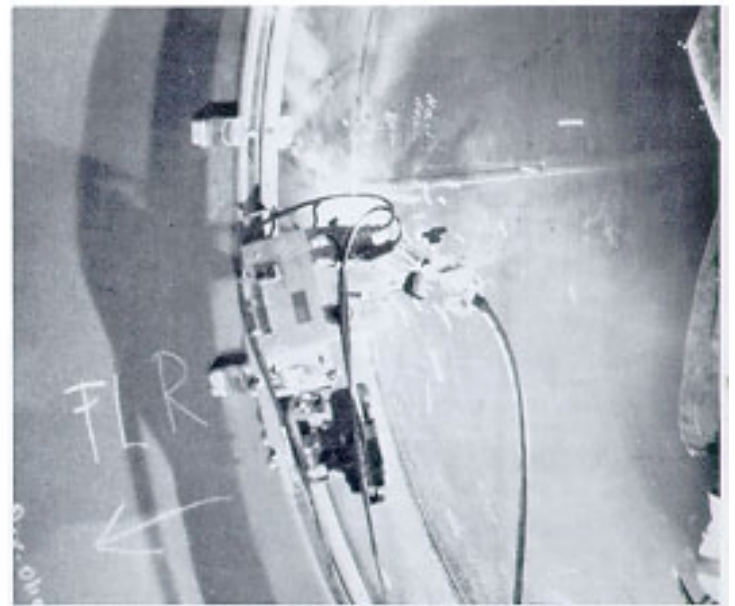
Weld position, vertical up.



Finished weld.



Equipment inside the Penstock.



9 o'clock position, vertical up.



Applications

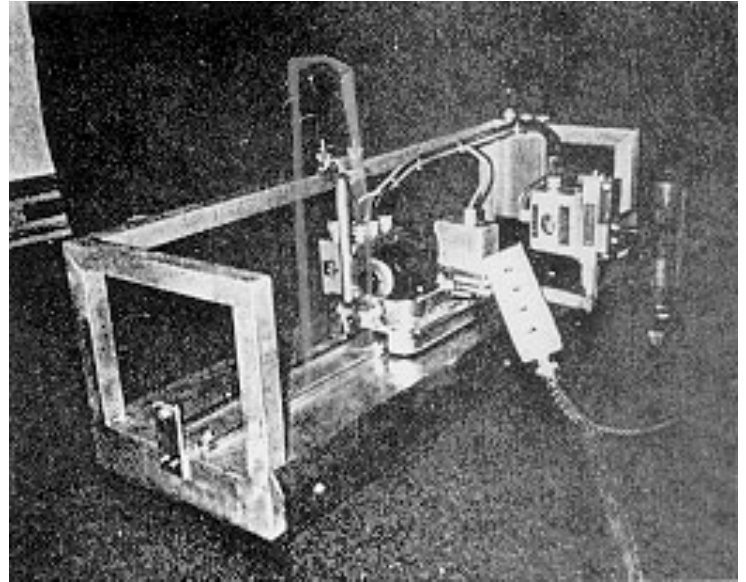
Straightline Cutting

Application: Cutting residue in aluminum reduction pots

Process: Plasma cutting

Equipment: BUG-O Mark III (DC-III), ARR-Rail, (2) Power Racker, Right Angle Rack, Cable Anchor Assembly and Limit Switch Kit.

Savings: Faster cutting, safer working conditions for the operator.

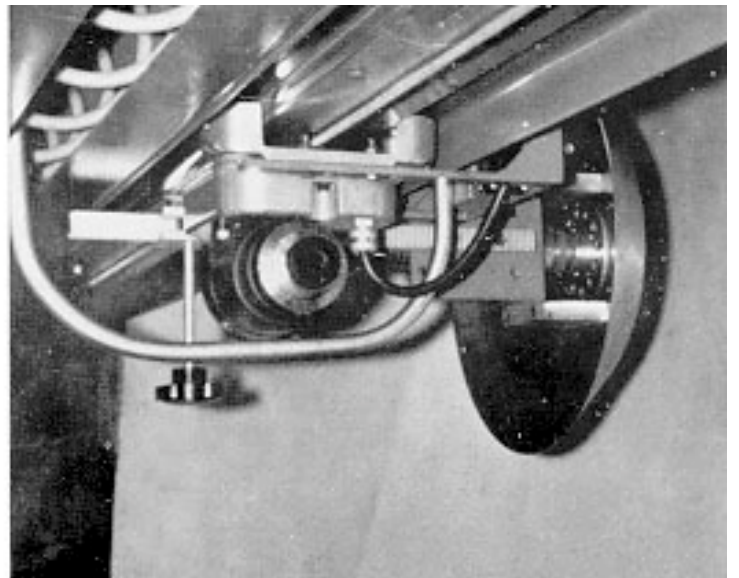
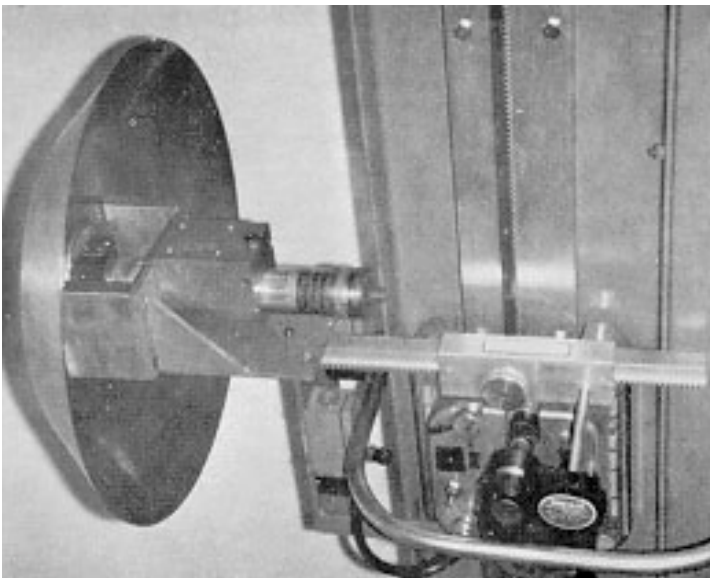


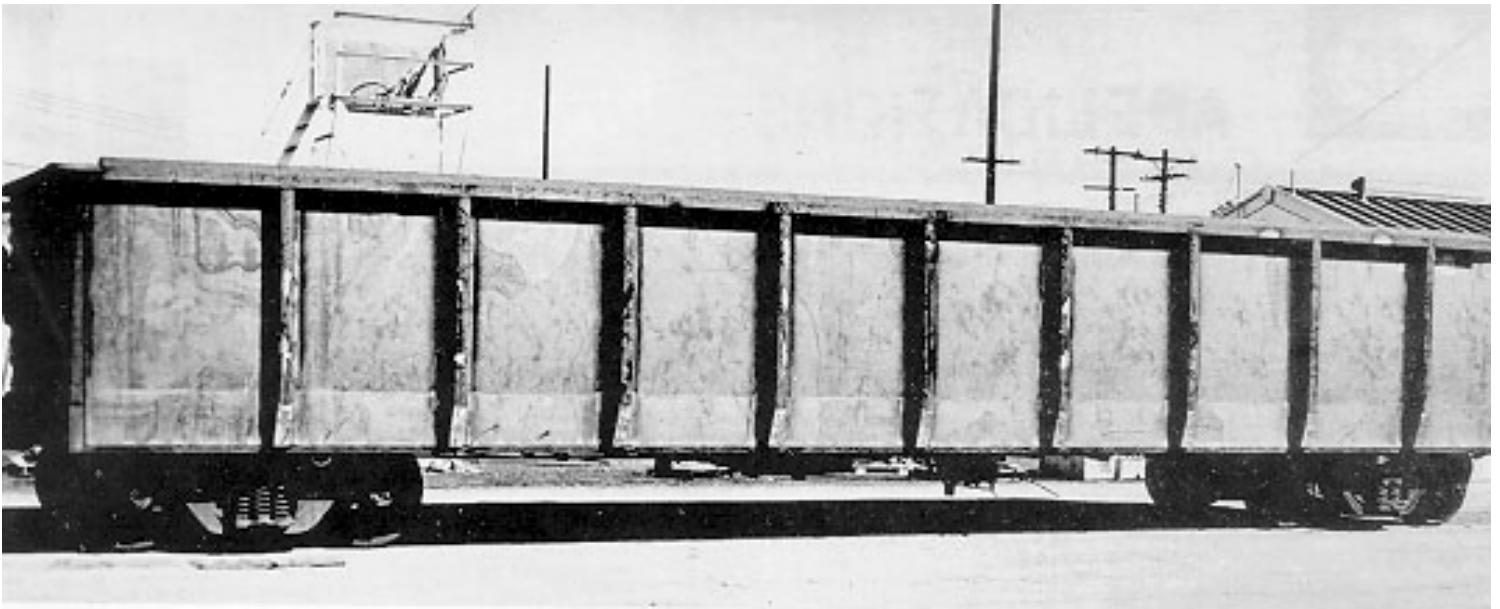
Application: Precision movement of nuclear mass gauge.

Process: Inspection

Equipment: BUG-O Heavy Duty Welding Kit and Limit Switches.

Savings: Low cost, easy to assemble system with minimum maintenance.



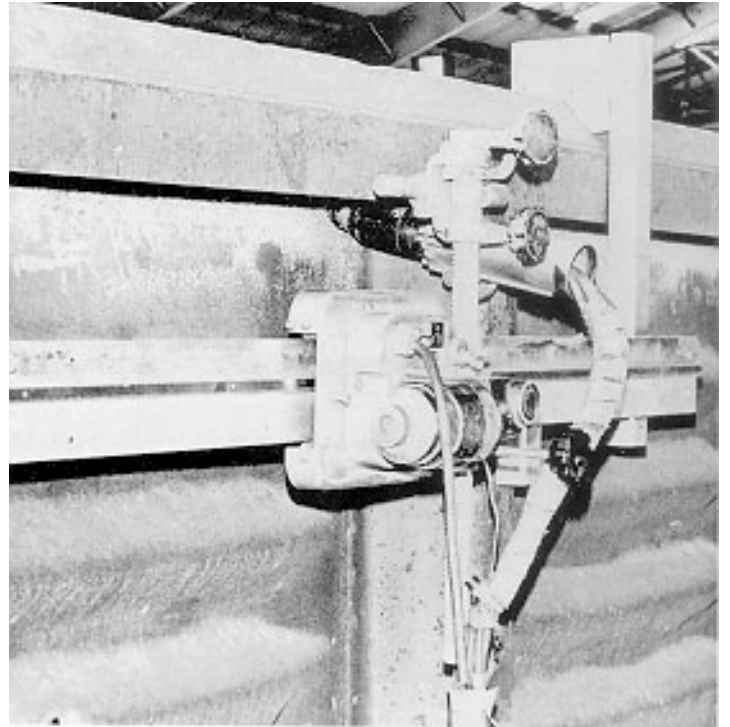


Application: Removing railway car sides and ends.

Process: Plasma cutting.

Equipment: BUG-O Straightline Kit.

Savings: \$1,000.00 per day.



Application: Trimming edges of pressure vessels.

Process: Oxyfuel gas cutting.

Equipment: BUG-O Straightline Kit with Extra Rails and Fixture built by Customer.

Savings: Eliminated grinding, produced straight, accurate cuts.

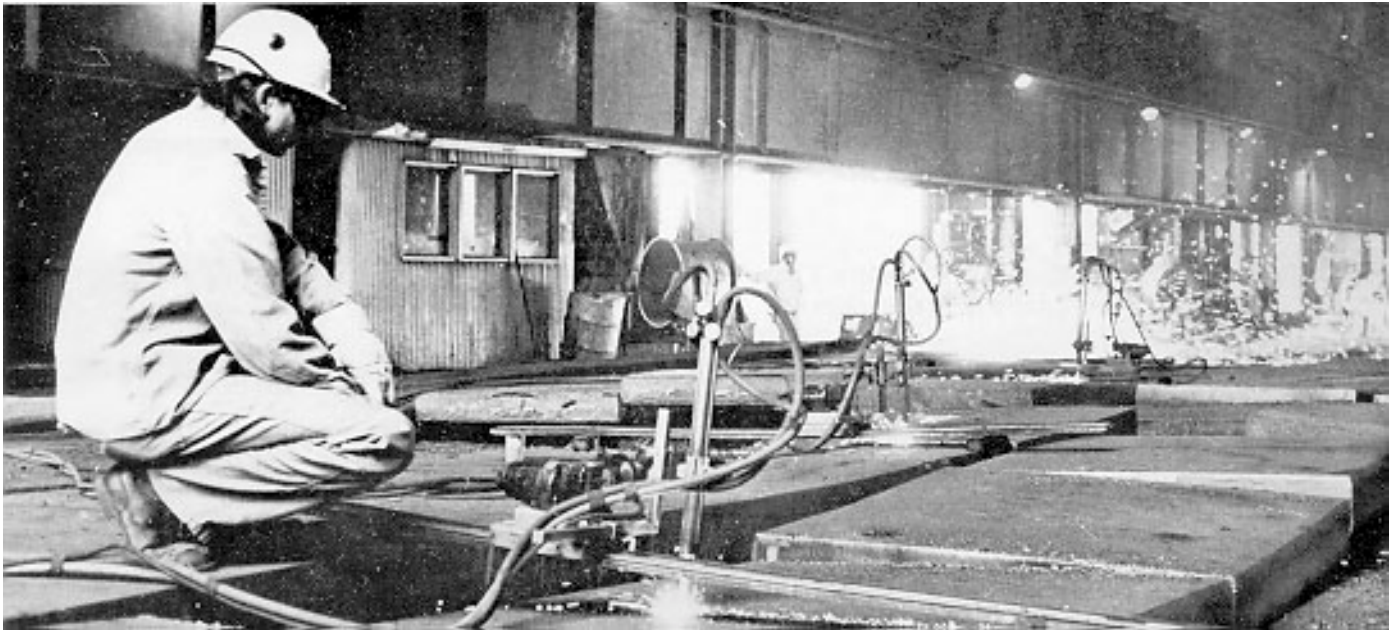
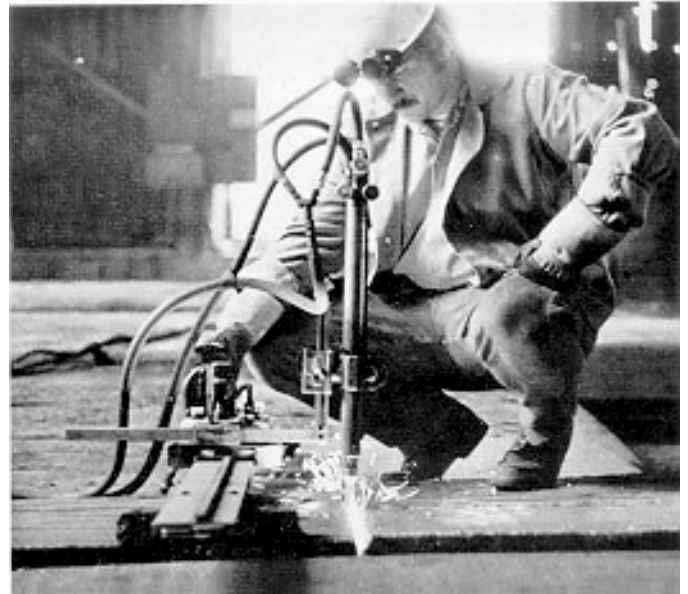


Application: A steel manufacturer's crop shear broke. While being repaired, it was necessary to crop 600 slabs per day to maintain production.

Process: Oxyfuel gas cutting.

Equipment: BUG-O Straightline Kits (38)

Savings: Operating 24 hours/day, 7 days/week with inexperienced operators, the BUG-O equipment kept the mill working on a normal schedule.

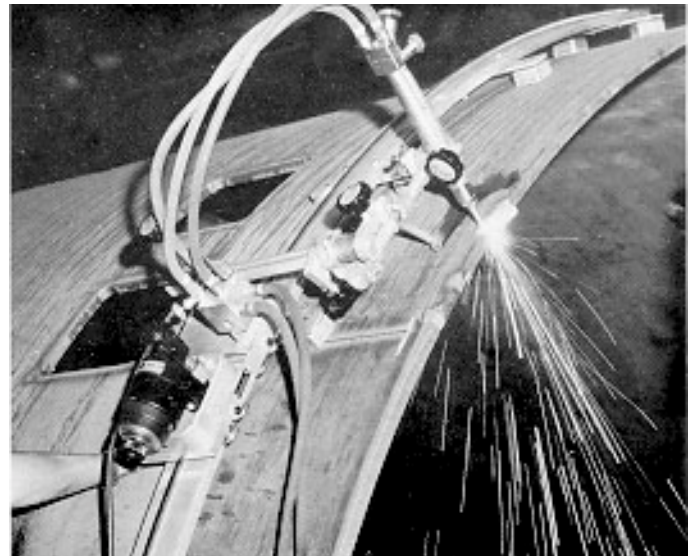


Application: Large turbine generator shells would not fit under conventional machine tools. Portable BUG-O equipment was transported and used.

Process: Oxyfuel gas cutting.

Equipment: ROL-O Carriage, Panograph, Bent Rails and Magnets.

Savings: Precision, portable equipment reduced material handling, repairs and grinding, which reduced welding costs and improved quality.

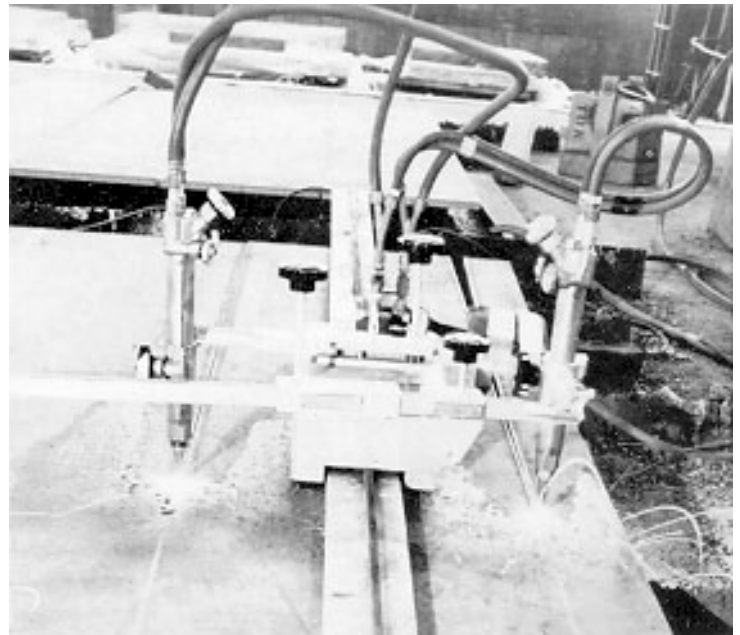


Application: Manufacturing parts for power boilers.

Process: Oxyfuel cutting.

Equipment: GO-FER II Kit

Savings: Burning time reduced 50%.

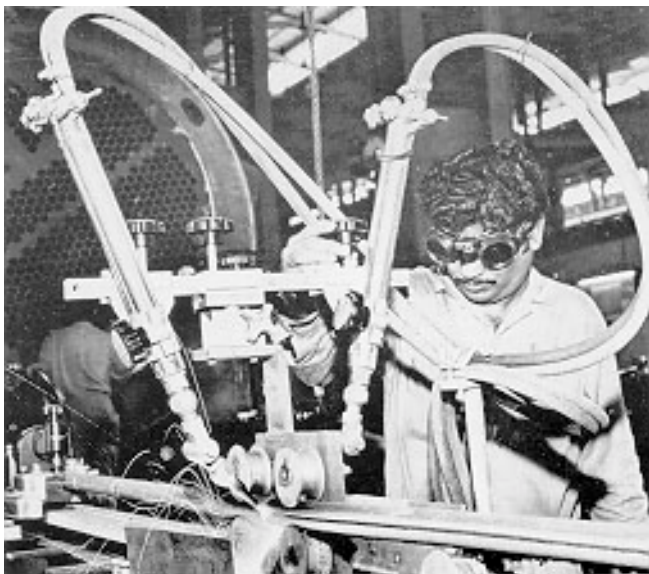
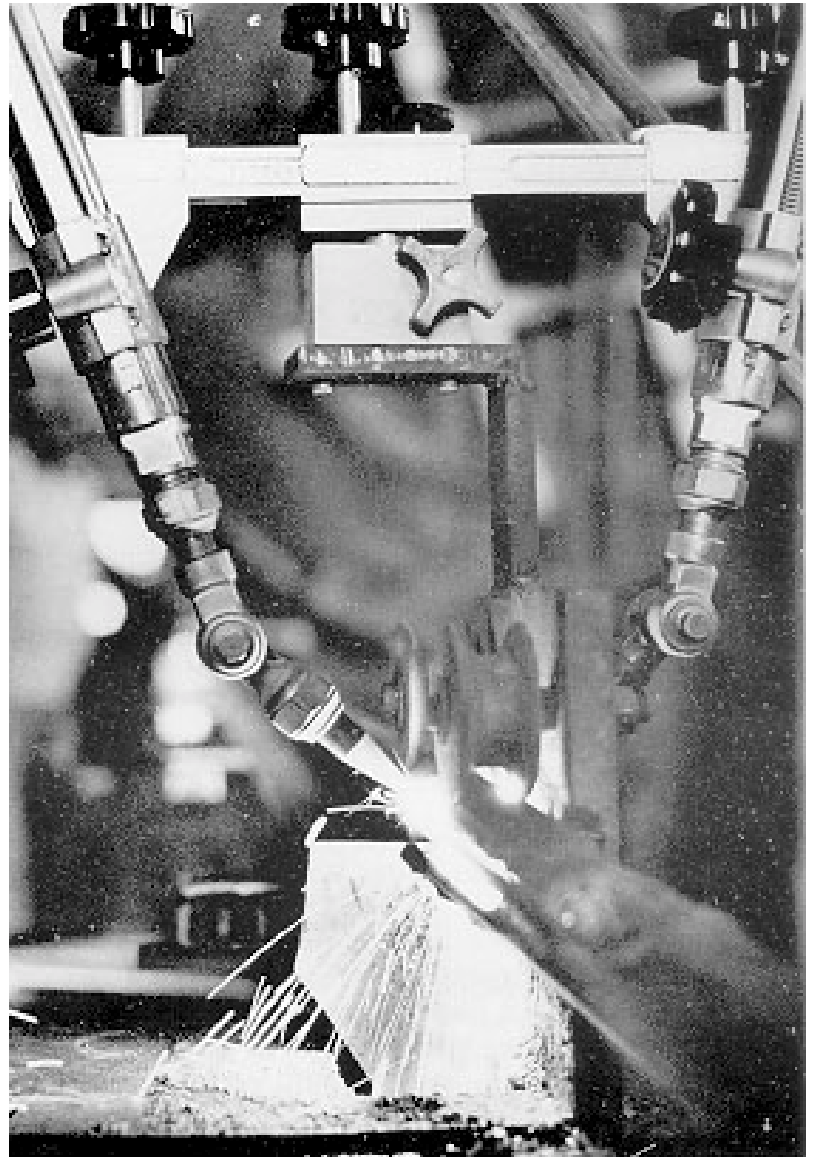


Application: Pipe cutting (moving the pipe past fixed torches).

Process: Oxyacetylene cutting

Equipment: BUG-O DC Straightline Kit, two machine torches with adjustable tip adapters and customer fixturing.

Savings: \$8,068.00 on the job.

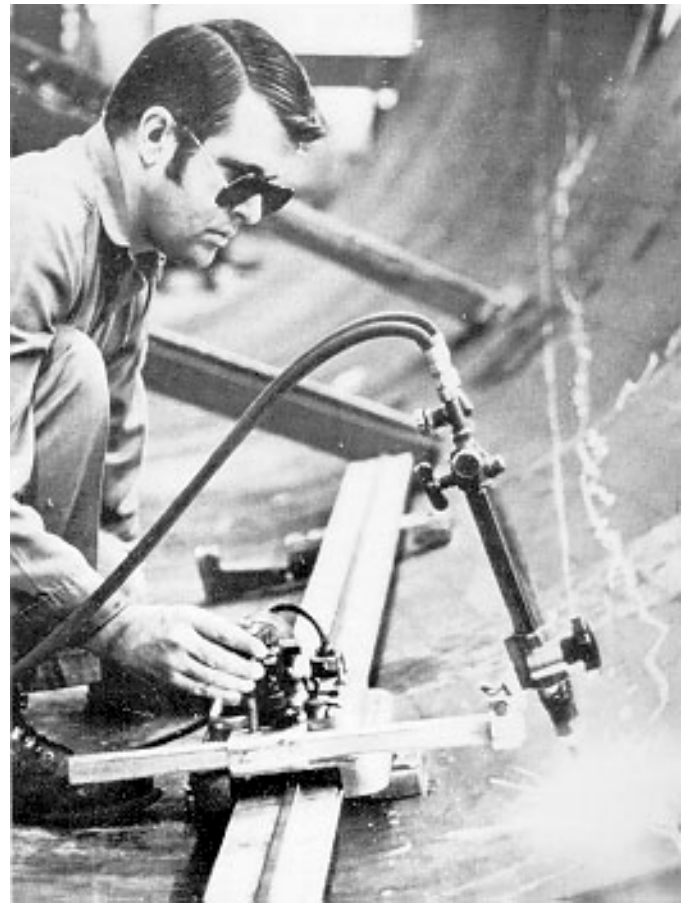


Application: Fabrication of scrap hoppers for steel mills.

Process: Oxyacetylene flame cutting.

Equipment: BUG-O DC Straightline Kit.

Savings: Portable equipment reduced material handling and improved productivity 3 times over hand cutting.

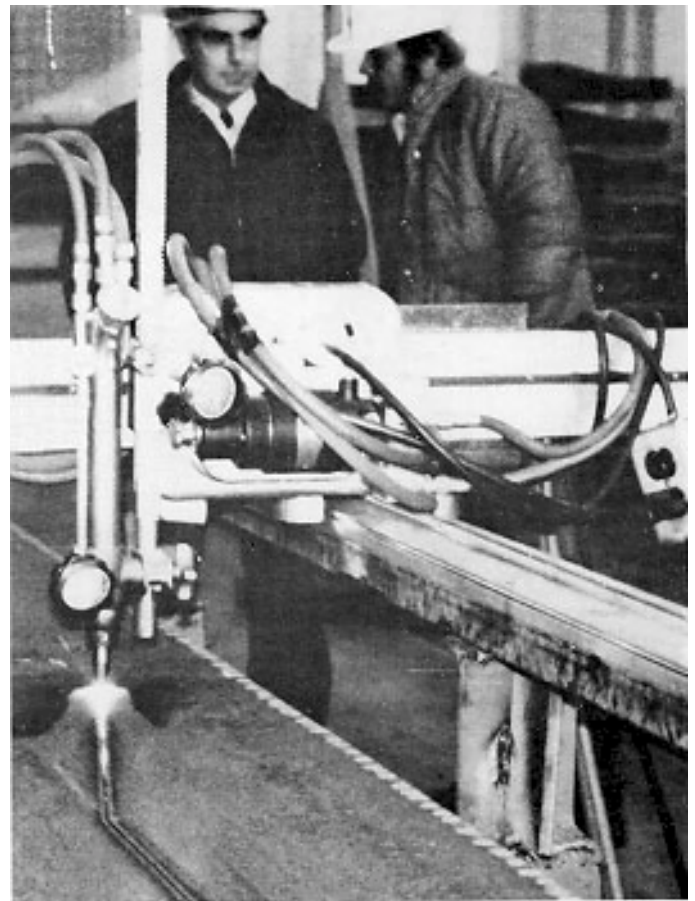
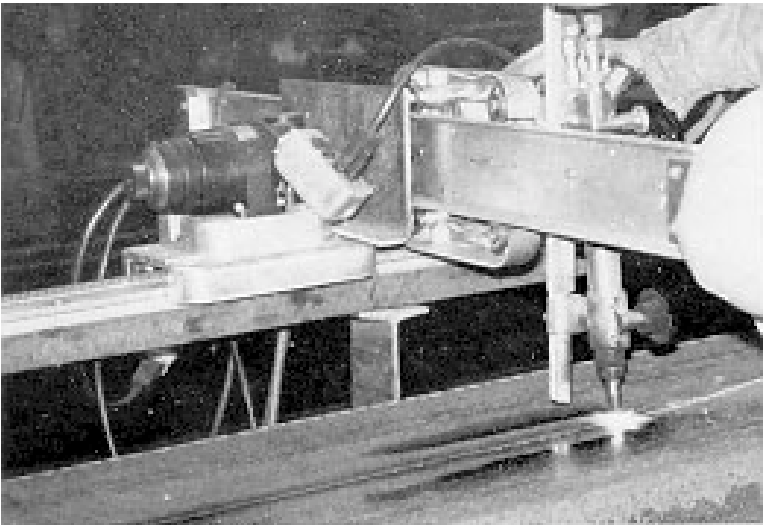


Application: Fabrication of railway car sidesills.

Process: Oxyfuel cutting.

Equipment: BUG-O DC II and DC-III, rails and torch mountings.

Savings: Cutting time reduced 66%, improved quality eliminated grinding.

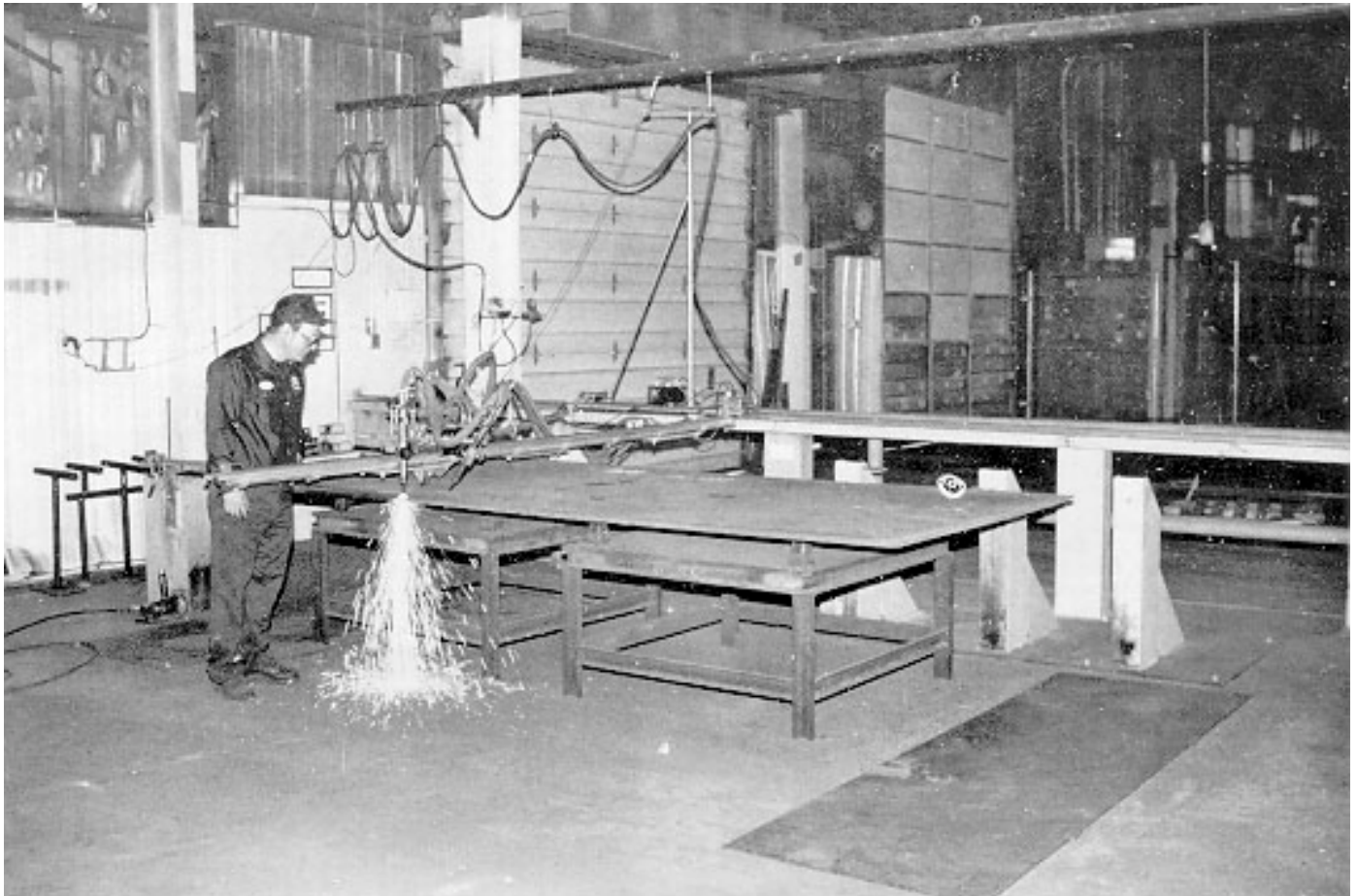
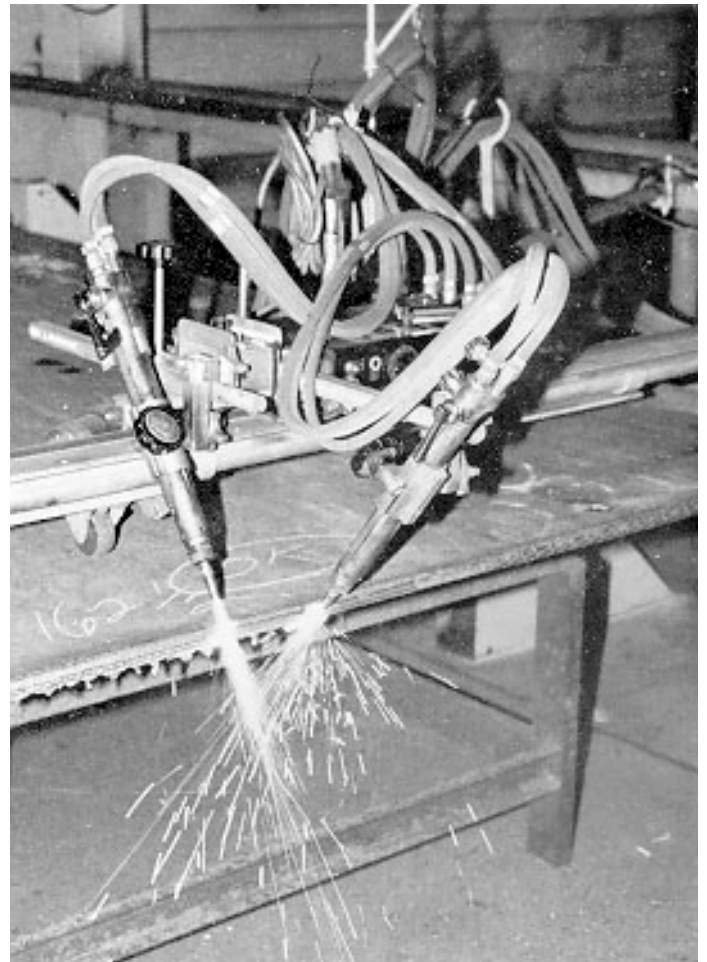


Application: Cutting and beveling large plates.

Process: Oxyfuel cutting.

Equipment: Folding MUG-O with cross drive (BUG-O DC II) and torch mounts.

Savings: \$7,342.00 per year.

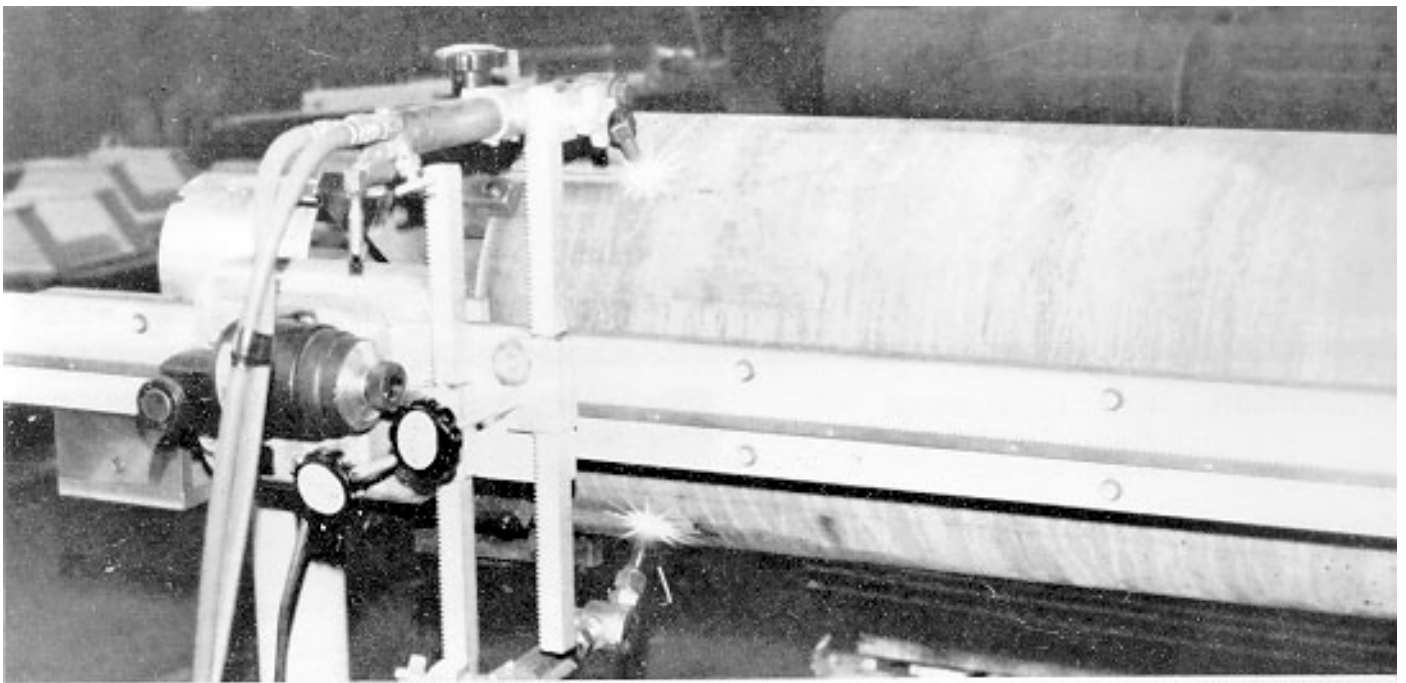
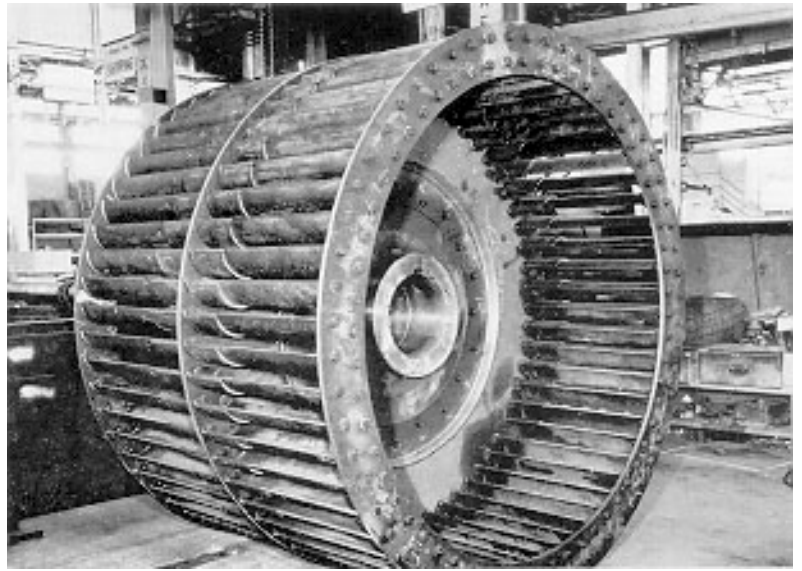


Application: Cutting parts for centrifugal fans.

Process: Oxyfuel cutting.

Equipment: BUG-O DC II with double torch cutting group and ARR-1080 rails, fixture supplied by customer.

Savings: \$12,000.00 per year.

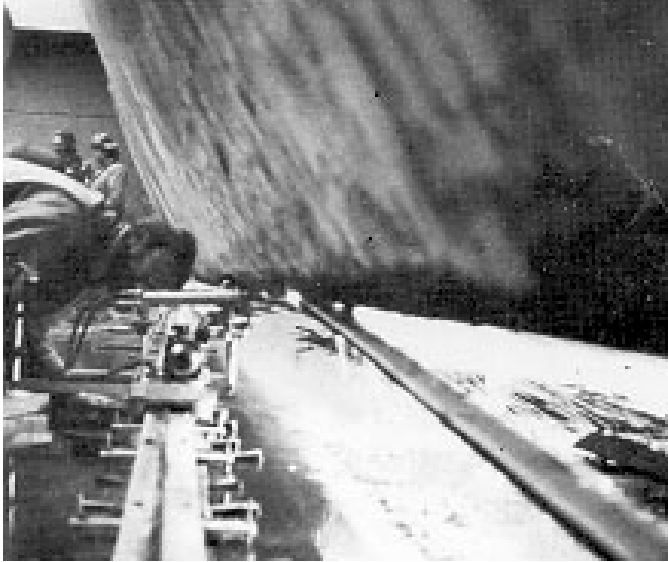


Application: Trimming dam gates on river dams

Process: Oxyfuel cutting.

Equipment: BUG-O DC Straightline Kit

Savings: 6 times faster than manual operation.

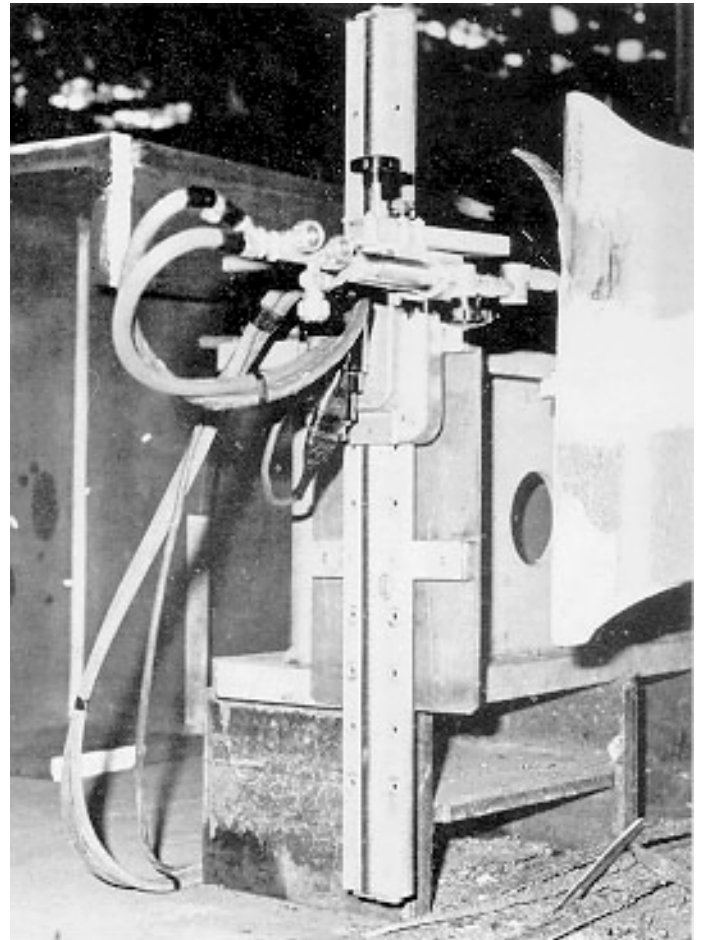
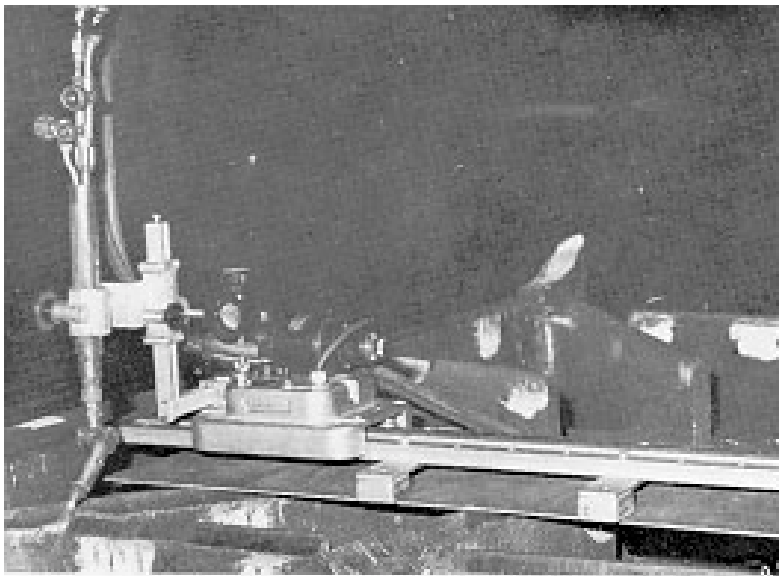


Application: Beveling weld joints on marine diesel engines.

Process: Oxyfuel cutting.

Equipment: BUG-O DC Straightline Kit

Savings: Increased production and quality.





Applications

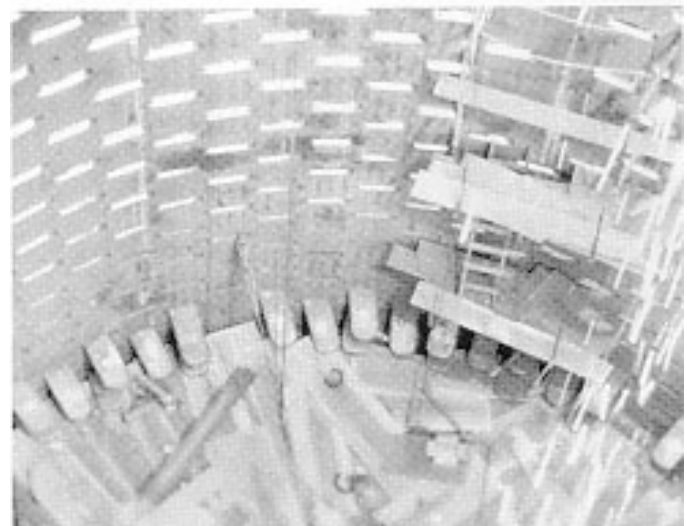
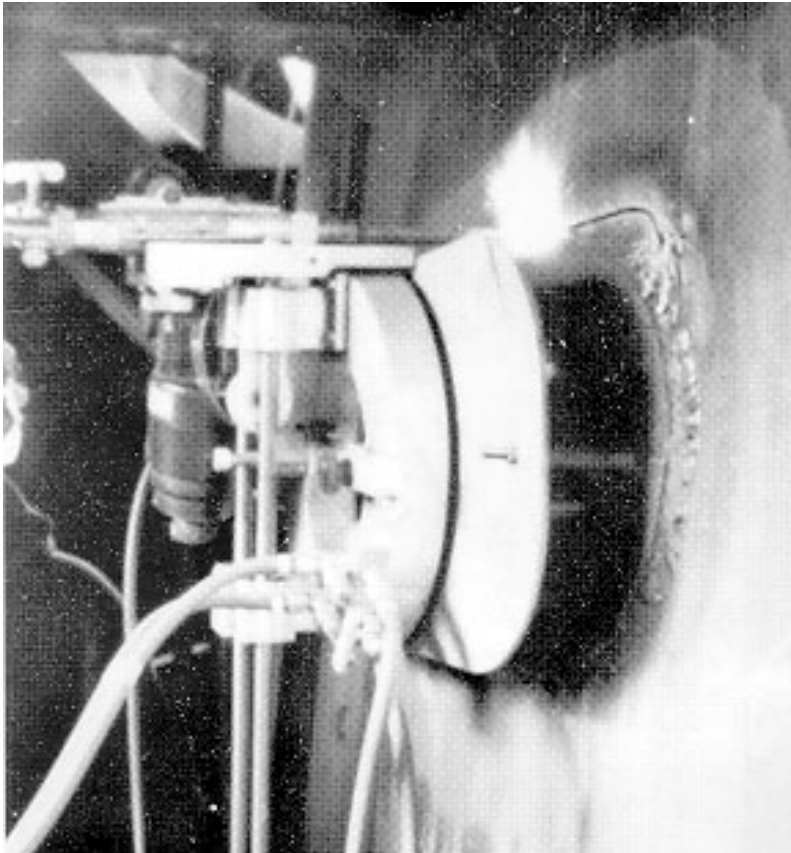
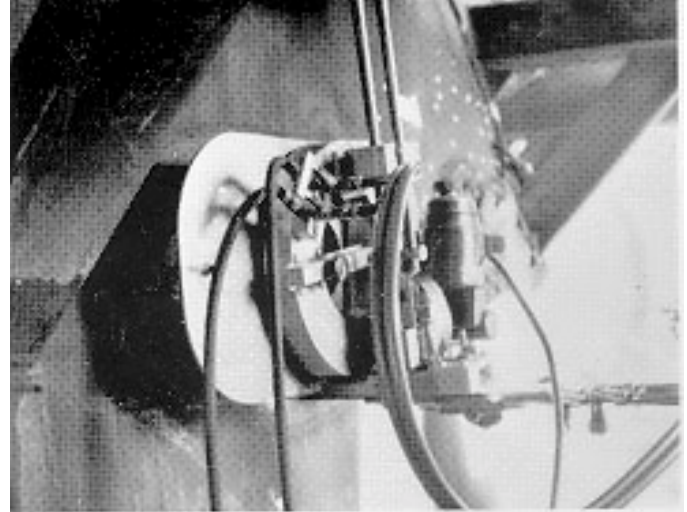
Circular or Radial Cutting

Application: Rebuilding blast furnace required cutting elliptical openings 27" x 18" (686 mm x 457 mm) with a 6" (152 mm) radius.

Process: Oxypropane cutting.

Equipment: HOB-ROUND Machine.

Savings: 200% savings in flame cutting time and additional savings due to accurate, smooth cuts which eliminated grinding.

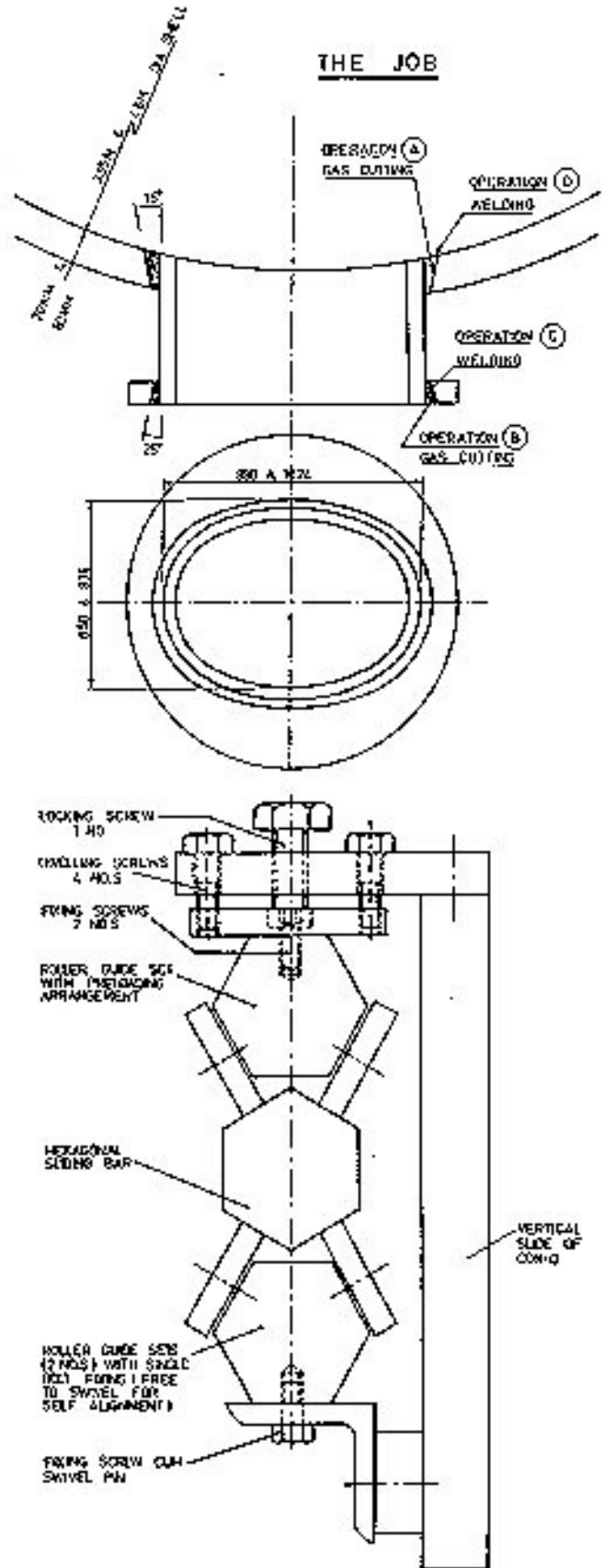
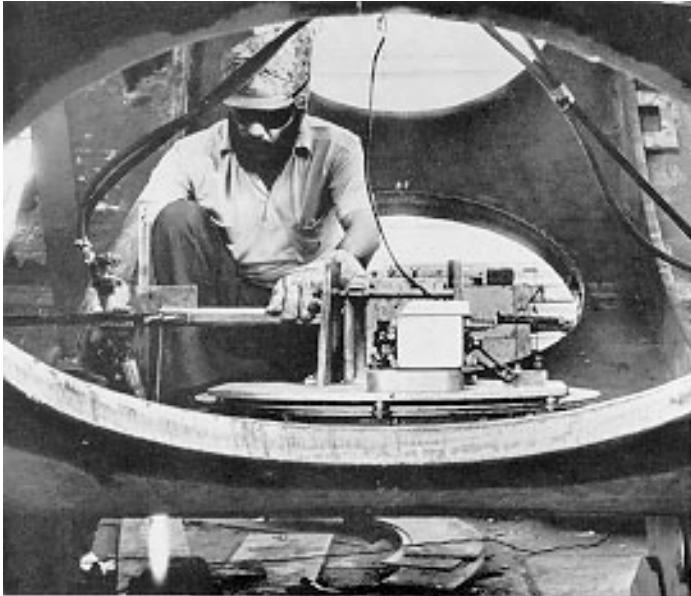


Application: Cutting and welding elliptical openings on rotating cement kilns to produce high quality product.

Process: Oxypropane cutting; thin wire sub arc welding.

Equipment: CON-4, modified by customer.

Savings: 80% over manual flame cutting and 40% over manual welding.



Application: Removal of heads used to pressure test (hydrostatically) heat recovery piping for the fertilizer industry and preparation of piping for field welding.

Process: Oxyfuel gas cutting.

Equipment: CIR-5 with carriage mounted to customer's fixture so that ring gear with torch rotates instead of the carriage.

Savings: Flame cutting and weld preparation time reduced 500% with semi-skilled operator.

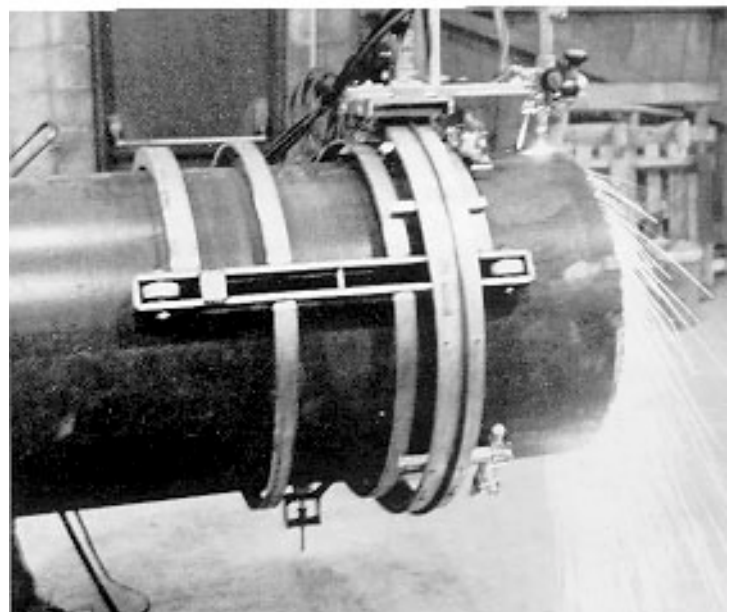
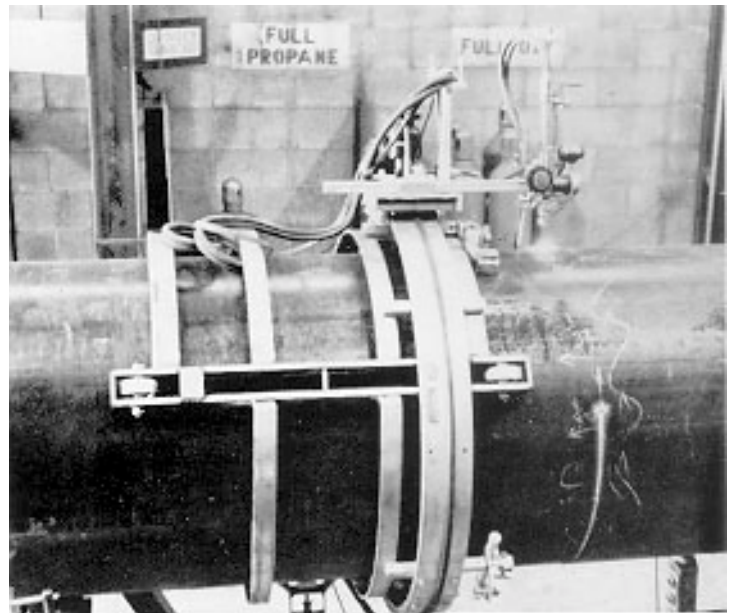


Application: Flame cutting pipe sections to length accurately; 30" (769 mm) O.D. pipe x 3/4" (19 mm) wall - the ends had to be perpendicular with 0.130" (3.3 mm)

Process: Oxyacetylene.

Equipment: Two BRR-Bent Rail mounted on customer's fixture; ROL-O Carriage, panograph, manifold and magnet assembly.

Savings: Burning time reduced 43%.

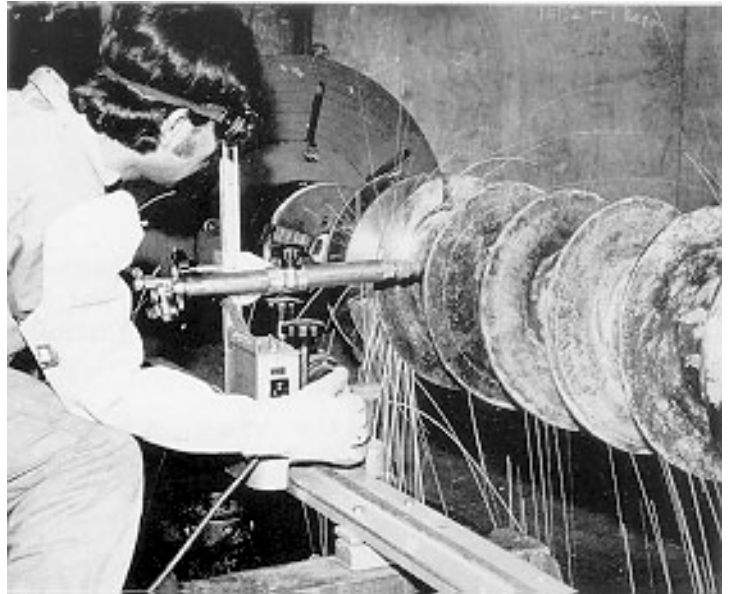


Application: Flame cutting helical flights on screw-shaft conveyor on a taper.

Process: Oxyfuel gas cutting.

Equipment: BUG-O Straightline Kit.

Savings: 64% direct labor savings, plus; reduction in cycle and handling time.

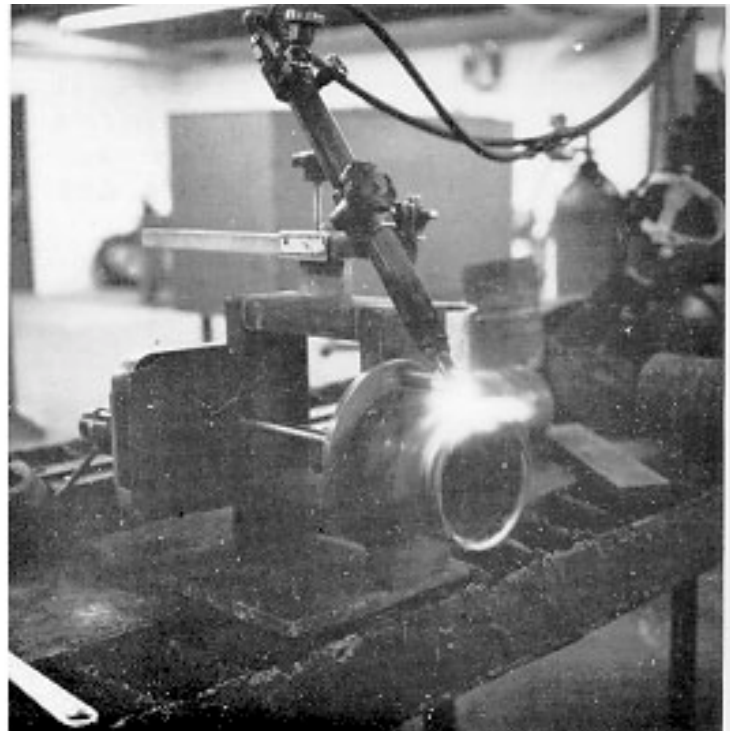


Application: Prepare pipe ends for welding at vo-tech school.

Process: Oxyacetylene.

Equipment: BUG-O Drive Unit and lathe bed made by customer.

Savings: Flame cutting and weld preparation reduced to 2 minutes each.



Application: Flame cut and bevel large phosphate calcining kiln to facilitate rebuilding.

Process: Oxyacetylene.

Equipment: BRR-Bent Rail, panograph, manifold and magnets.

Savings: Labor cost reduced 50%.

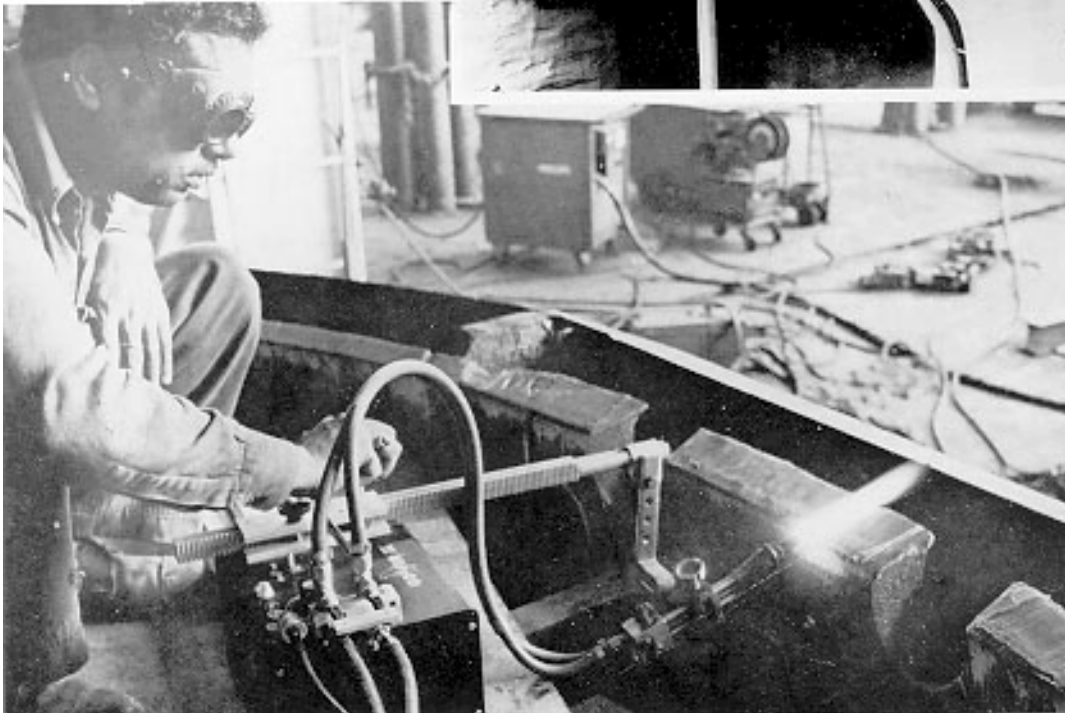
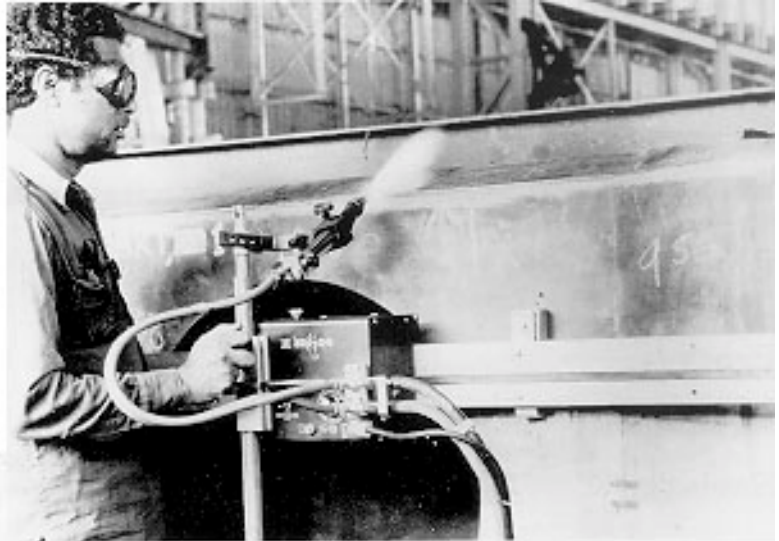


Application: Flame cutting on LD converter trunnion ring to replace top and bottom flanges.

Process: Oxyacetylene.

Equipment: GO-FER II, ARR-Rails and magnets.

Savings: 61% cost reduction.

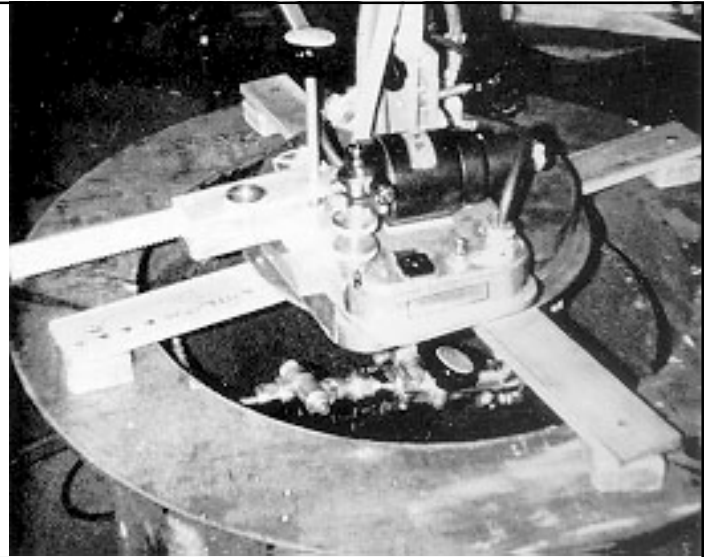
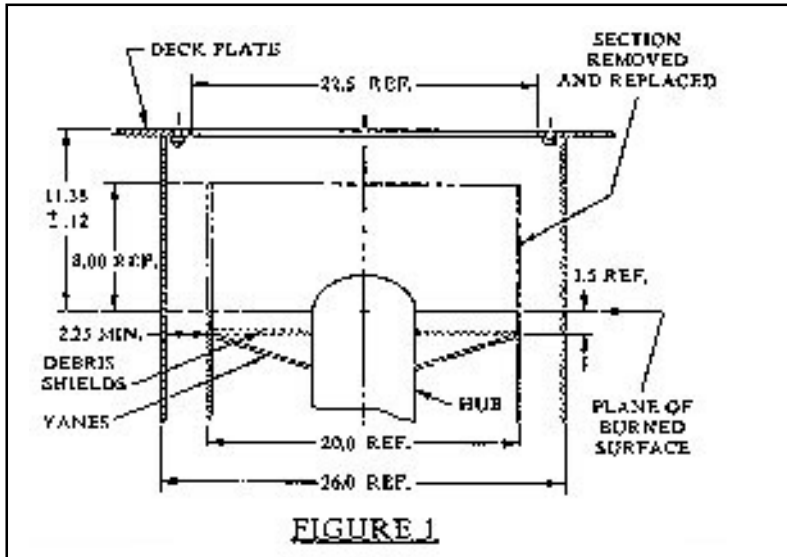


Application: Remove pipe section in remote, confined area of nuclear reactor.

Process: Oxyfuel gas cutting.

Equipment: HOB-O with fixture supplied by customer.

Savings: Cost of HOB-O was 10% of quote for mechanical cutting system; set up, cutting time and labor savings 50% lower than mechanical cutting.

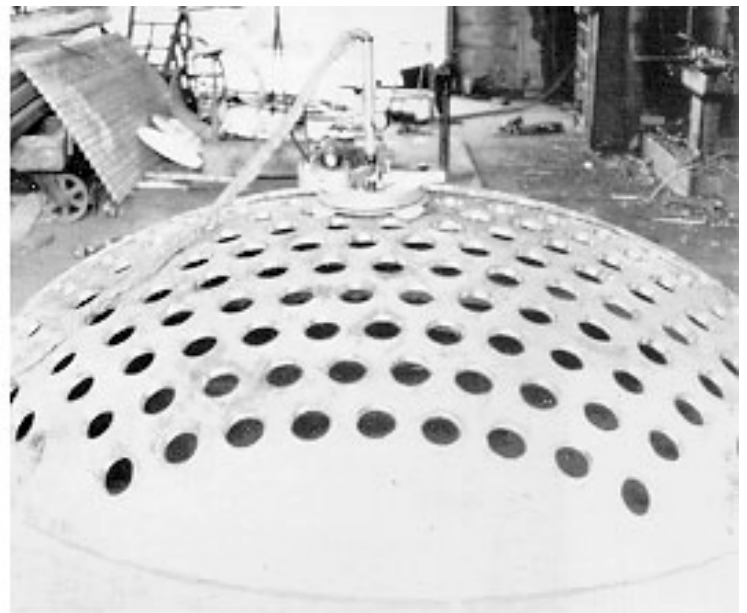
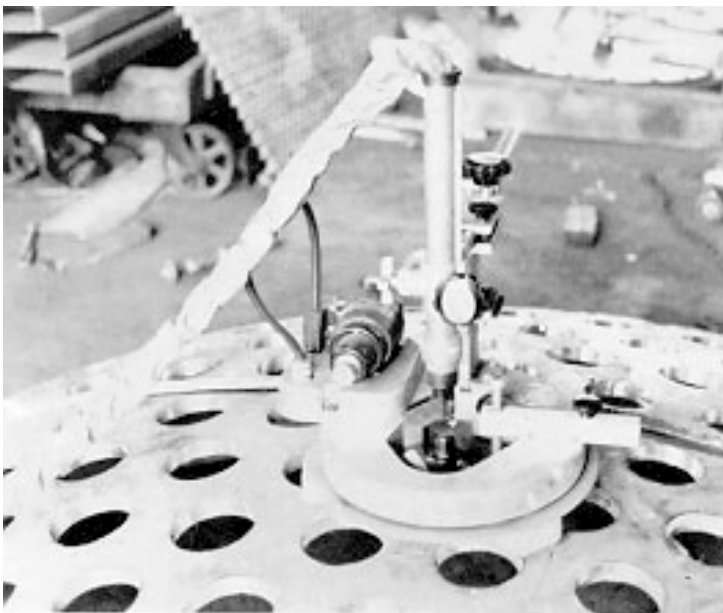


Application: Cutting 280, 4" (100 mm) diameter holes in 1" (25 mm), Type 304 Stainless Steel Elliptical Head.

Process: Plasma cutting.

Equipment: HOB-O

Savings: Accurate, uniform, quality holes at 1/10th the cost of machine boring.

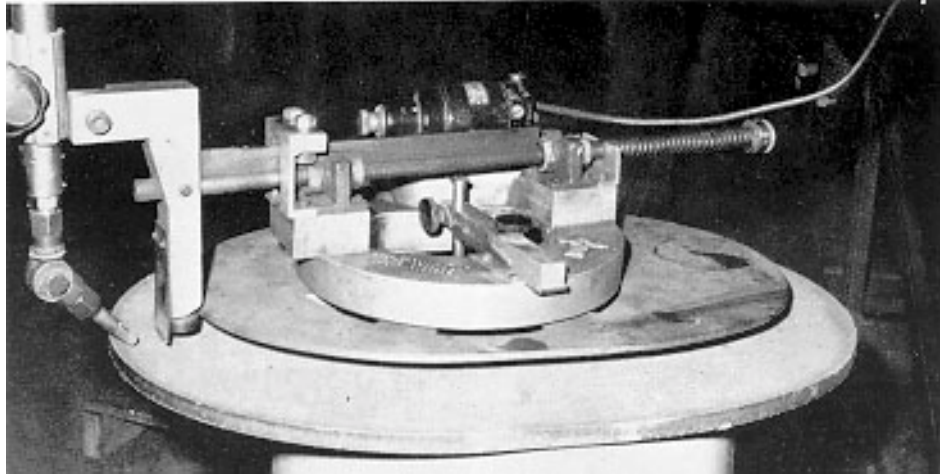


Application: Fabricating obround plates with a beveled edge to close tolerances for a nuclear application.

Process: Oxyfuel gas cutting.

Equipment: HOB-O modified by customer.

Savings: Outstanding results - at a much lower cost than machining.

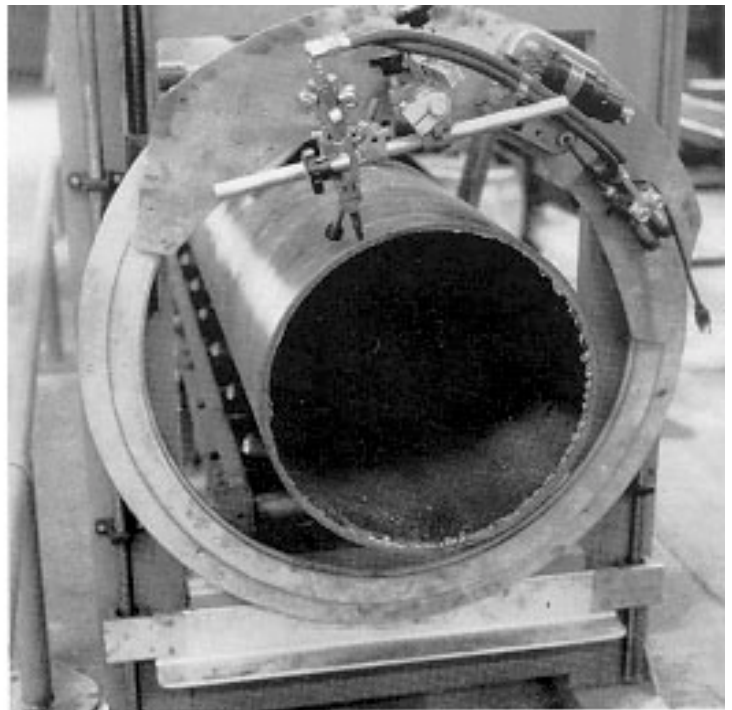
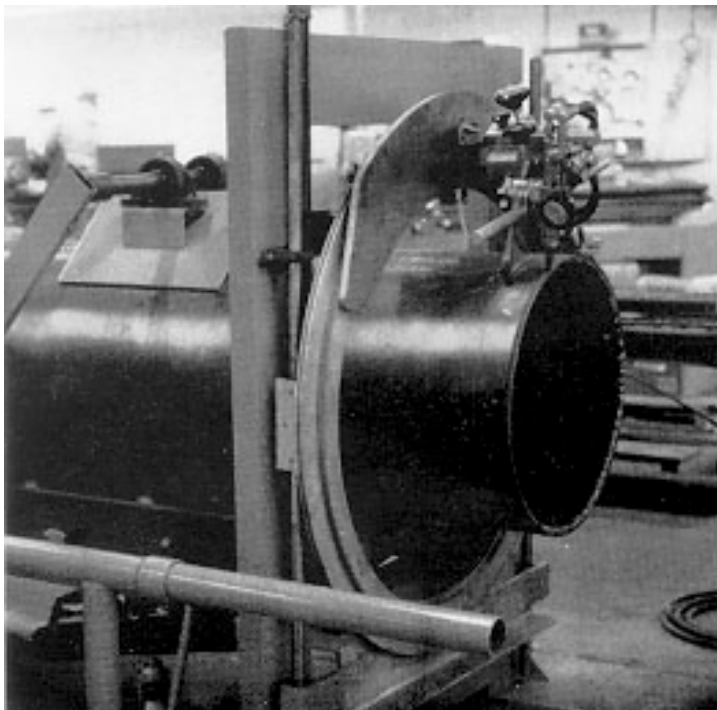


Application: Make accurate, square cuts on pipes/vessels

Process: Oxyfuel gas cutting.

Equipment: CIR-5, with annular carriage, panograph mounted on fixture made by customer.

Savings: Fabricating costs reduced 48% - the machine paid for itself in 60 days.

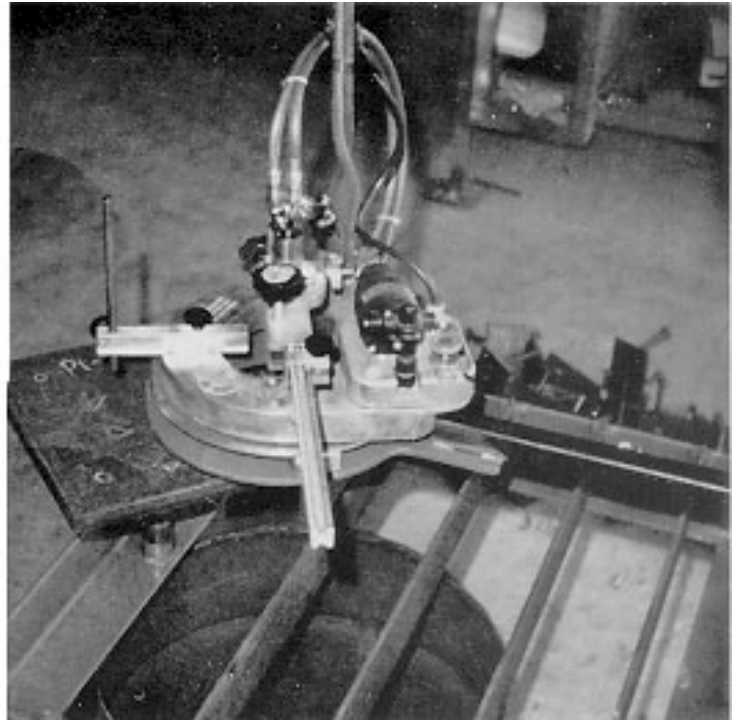
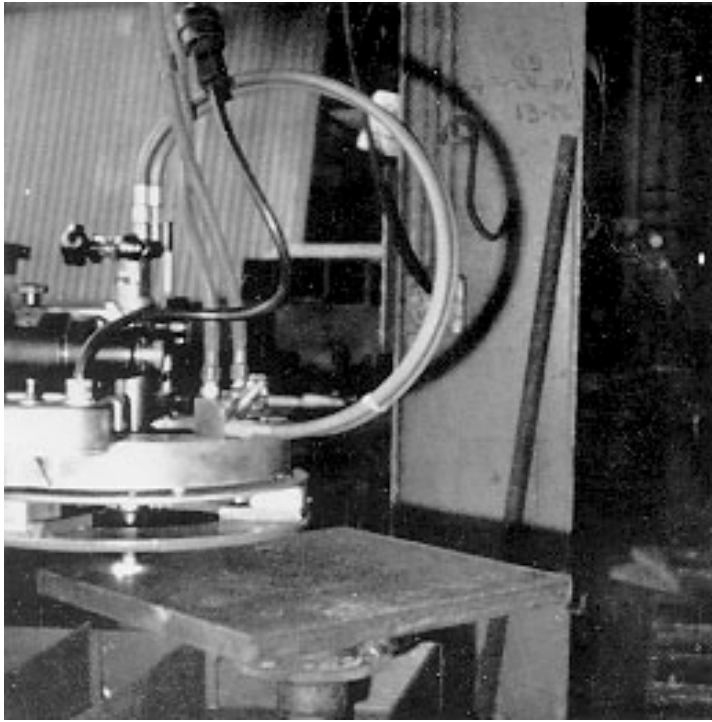


Application: Make numerous holes in steel plate faster and cheaper than drilling.

Process: Oxyfuel gas cutting.

Equipment: HOB-O mounted on fixture supplied by customer.

Savings: Flame cutting produced clean, accurate holes — 10 times faster than drilling.



Application: Bevel ends of zirconium ingots prior to forging.

Process: Oxyfuel gas cutting.

Equipment: CIR-4 mounted on fixture made by customer.

Savings: Beveling time reduced from 16 to 2 hours (800% savings).

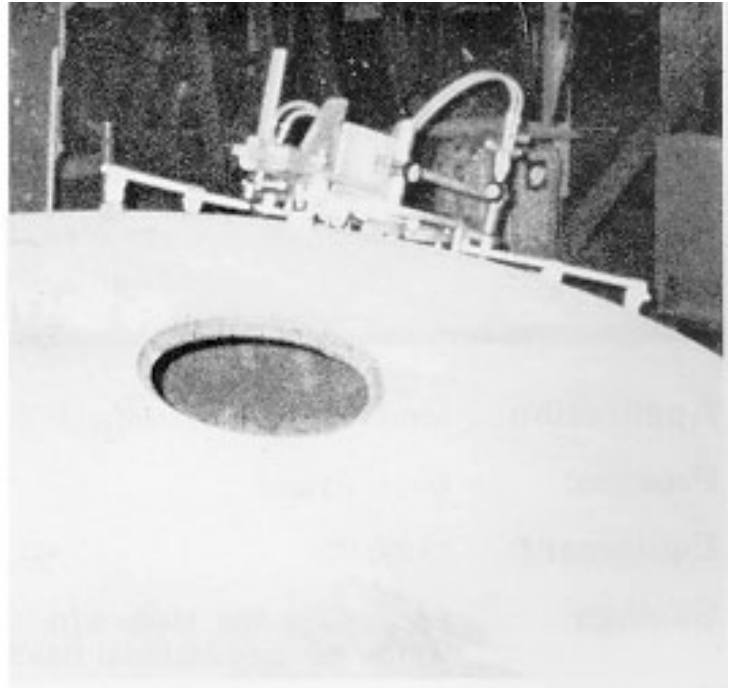
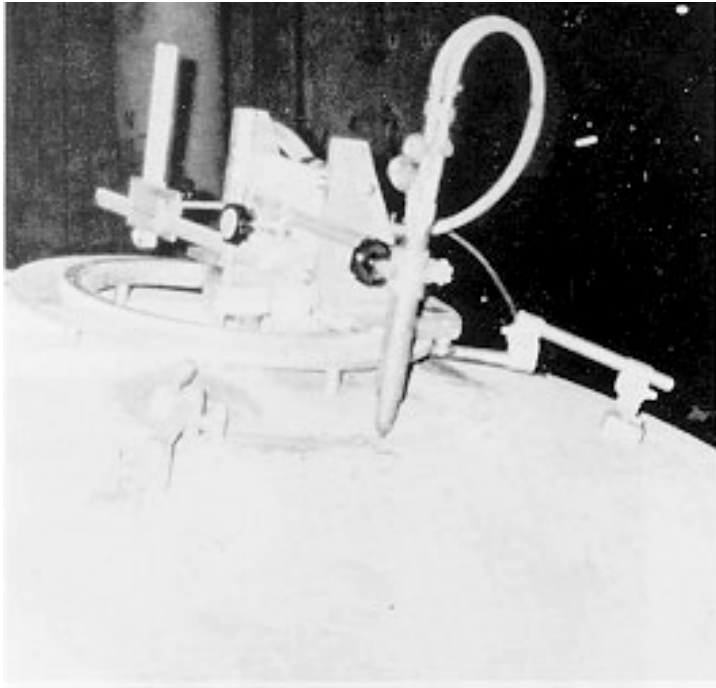


Application: Flame cut and bevel nozzle openings in thick hemispherical heads.

Process: Oxyacetylene.

Equipment: CON-3, CON-4 and CON-5

Savings: Flame cutting time reduced 50%. Total savings due to reduced handling and finishing - 70%.

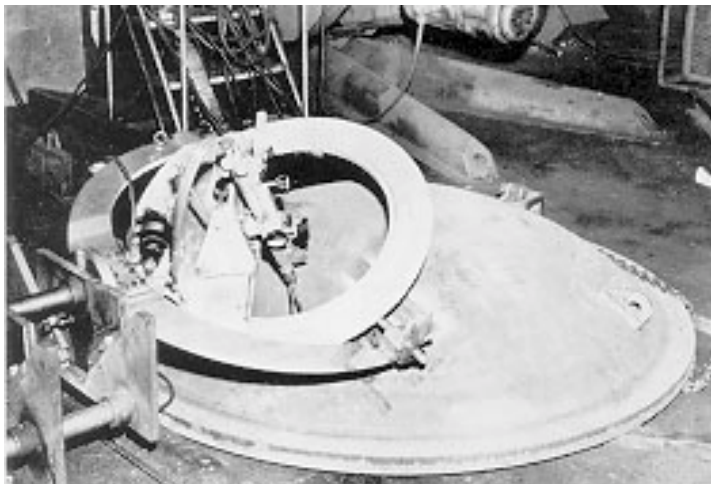


Application: Cutting two large diameter holes on thick, dished heads at various angles from the spherical axis to accept mitered nozzles.

Process: Oxyfuel gas cutting.

Equipment: CON-4 mounted on special fixture made by customer.

Savings: Accurate cuts in position reduced material handling and welding guns.

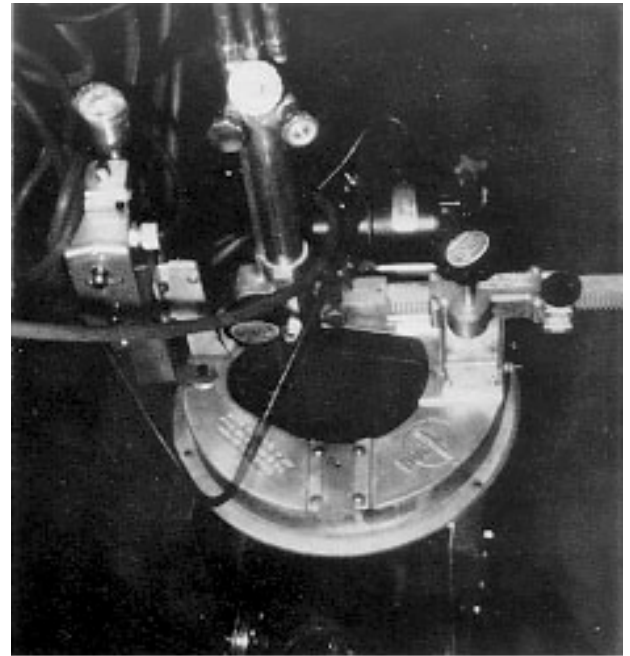


Application: Cutting holes in pipe.

Process: Oxyacetylene.

Equipment: HOB-O mounted on fixture supplied by customer.

Savings: Fast, accurate, clean flame cut holes.

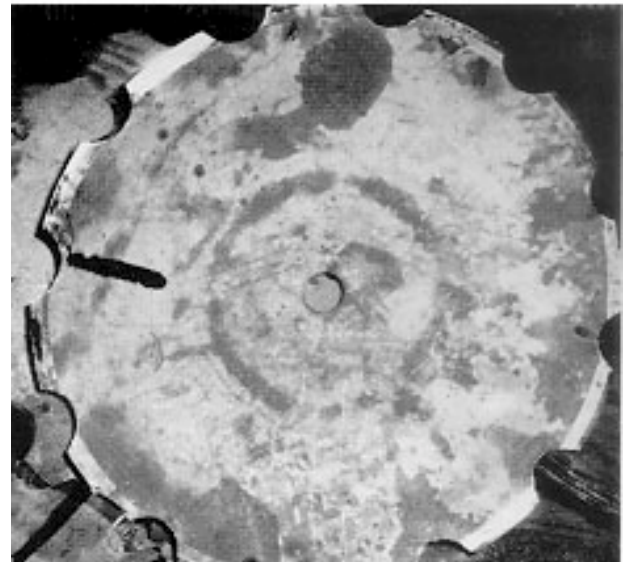


Application: Manufacturing agricultural discs.

Process: Oxyacetylene.

Equipment: CIR-3303

Savings: Entire disc was made with CIR-3 which reduced material handling.

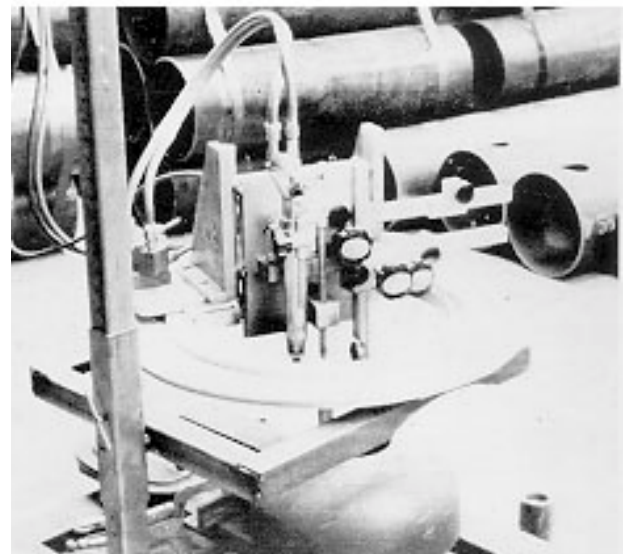


Application: Cutting beveled holes in heads

Process: Oxyacetylene.

Equipment: CON-3303 mounted on customer's fixture.

Savings: Increased production 300%.



Application: Fabrication of manifold for ice skating rinks.

Process: Oxyacetylene.

Equipment: HOB-O mounted on customer fixture.

Savings: Accurate, clean holes, reduced welding time 40%

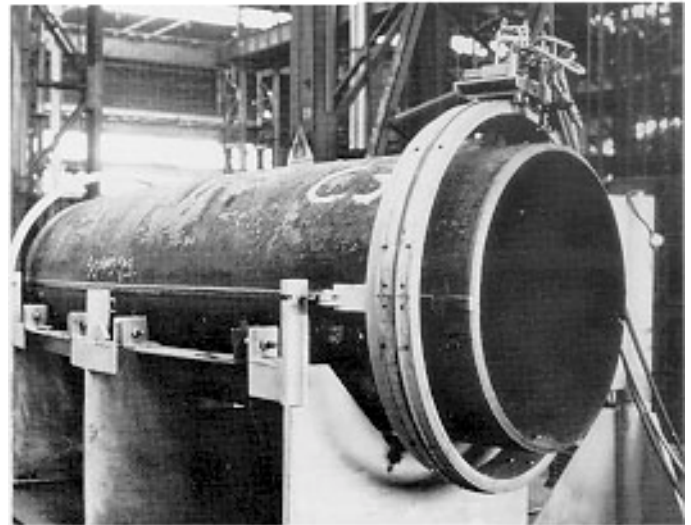


Application: Fabricating 42" (1.06 m) diameter pipe elbows.

Process: MIG welding.

Equipment: ROL-O carriage, torch mounts, BRR-rails and fixture made by customer.

Savings: 30% per elbow over manual method.

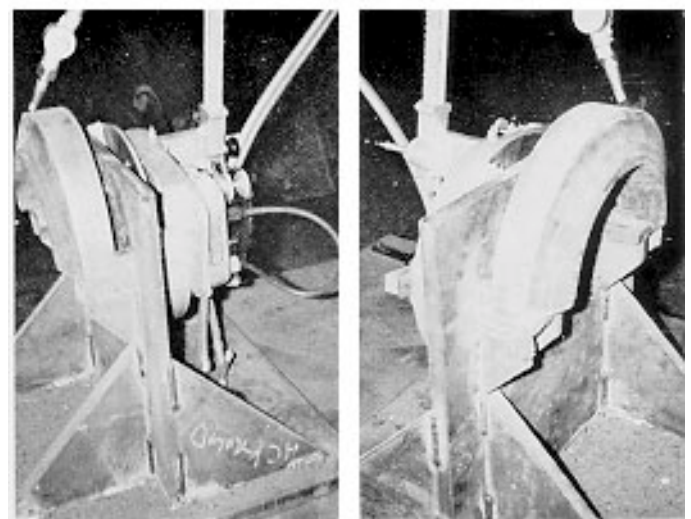


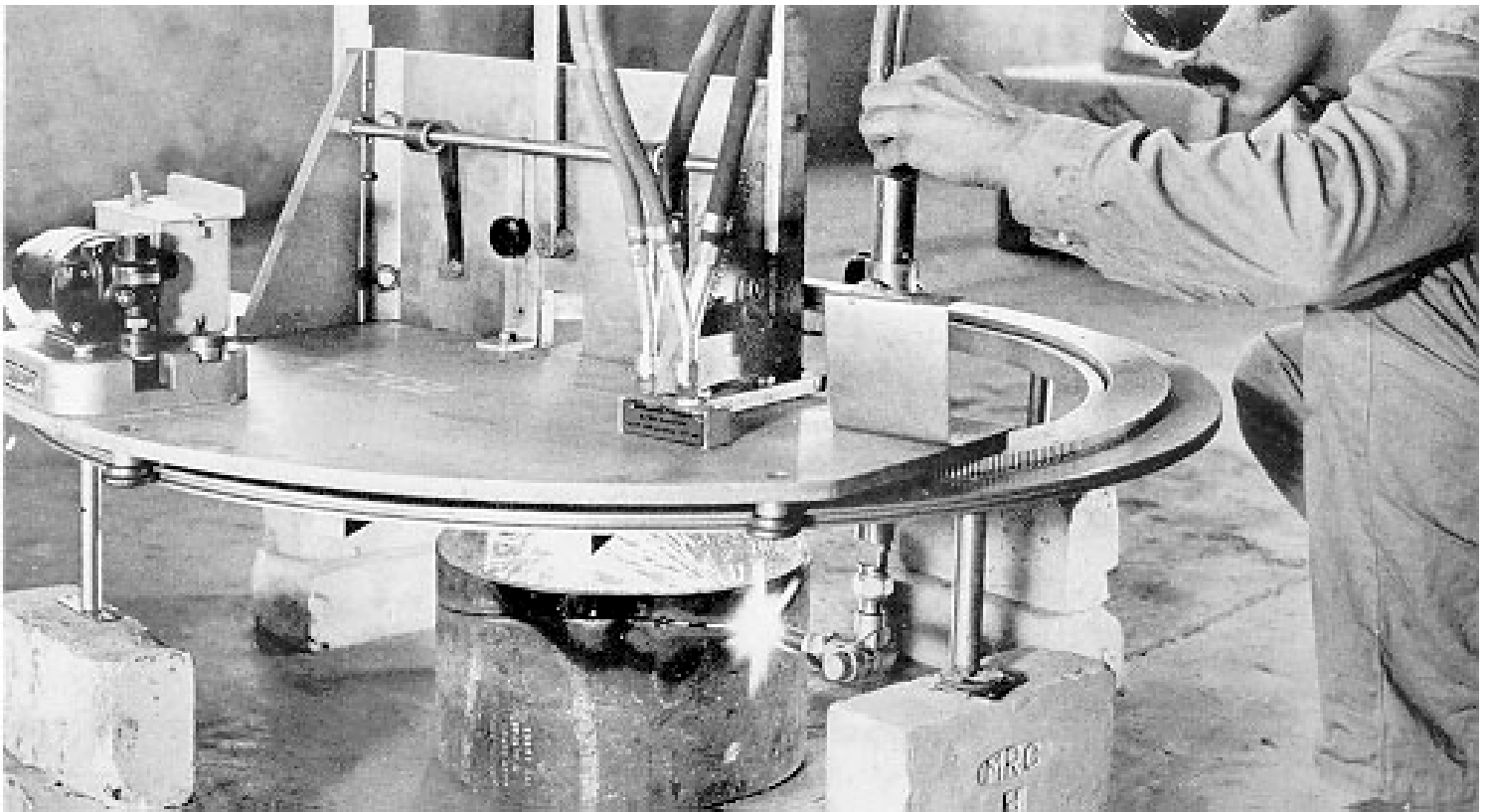
Application: Cut a 30 degree bevel on 14" (355 mm) outside diameter, 8" (200 mm) inside diameter, 3" (75 mm) thick disc.

Process: Oxyacetylene.

Equipment: HOB-O with torch and adjustable tip adaptor and Q.A. manifold on fixture designed by customer.

Savings: High quality cut — in a short time.





Application: Make saddle contoured cuts on pipe.

Process: Oxyacetylene.

Equipment: CON-5 with 1:2 ratio bevel gear set mounted by customer.

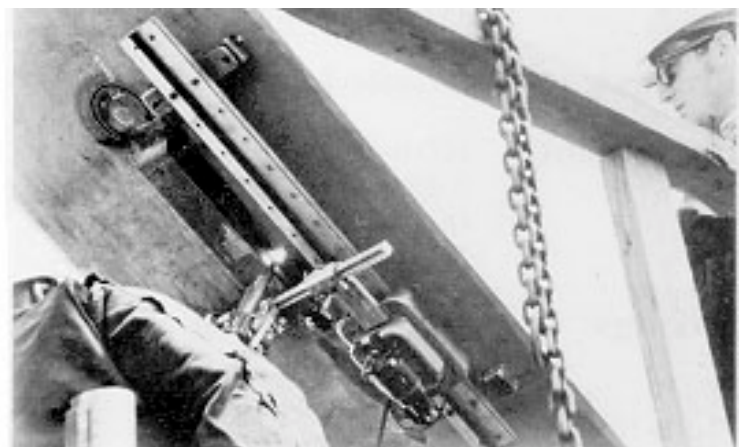
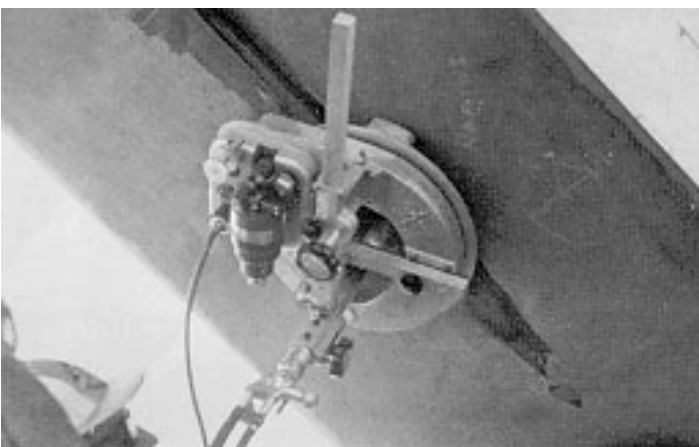
Savings: 8 man hours per assembly.

Application: Overhead cutting to remove defective hanger bars on suspension bridge.

Process: Oxyfuel gas cutting.

Equipment: HOB-O and BUG-O straightline kit.

Savings: Precise, smooth cuts, reduced cleanup and subsequent welding of new components.

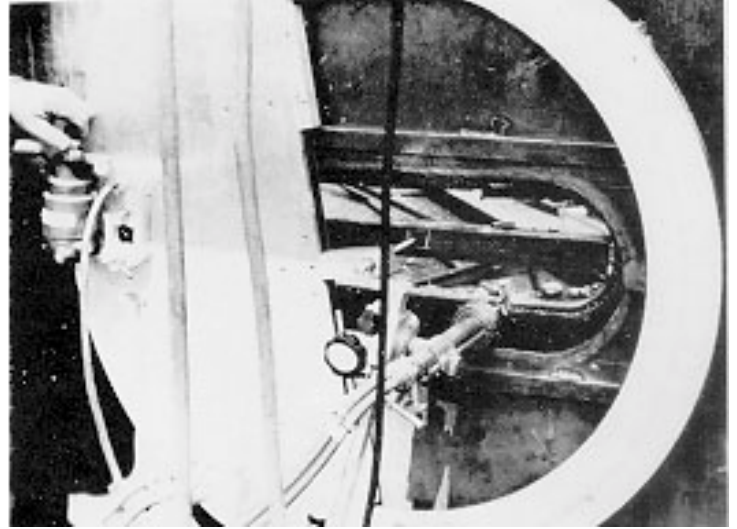
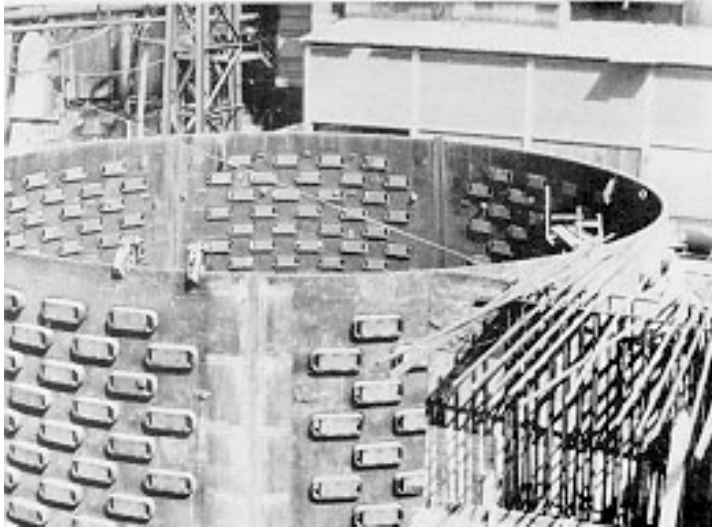


Application: Cutting obround holes in blast furnace shell.

Process: Oxyfuel gas cutting.

Equipment: CIR-5 with template kit.

Savings: 30% compared to manual cutting.

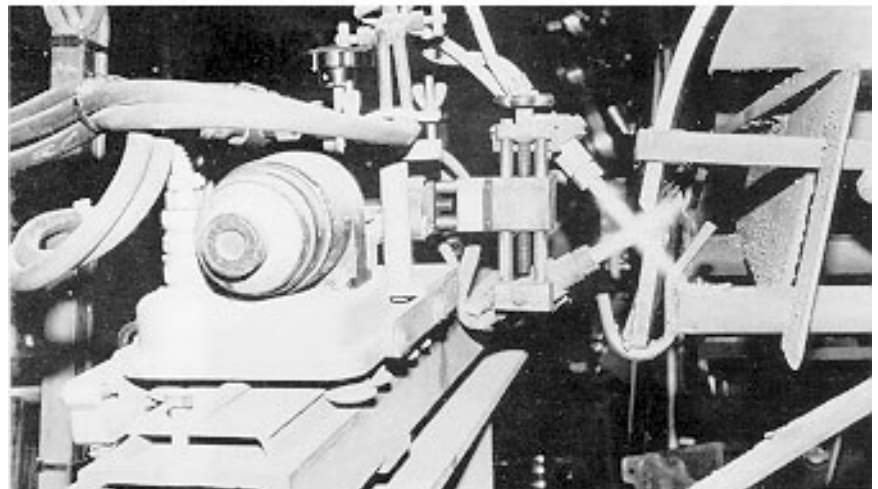
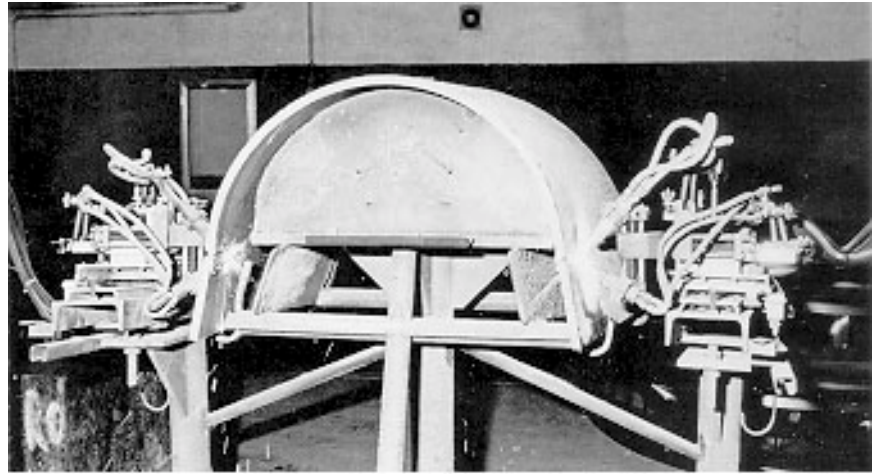


Application: Cutting conical section from rolled plate.

Process: Oxyacetylene.

Equipment: ROL-O Carriages and ARR-rails mounted on customer's fixture.

Savings: 80% less costly than manual cutting.

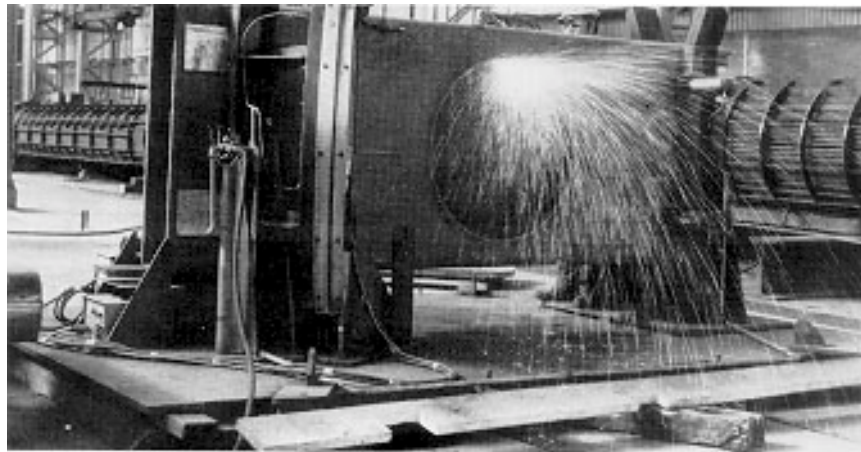
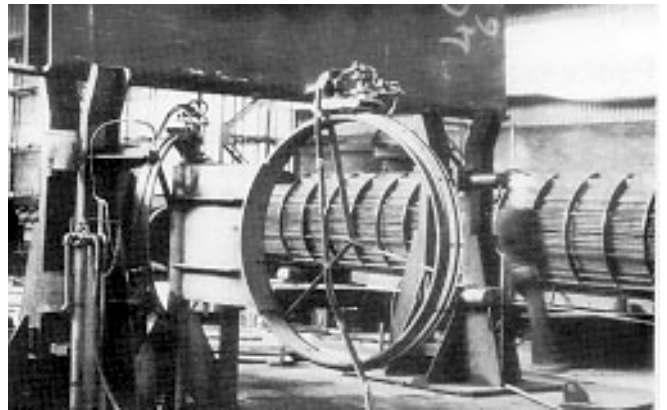


Application: Fabrication of large gate valves.

Process: Oxyfuel gas cutting.

Equipment: Two ring rails and two ROL-O carriages mounted on customer's fixture.

Savings: 100% compared to manual cutting.

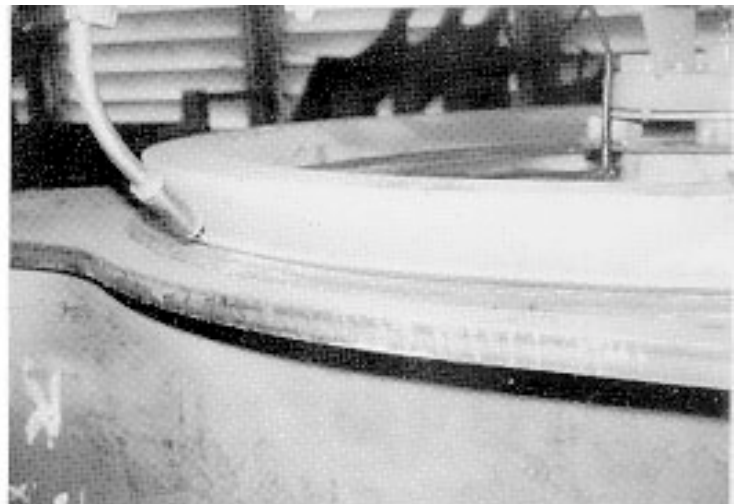
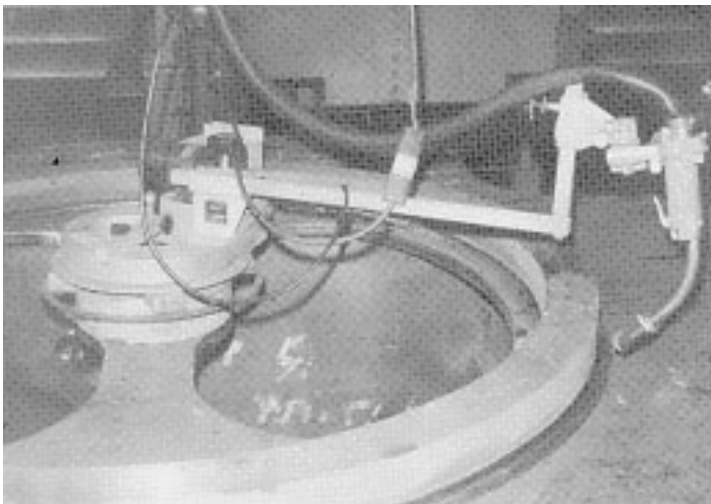


Application: Fillet welding I.D. and O.D. of rings.

Process: Flux cored arc welding.

Equipment: HOB-O with all-position clamp and right angle rack.

Savings: Production increased 300%.

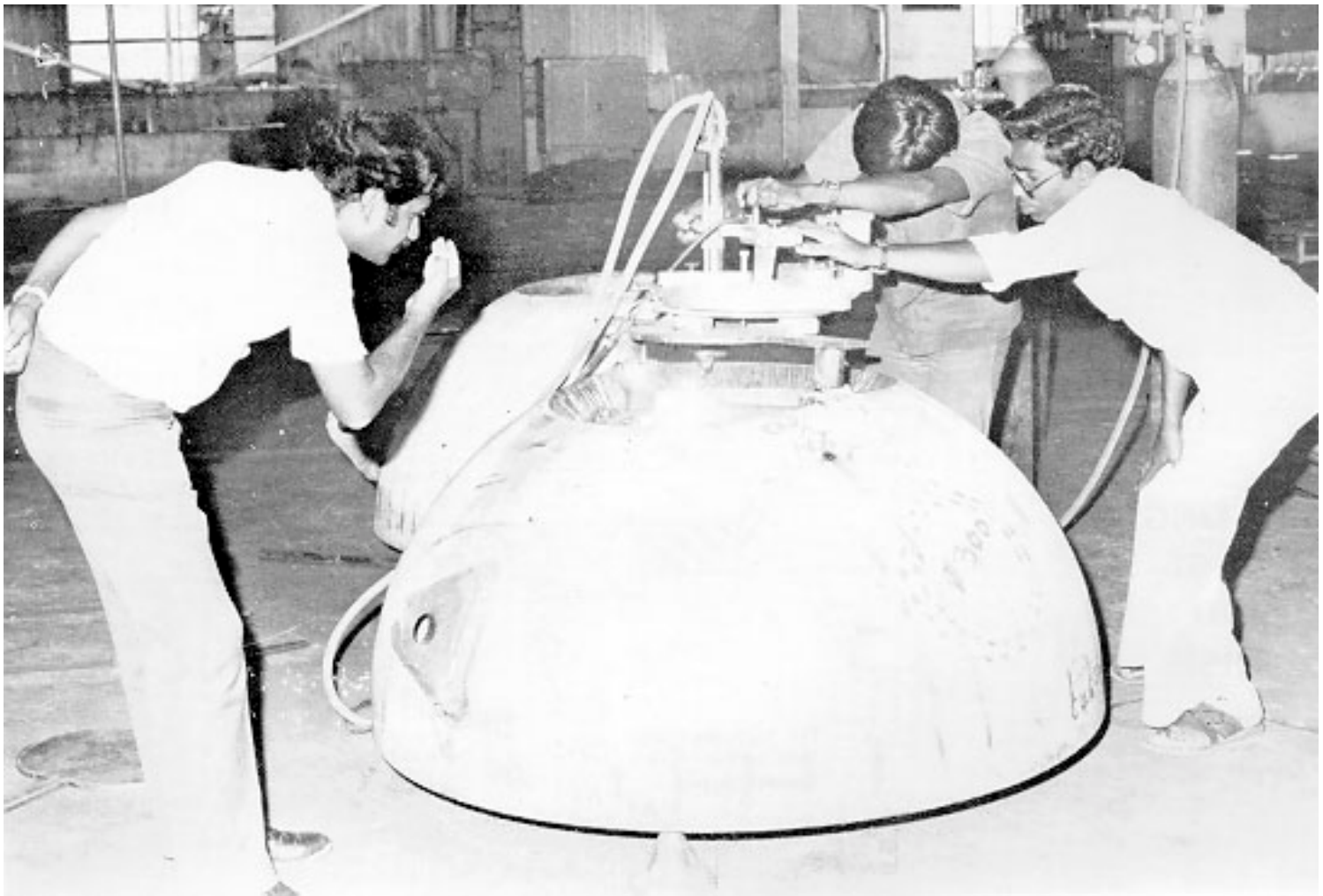


Application: Cutting obround holes in a hemisphere.

Process: Oxyfuel cutting.

Equipment: HOB-O with adjustable tip adaptor.

Savings: Substantial reduction in grinding and machining time.

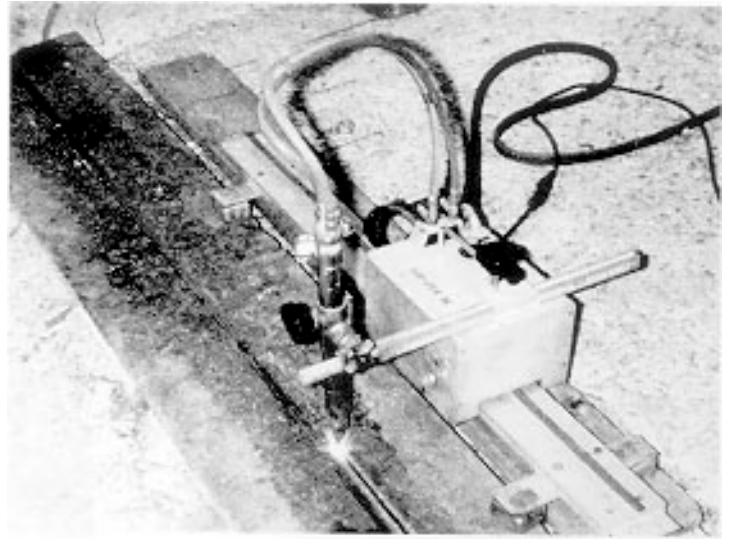


Application: Replacing expansion joints on bridges.

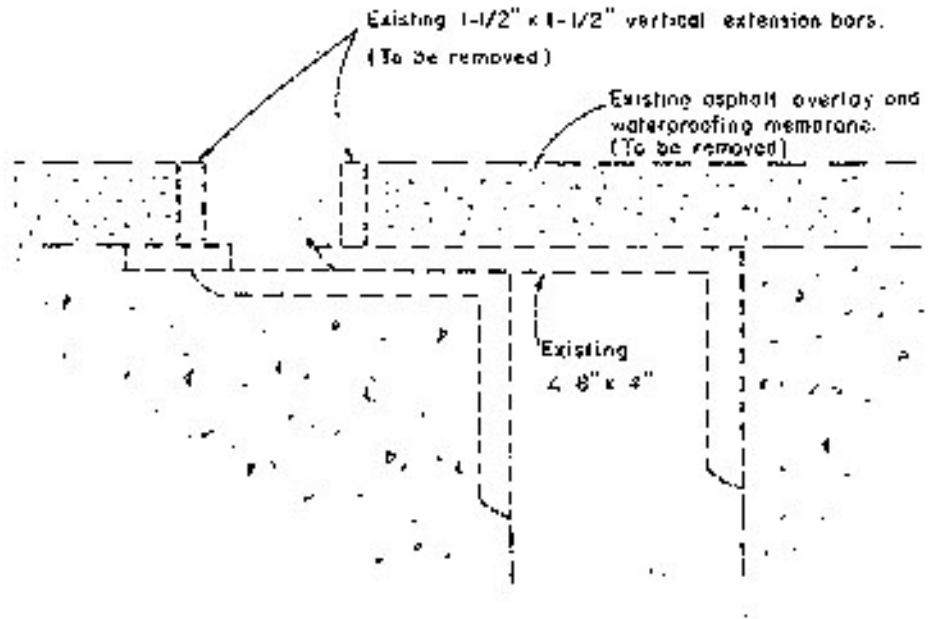
Process: Oxyfuel gas cutting.

Equipment: GO-FER Kit, Smith torch, ARR-rail and magnets.

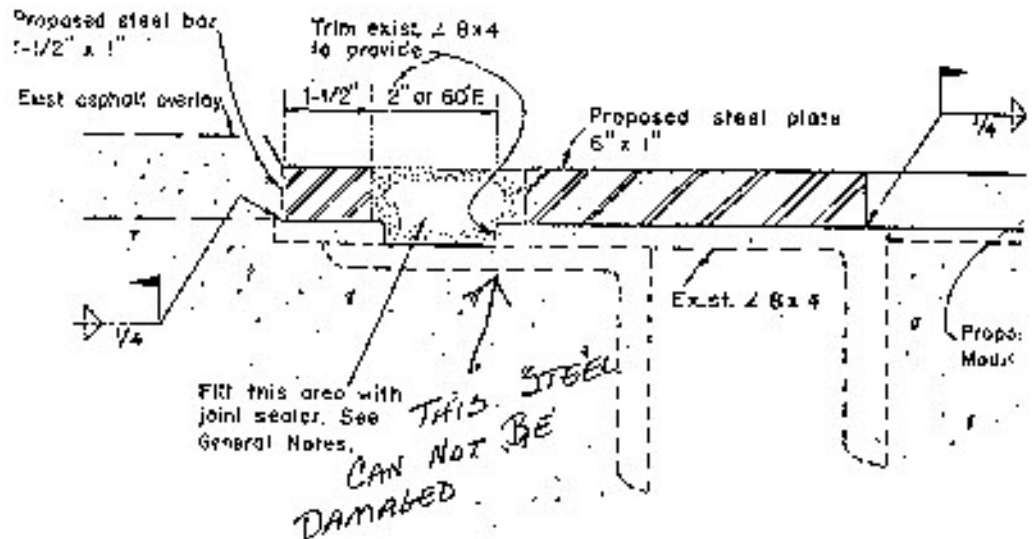
Savings: Satisfied customers (bridge owners) and time and money savings for the contractor.



PROPOSED
BRIDGE
END
FINISH



EXISTING
BRIDGE
END
FINISH





Applications

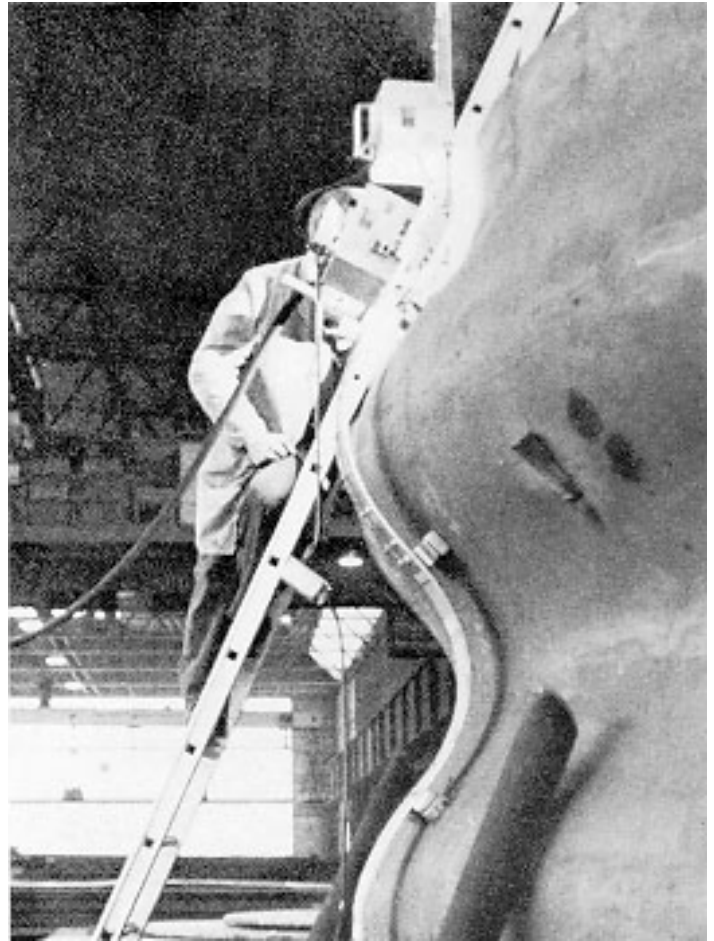
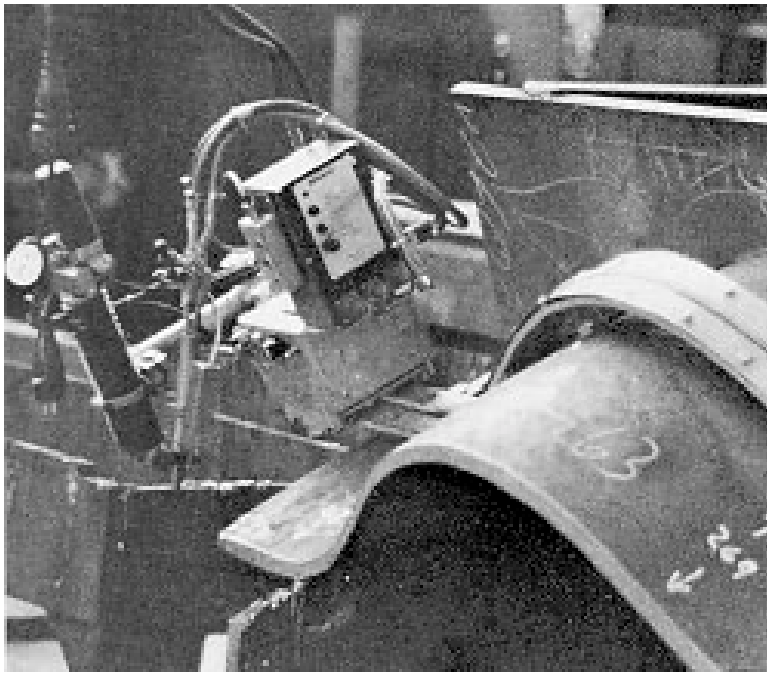
Fixturing For Special Cutting And Welding

Application: To bevel, trim (20°) pressed steel plates of special corrugated shape, for tube segments in construction of subway system tunnel.

Process: Oxyfuel cutting.

Equipment: Super-Flex rail bolted to aluminum template, Super-Flex carriage, height sensing control.

Savings: Mechanized a job impossible to do manually at a cost of \$13,000.00 compared to \$130,000.00 for a robotic system. Also realized an 80% reduction in time.



Application: Finish trim square section of 12 ft. (3.7 m) diameter sphere.

Process: Oxyfuel flame cutting.

Equipment: BUG-O DC II, special bolts to clamp rail to plate by customer.

Savings: Obtained perfect uninterrupted cuts.

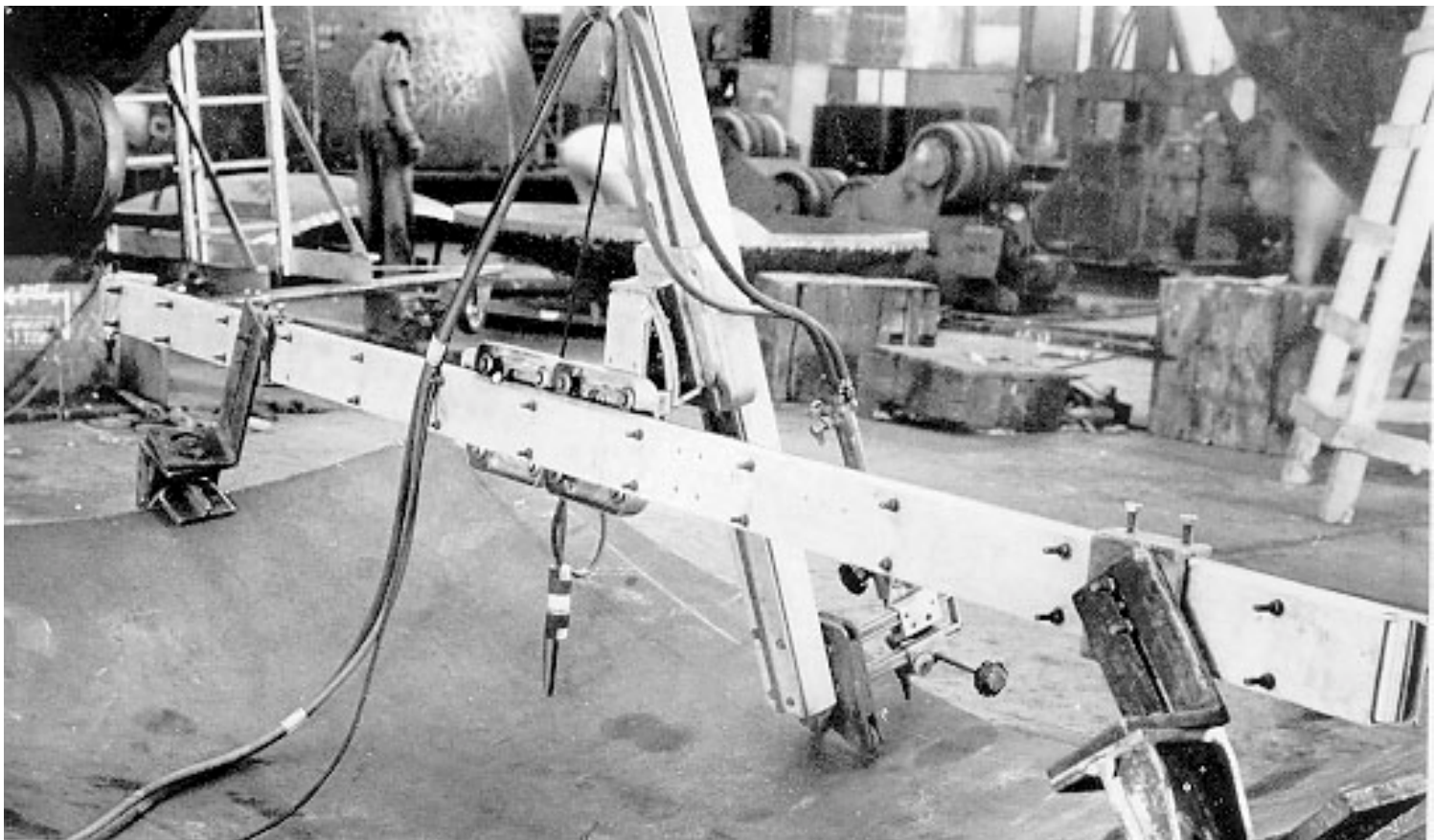


Application: Trimming sides of gore sections of dished plate heads with hemispherical, torispherical or ellipsoidal profiles.

Process: Oxyfuel flame cutting.

Equipment: MUG-O rail, BUG-O drive, trailer carriage, torchholder, racks, rackholder - special clamps, tiltable sliding mount by customer.

Savings: Reduced grinding and assembly time, saved 8 hours per section, \$6,500.00 per year.

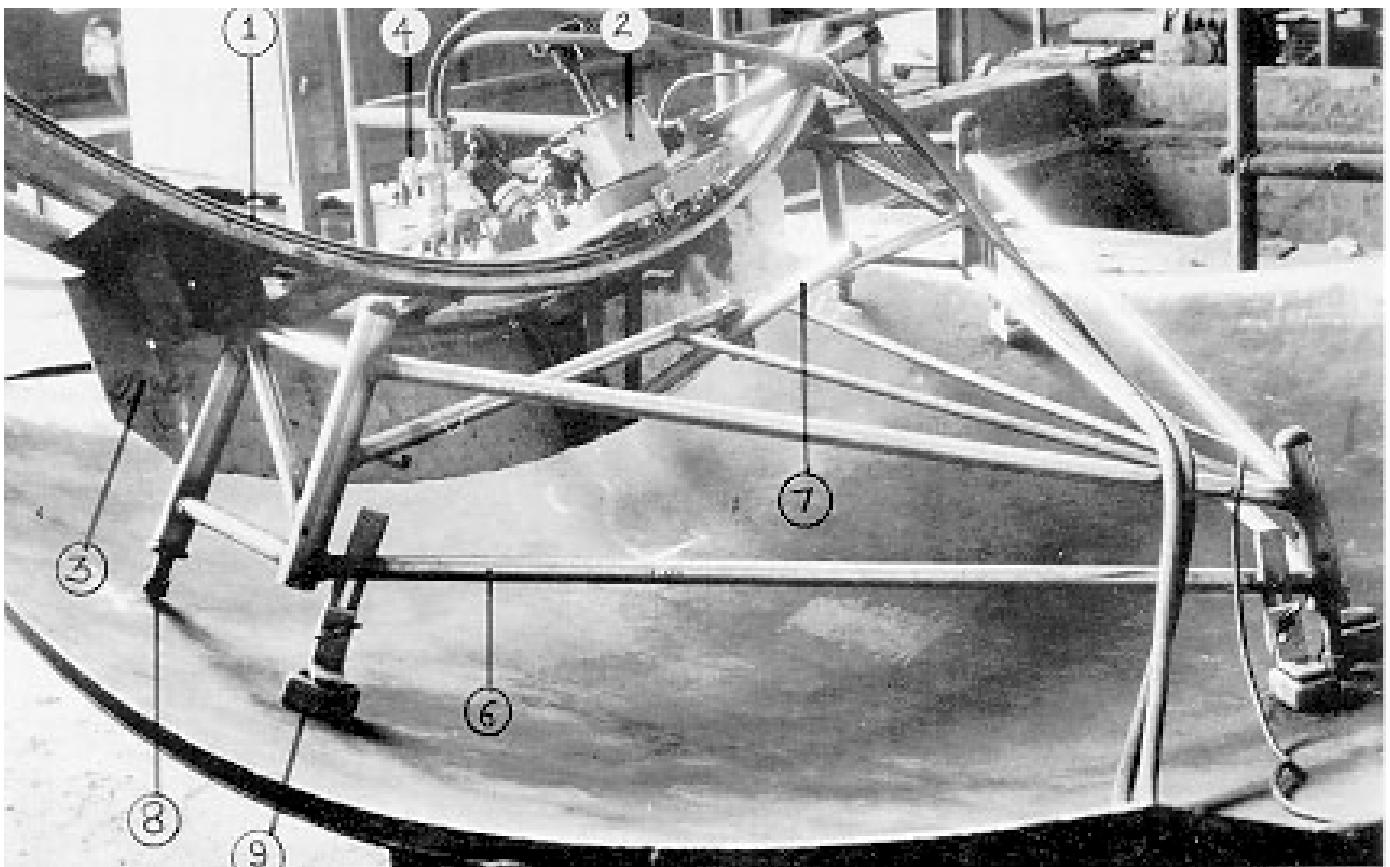
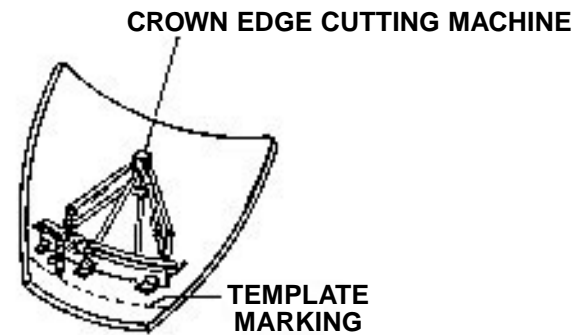
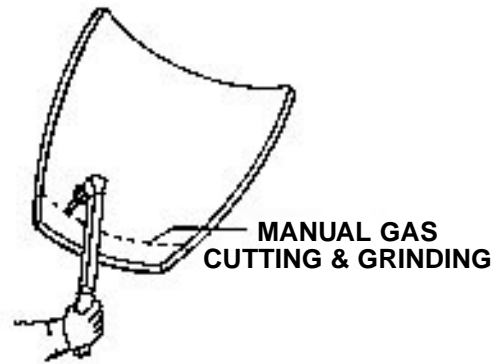


Application: Cutting and trimming crown to petal joints for dished ends.

Process: Oxyfuel flame cutting.

Equipment: ROL-O carriage, flex rail, torchholder, panograph torch floater, rod clamp, (4) magnet feet and fixture by customer.

Savings: 16 man hours (67%) per dished end amounting to savings of \$146.00 per dished end.



- 1. BUG-O Flexible Rail
- 2. ROL-O carriage
- 3. Aluminum Flapper Plate

- 4. Torch Assembly
- 5. Panograph Torch Floater
- 6. Frame

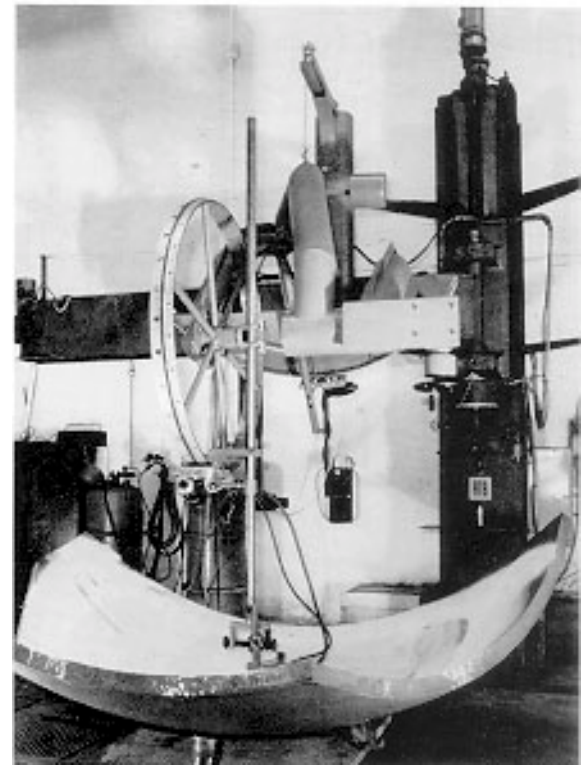
- 7. Telescopic Arm
- 8. Jack Screws
- 9. BUG-O Magnet

Application: Cutting bevels for welding hemisphere sectors for spheres and heads.

Process: Oxyfuel cutting.

Equipment: Customer's special fixture designed around BUG-O equipment; ROL-O carriage and bent rails.

Savings: Reduced preparation time 90%, increased productivity.

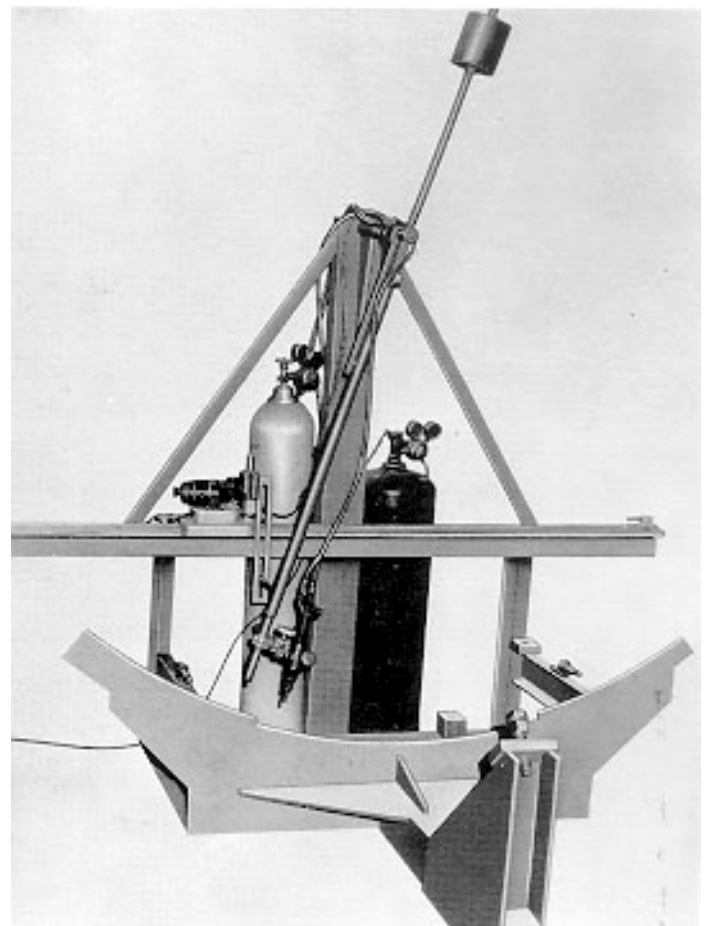


Application: Produce 10 ft. (3.1 m) diameter hemispherical heads fabricated from 4 ft. (1.2 m) formed circular piece and six gore sections with excess material on edges.

Process: Oxyfuel gas cutting.

Equipment: BUG-O carriage and drive unit, rail, torchholder, clamp, customer's fixture.

Savings: Excellent gore sections produced quickly.

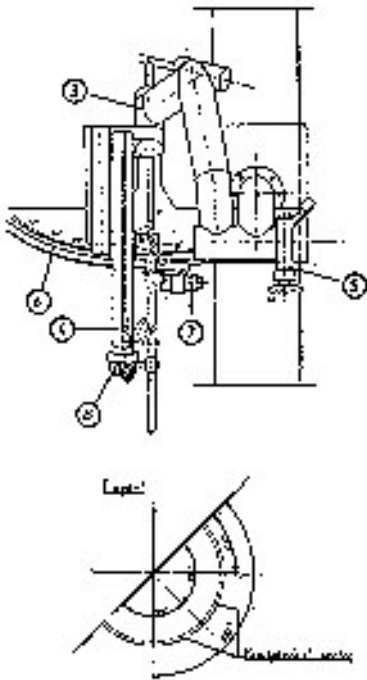
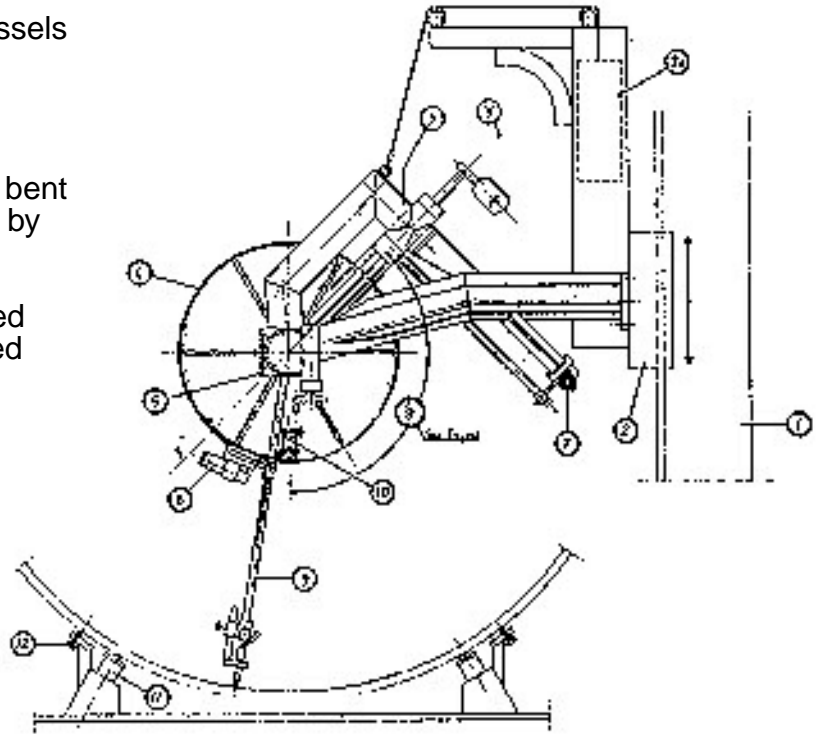


Application: Constructing large hemispherical, elliptical and welded heads for vessels and reactors.

Process: Oxyfuel gas cutting.

Equipment: BUG-O carriages and drive units, bent rail, rigid rail with fixture designed by customer.

Savings: 70% in labor time, greatly improved accuracy of preparation, eliminated template construction.

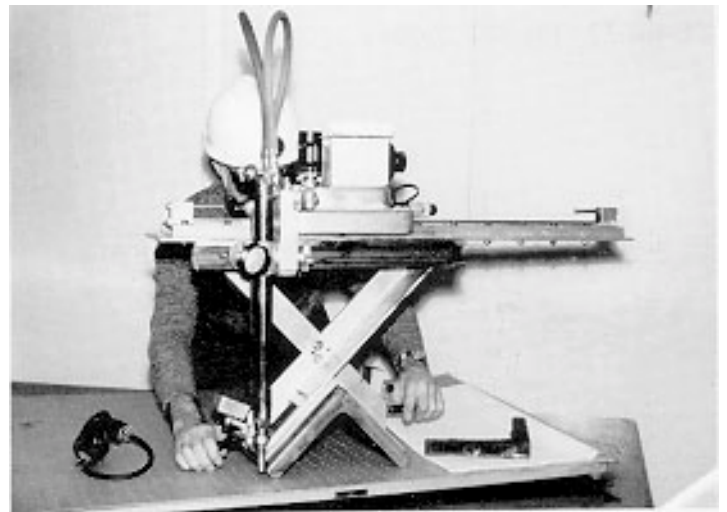


Application: Cutting heavy angles.

Process: Oxyfuel cutting.

Equipment: BUG-O DC III with limit switch kit, rail, torchholder, mounted on customer's fixture.

Savings: Cutting time reduced 50%, set up time reduced 75%, reduction of slag-blow, grinding eliminated.

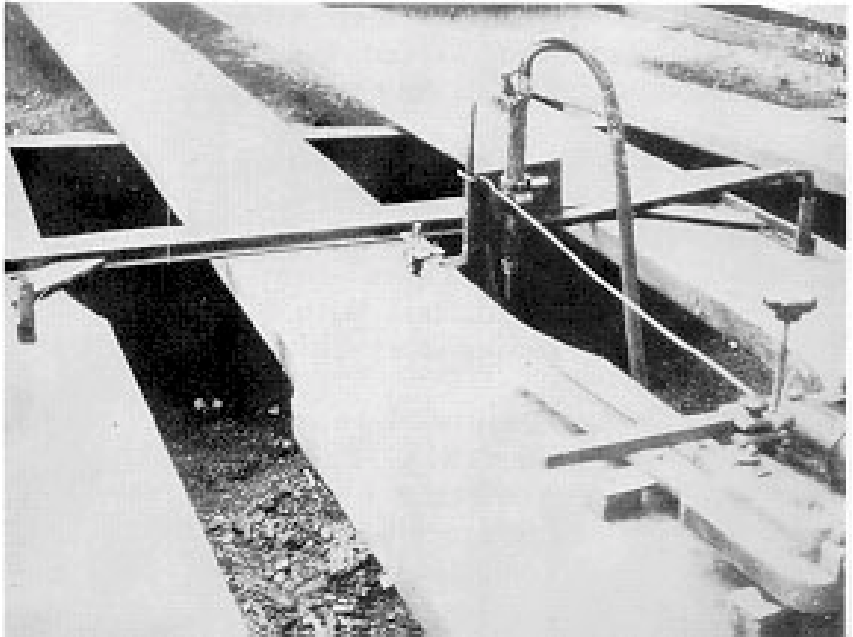


Application: Cutting transition radius on flange plates.

Process: Oxyfuel flame cutting.

Equipment: BUG-O Straightline Kit, 3-Hose Manifold, Rail mounted on customer's fixture.

Savings: Mechanized fixture produced smooth, uniform, accurate transition from narrow to wider flange with minimum finishing required.

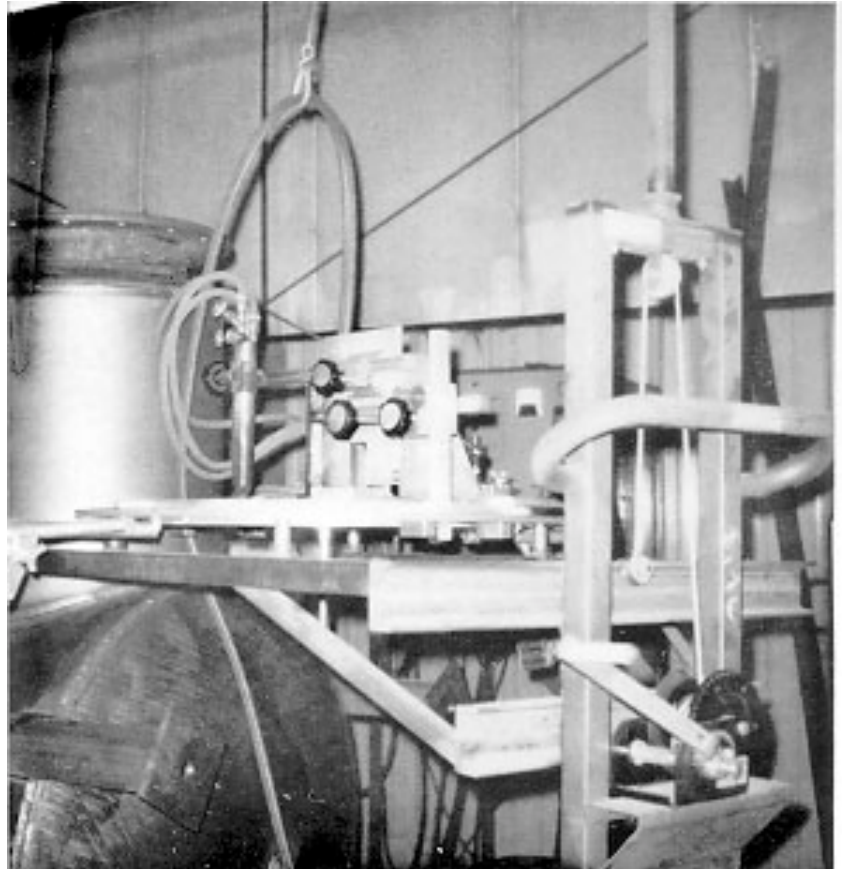


Application: Preparation for a weld around 18" to 72" (457 mm to 1829 mm) diameter tube-to-tube contour, in muffler fabrication.

Process: Oxyfuel flame cutting.

Equipment: CON-O mounted on customer's fixture.

Savings: Perfect fit-ups requiring only one pass to weld in the nozzle and only one operator to make the hole.

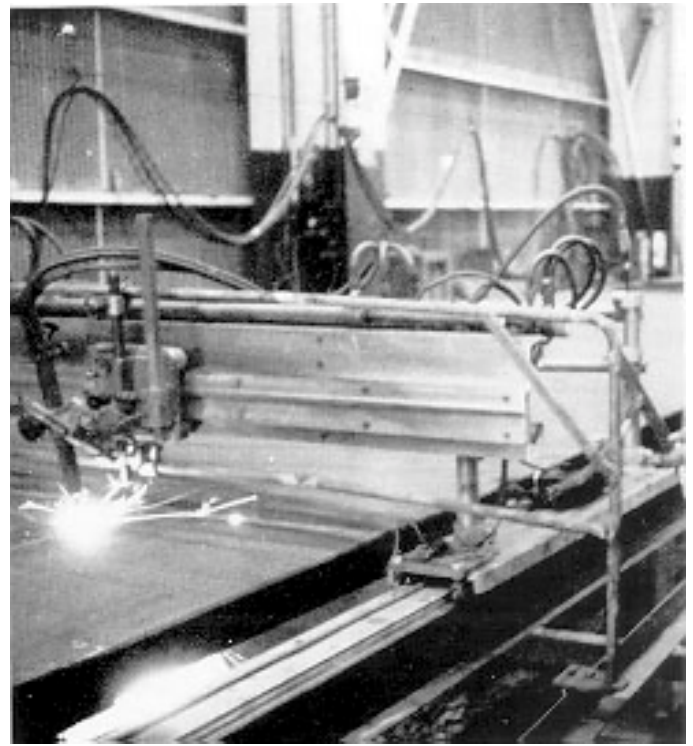
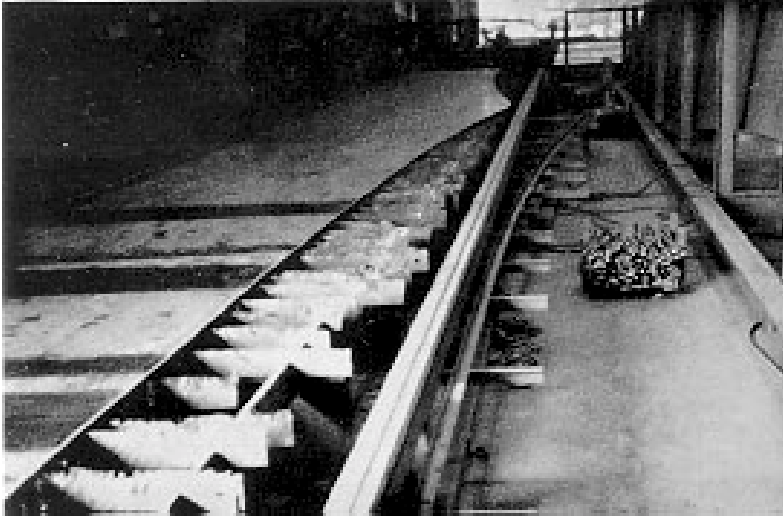


Application: Cutting fish belly webs for bridges.

Process: Oxyfuel cutting.

Equipment: MUG-O with template follower, 115 ft. (35 m) template by customer.

Savings: Eliminated 4 hours layout time, burning time reduced from 8 hours to 6 hours, saving 10 hours per girder.

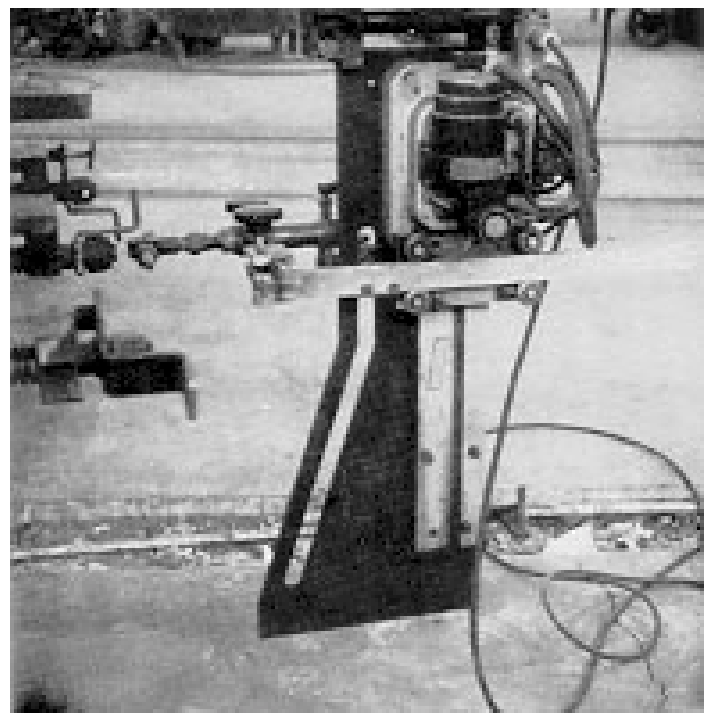
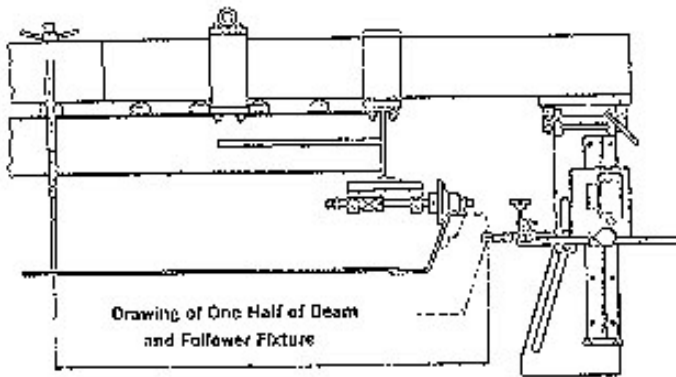


Application: Cut-outs for adding support gussets to increase width of railroad cars.

Process: Oxyfuel cutting.

Equipment: BUG-O Drives, Right Angle Rack, Rack Rider, Torchholder, Manifold, Heavy Duty Rail.

Savings: All gussets uniformly cut with little rework, precise car width established, new side sill easily installed, significant production increase and reduced manpower costs.

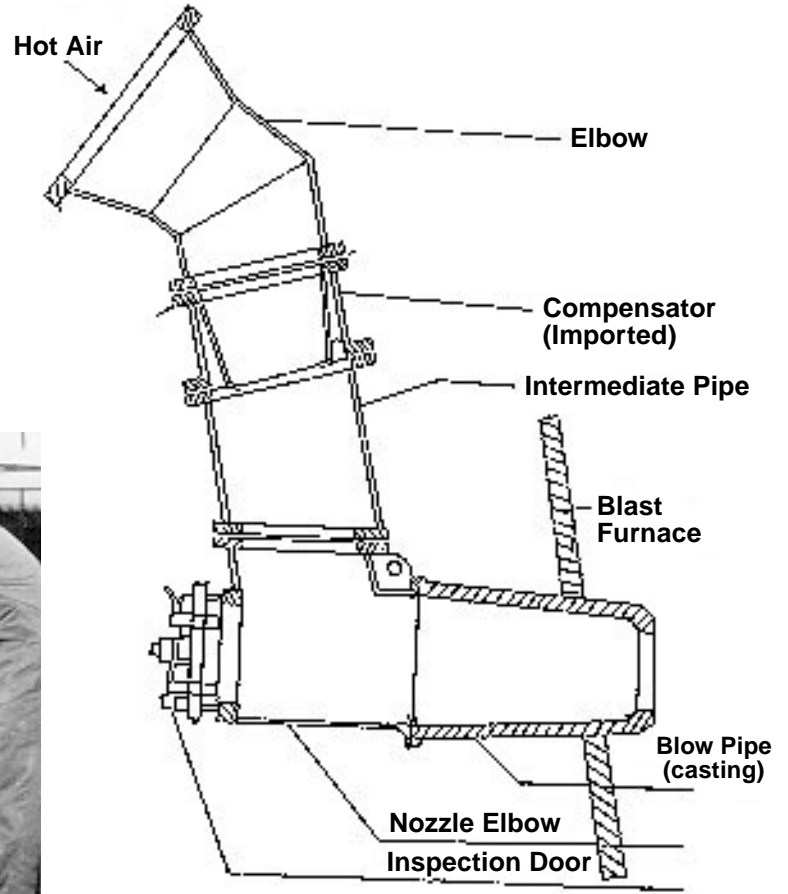


Application: Flame beveling tubular sections.

Process: Oxyfuel cutting.

Equipment: HOB-O

Savings: 72% over manual cutting, and eliminated grinding and repairing.

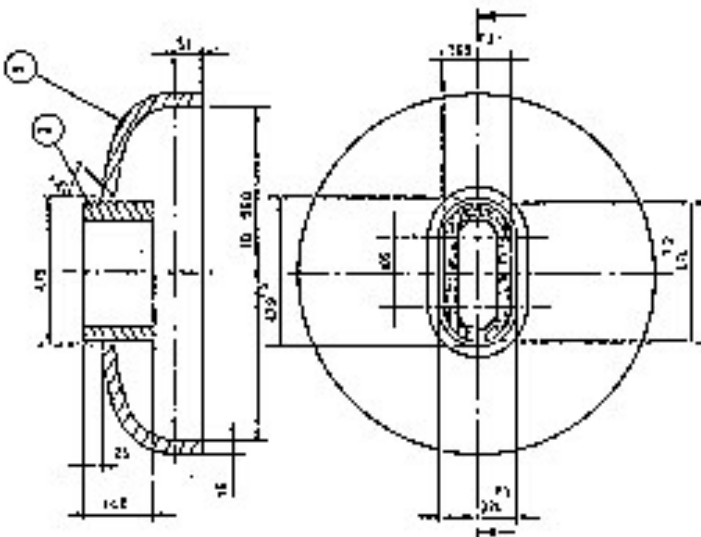
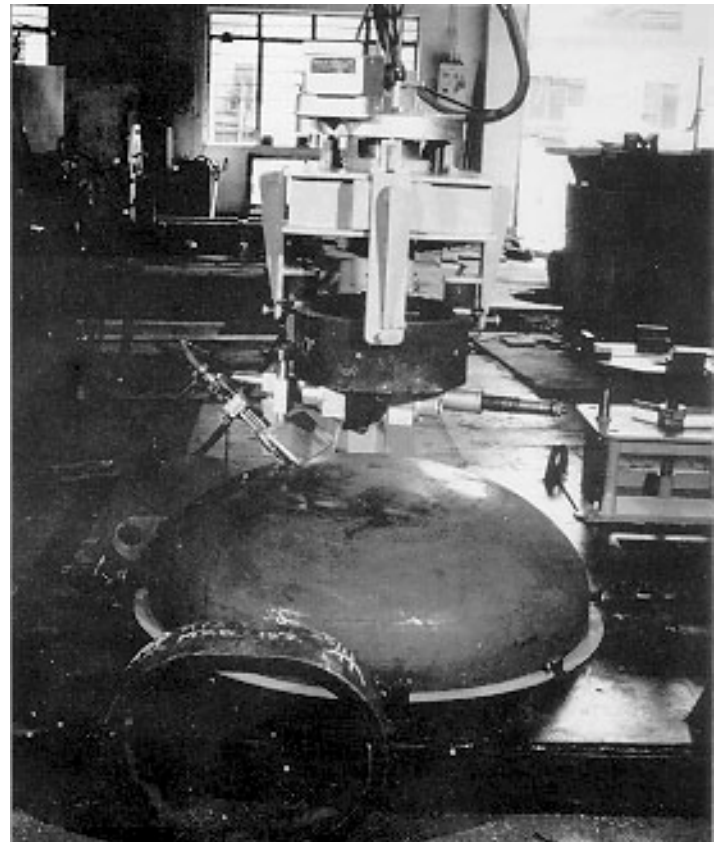


Application: Flame cutting elliptical holes.

Process: Oxyfuel cutting.

Equipment: HOB-O mounted on customer's fixture.

Savings: Flame cutting time increased ten times with semi-skilled operator.

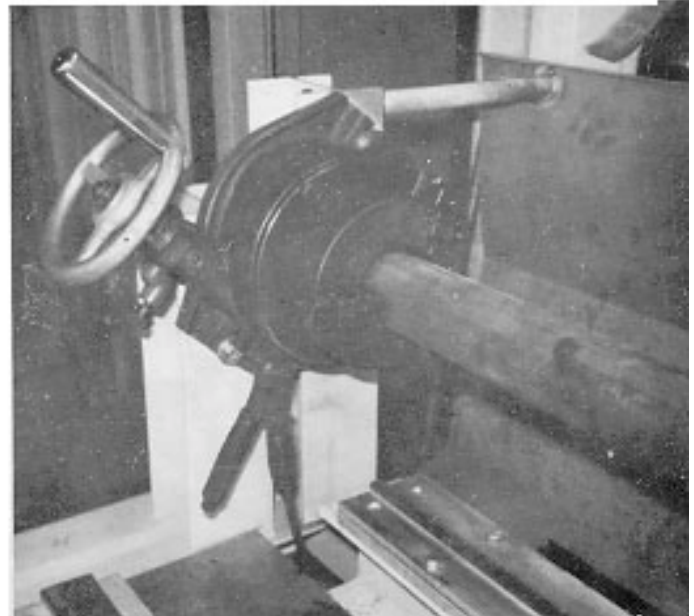
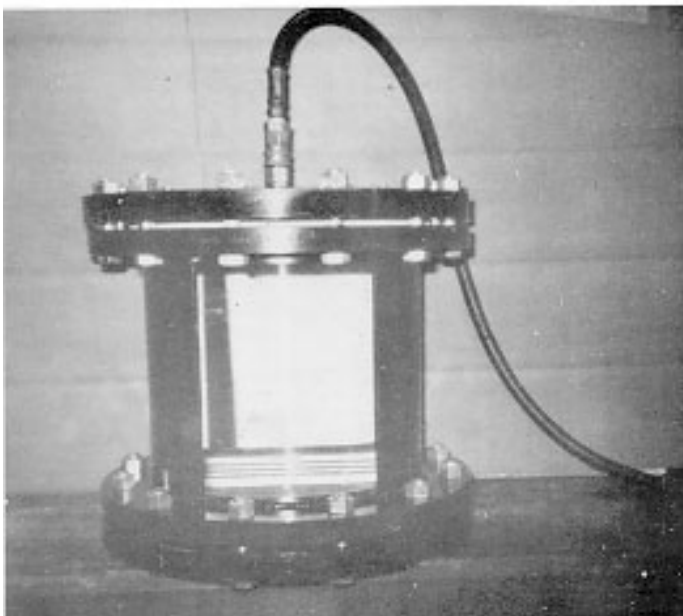
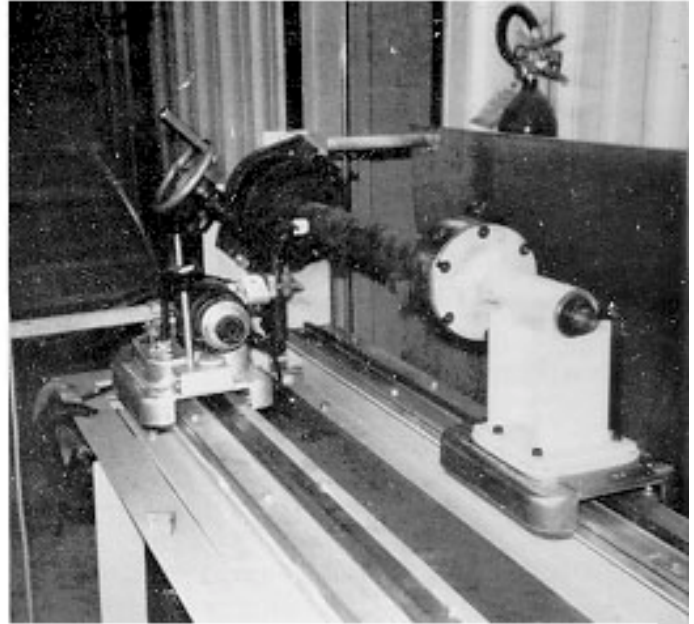
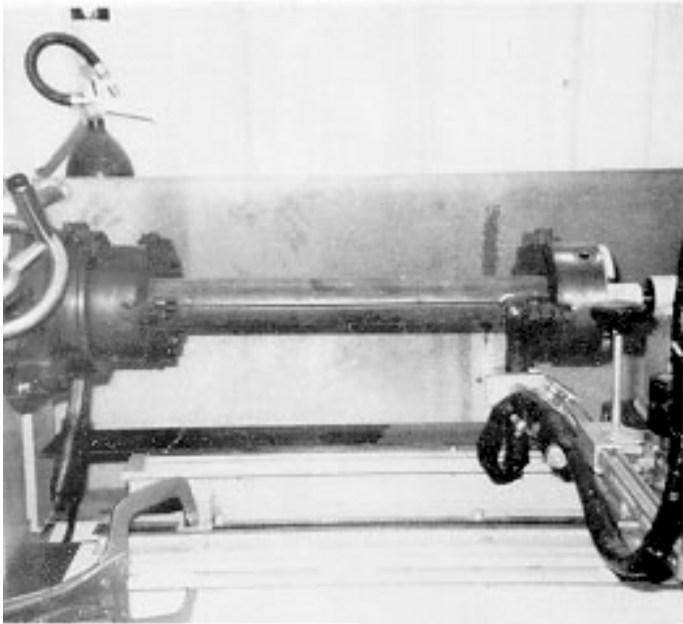
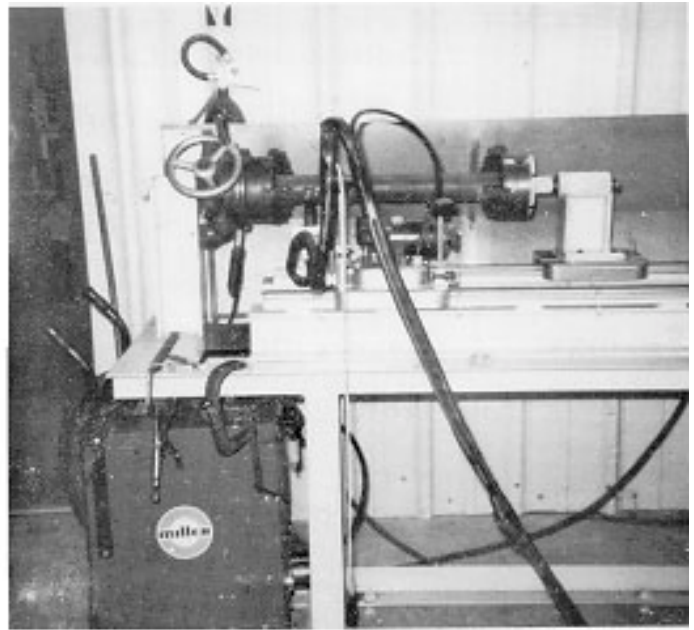


Application: Plasma cutting replaces milling operations.

Process: Plasma cutting.

Equipment: BUG-O DC III, trailer and rails.

Savings: 300% increase in production.

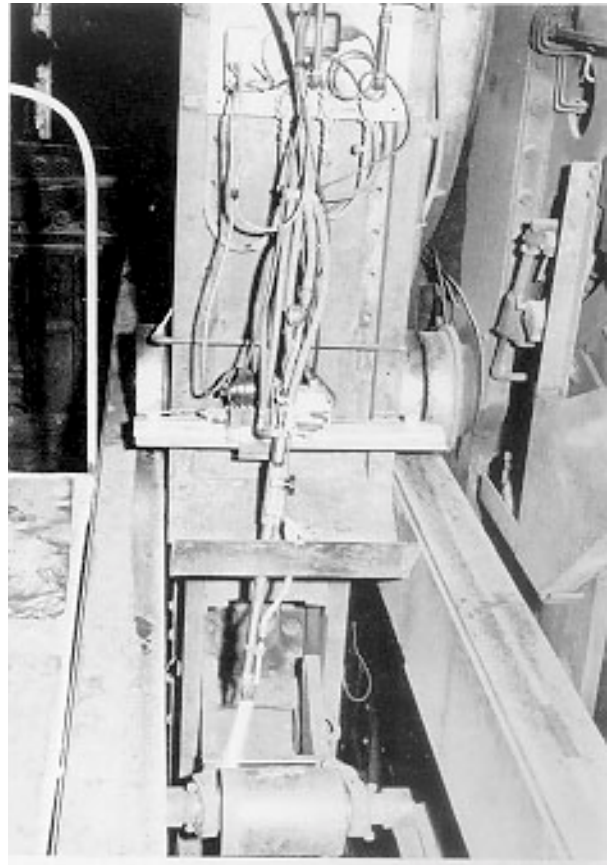
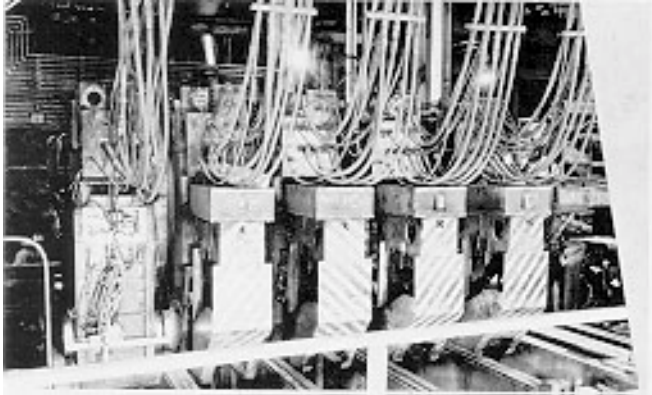


Application: Cutting billets on continuous strand caster.

Process: Oxyacetylene flame cutting.

Equipment: BUG-O DC IV with accessories and special controls mounted on customer's fixture.

Savings: Quality of cut improved eliminating shear-drag, production increased.

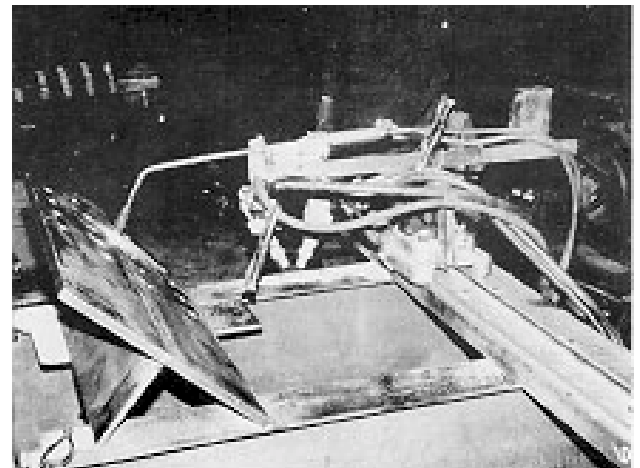
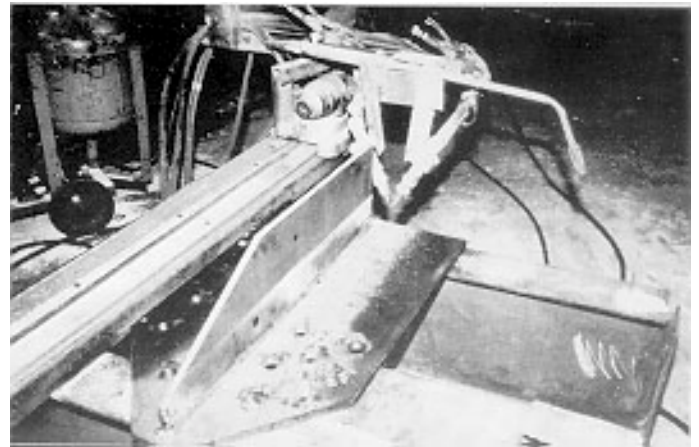


Application: Continuous welding of structural stiffeners.

Process: Semiautomatic sub arc welding oxyfuel heating.

Equipment: BUG-O General Welding Kit on customer's fixture.

Savings: High quality welds with minimum distortion saved 1300 man hours.





Applications

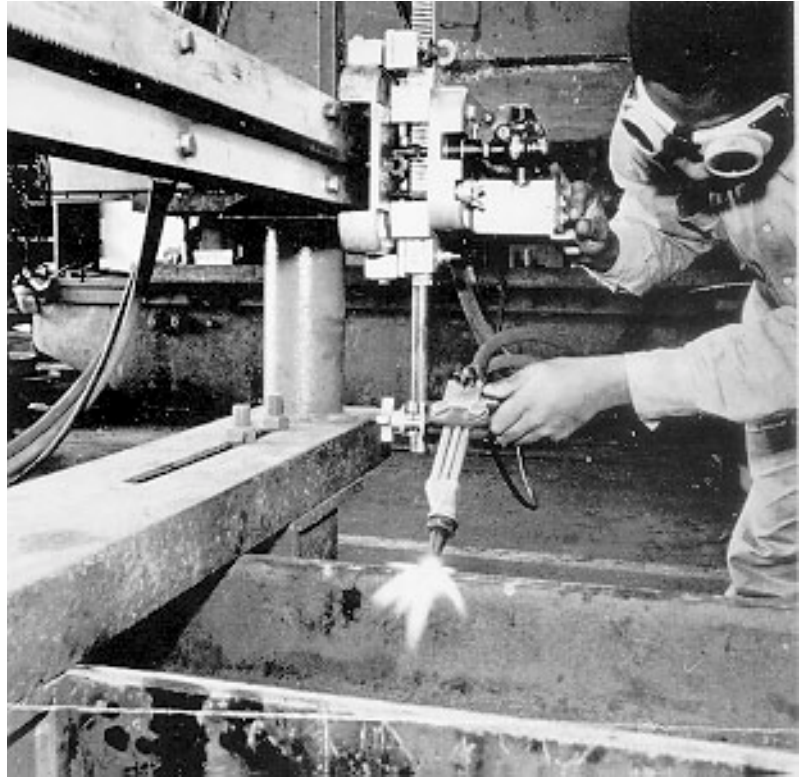
Beam / Column Cutting

Application: Fabricate "I" beams maintaining uniform length and square cut.

Process: Oxyfuel gas cutting.

Equipment: BUG-O General Welding Kit, Rack, Rackholders, Cam Clutch, modification to drive by customer.

Savings: Direct savings of 61% over manual cutting, reduction in handling, minimized grinding, touch-up and set up.

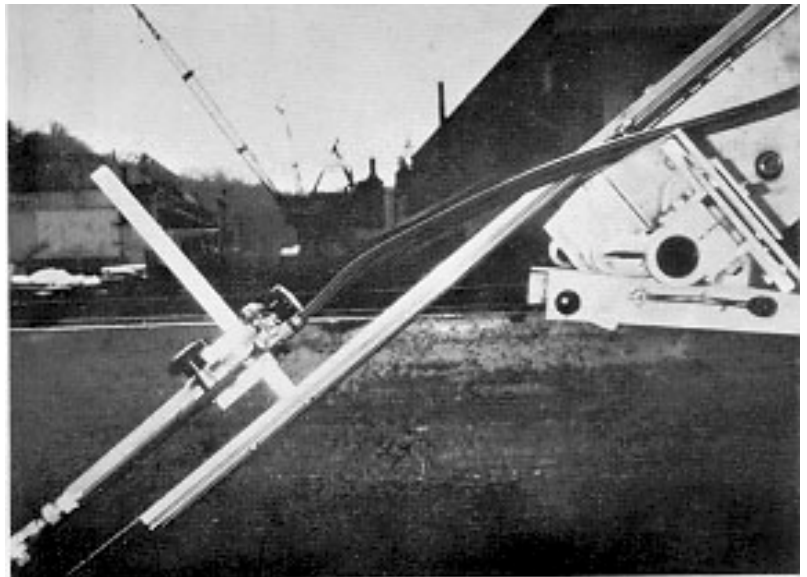


Application: Cut 580 angles on flange section of "I" beams.

Process: Oxyfuel machine burning.

Equipment: Beam Bug, Beam Rail, Special Rail on Vertical Travel, riser supplied by customer.

Savings: Achieved desired results with simple set up.

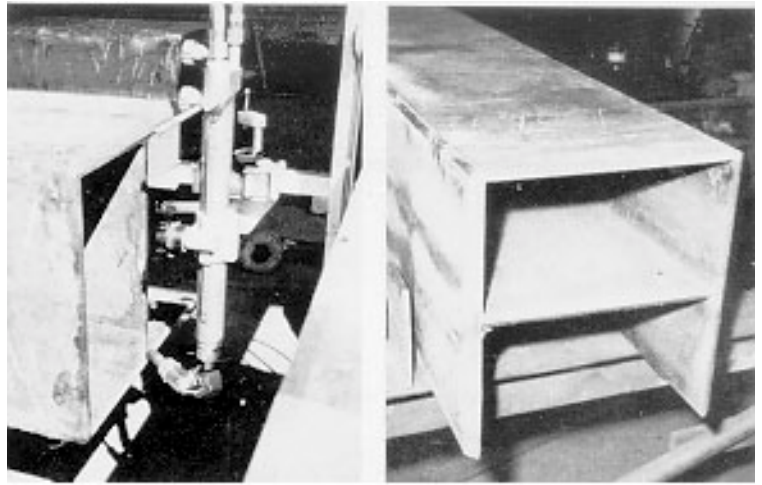


Application: Beveling lower ends of structural watertight columns.

Process: Oxyfuel flame beveling.

Equipment: Beam Bug mounted on tripod type jig designed by customer.

Savings: Time reduced from 1.4 hours to 18 minutes, plus achieving high accuracy.

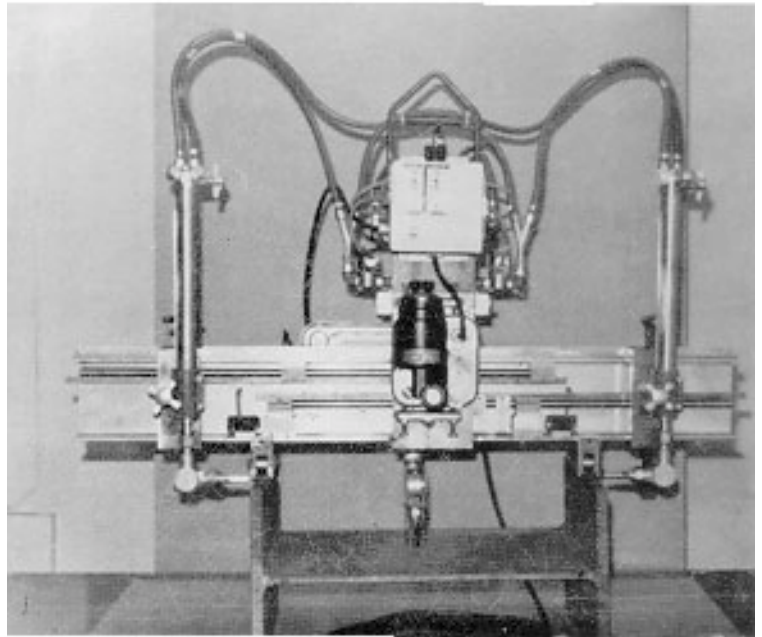


Application: Mechanize cutting of both flanges and web of heavy beam sections simultaneously.

Process: Oxyfuel gas cutting.

Equipment: Customer designed machine made from BUG-O Drive Unit, Rail, Limit Switches, Racks, Rack Riders and Torchholders.

Savings: Production increased eight to ten-fold due to reduced layout time, cutting time and elimination of grinding.

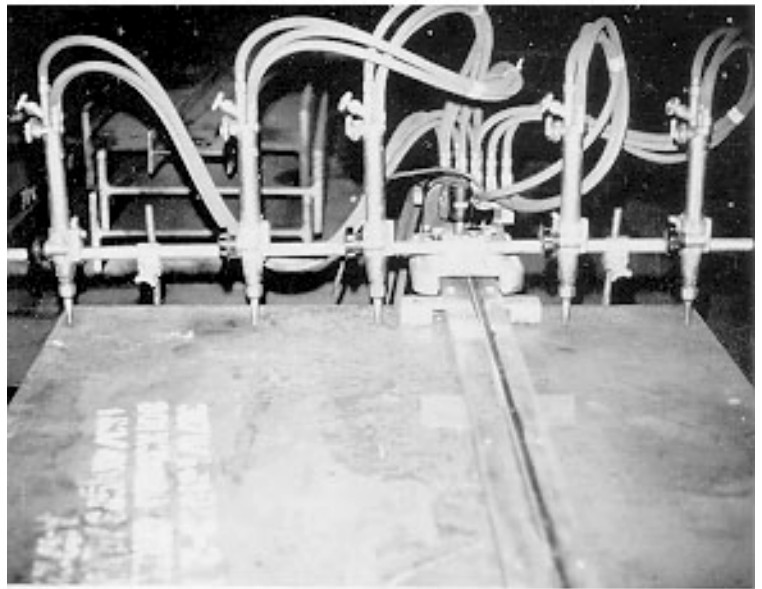


Application: Stripping 1-3/4" (45 mm) and 2-3/4" (70 mm) plate to fabricate box columns — 4 pieces per plate.

Process: Oxyfuel gas cutting.

Equipment: BUG-O DC III Rail, 53" (1346 mm) Aluminum Bar, Torchholders with clamps, two panograph wheels.

Savings: Strips distortion-free, minimal cleanup before assembly.





Applications

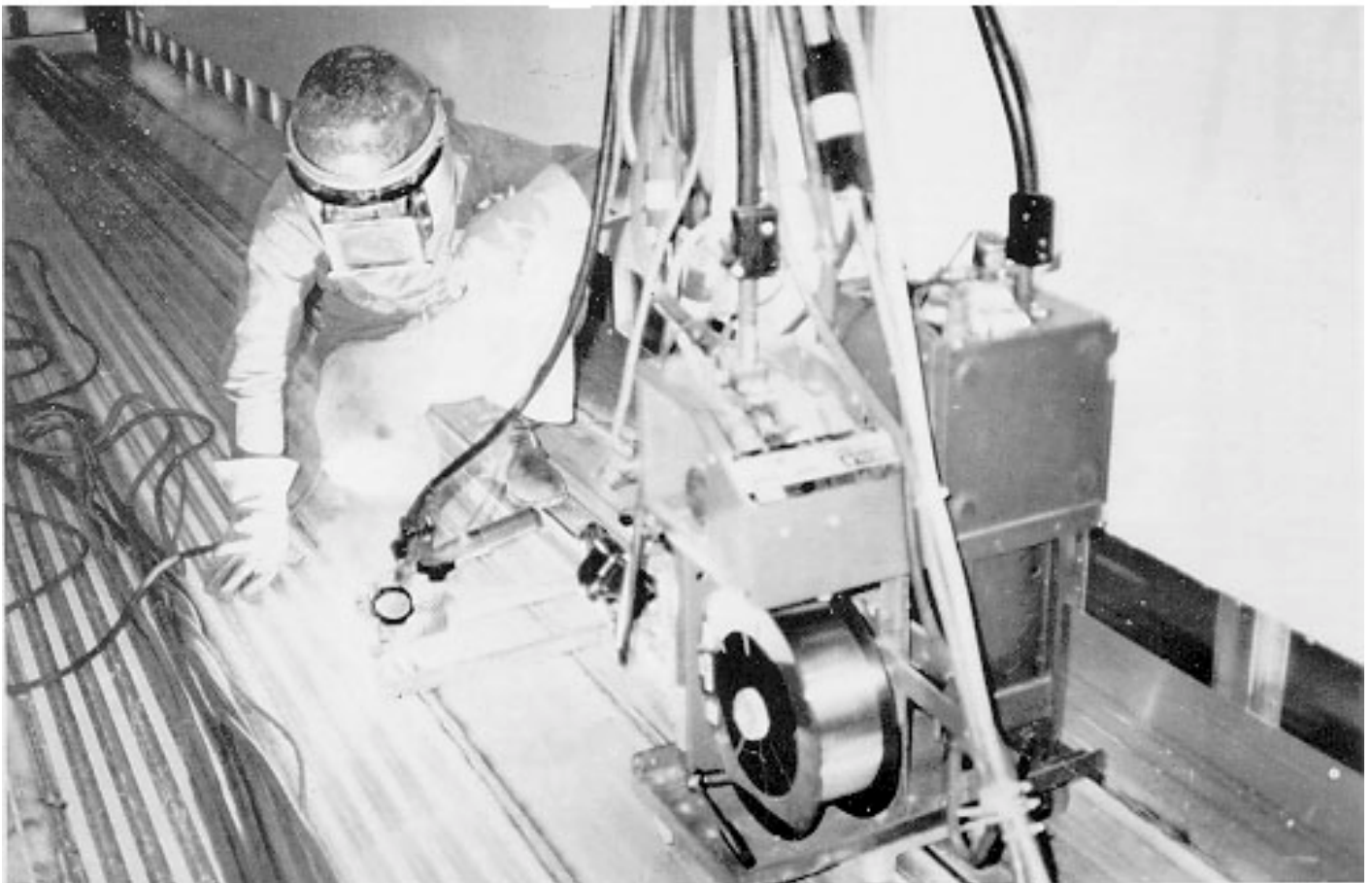
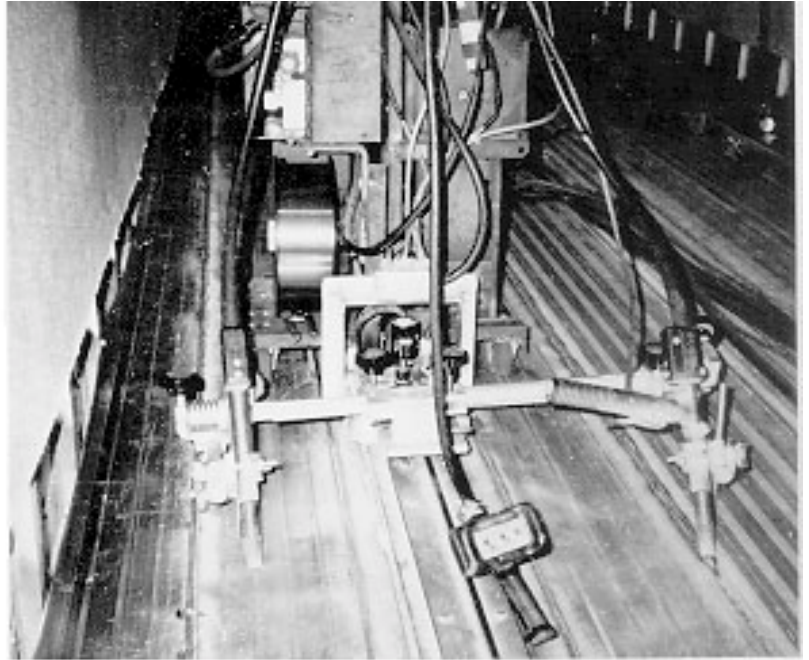
GMAW / MIG / TIG / FCAW Welding

Application: Continuous welds on aluminum truck trailer bodies 45 ft. (15 m) long.

Process: MIG welding.

Equipment: BUG-O General Welding Kit with accessories supplied by customer.

Savings: 300% over manual welding.

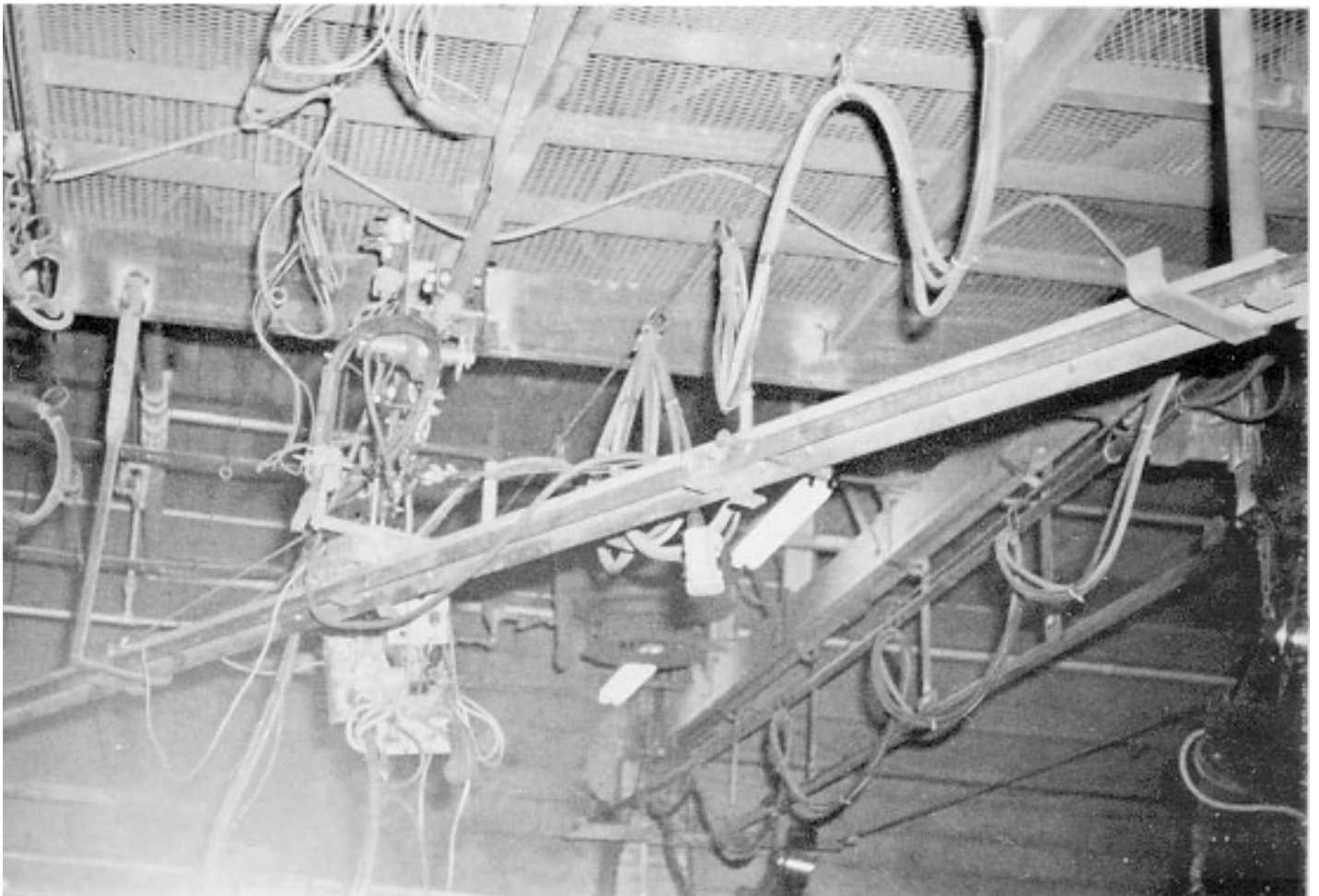
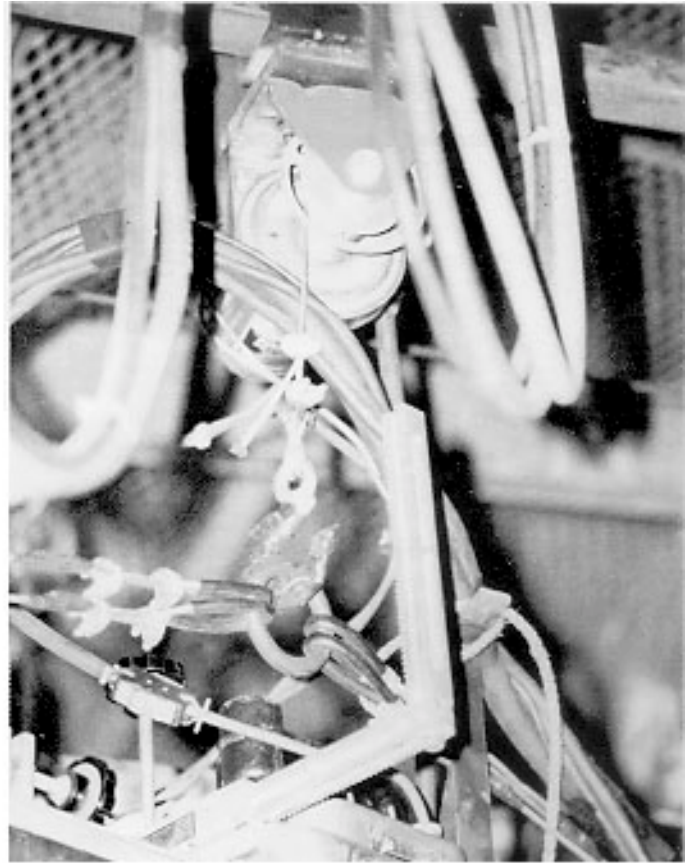


Application: Fabricating steel dump truck bodies.

Process: Flux Cored arc welding.

Equipment: BUG-O General Welding Kit with extra lengths of rail on customer's fixture.

Savings: Increased speed and deposition rates, reduced welding time 700%.

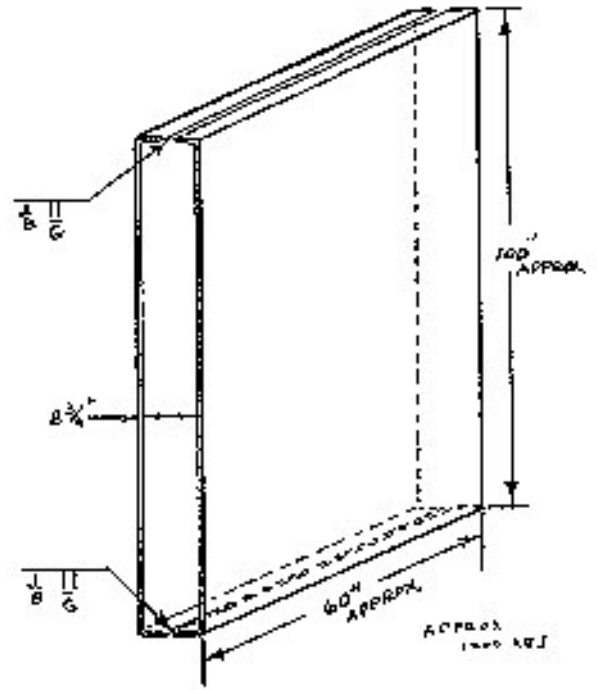
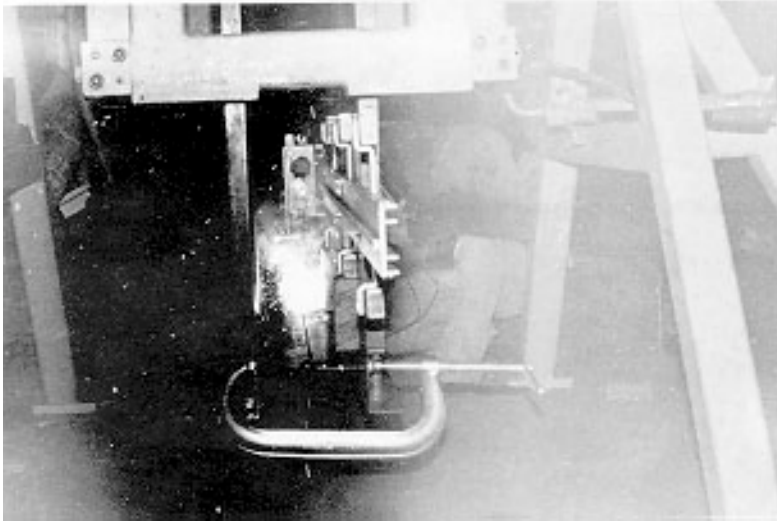


Application: Weld inside narrow box section.

Process: MIG welding.

Equipment: SKUTER with pendant control, torch mounts, low profile magnets and ARR-rails.

Savings: 4-1/2 hours per weldment.

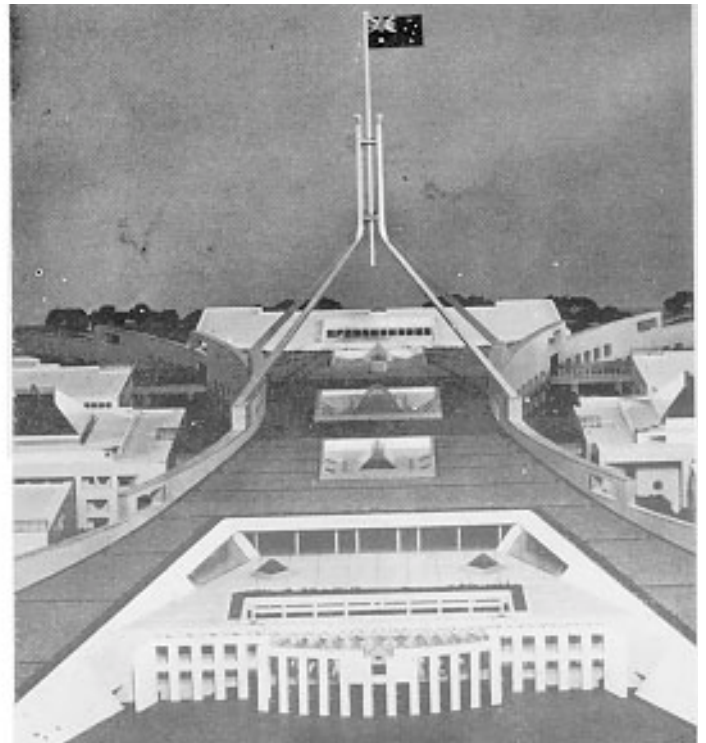


Application: Weld inside triangular stainless steel section to make legs for flagmast.

Process: MIG welding.

Equipment: BUG-O General Welding Kit.

Savings: Mechanization increased speed and accuracy of welding and reduced distortion to a minimum.

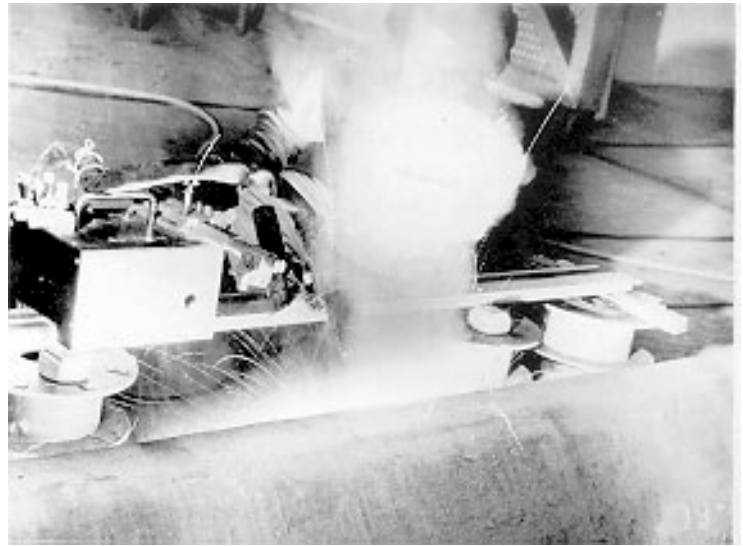


Application: Hardfacing beams for dolomite crusher preheated to 212° F. (100° C.)

Process: Flux cored arc welding.

Equipment: GO-FER II with rail and magnets.

Savings: 35 hours per beam over manual welding.

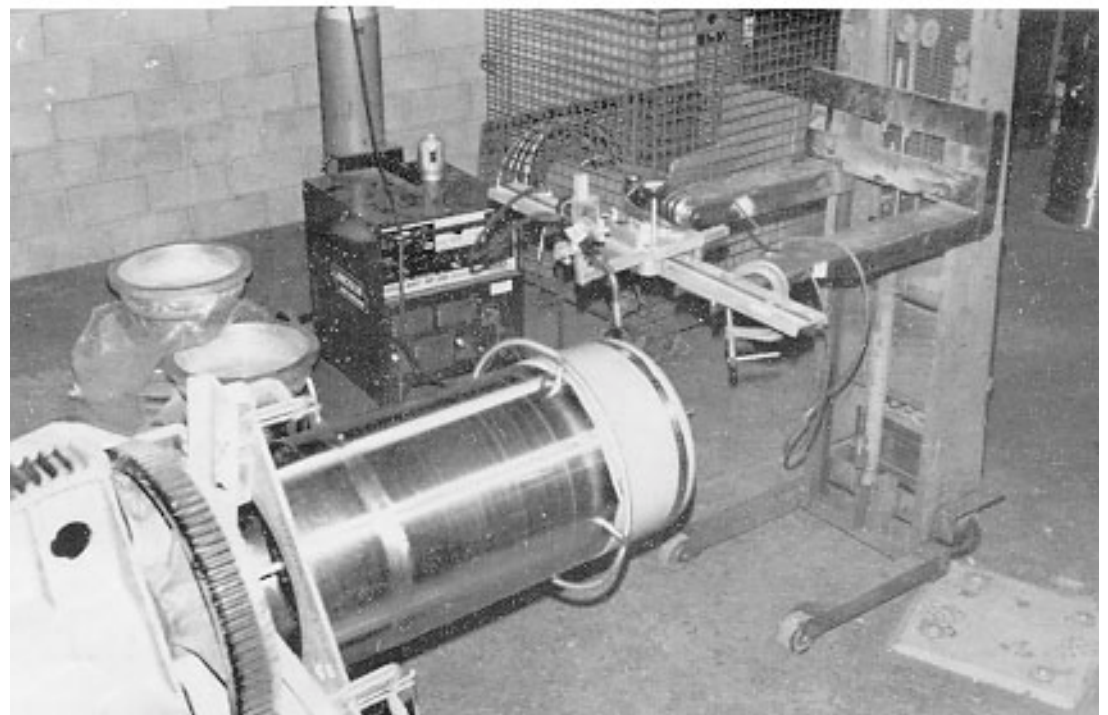


Application: Building 30 gallon (113 liter) vessels to ASME code.

Process: MIG welding.

Equipment: BUG-O General Welding Kit.

Savings: High quality job produced ahead of schedule with minimum distortion and zero defects.

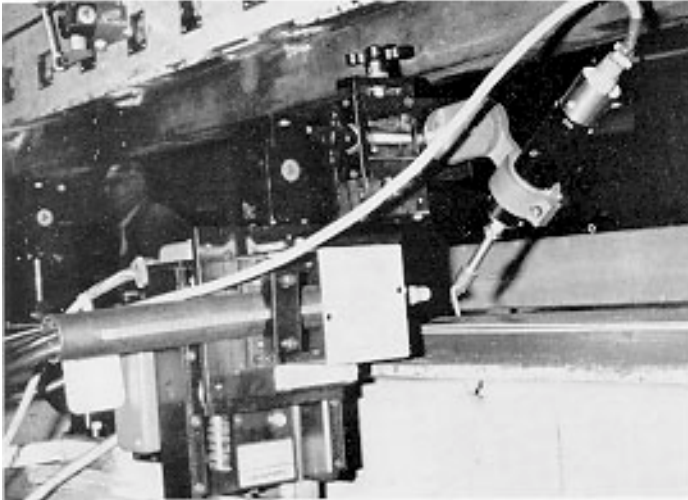
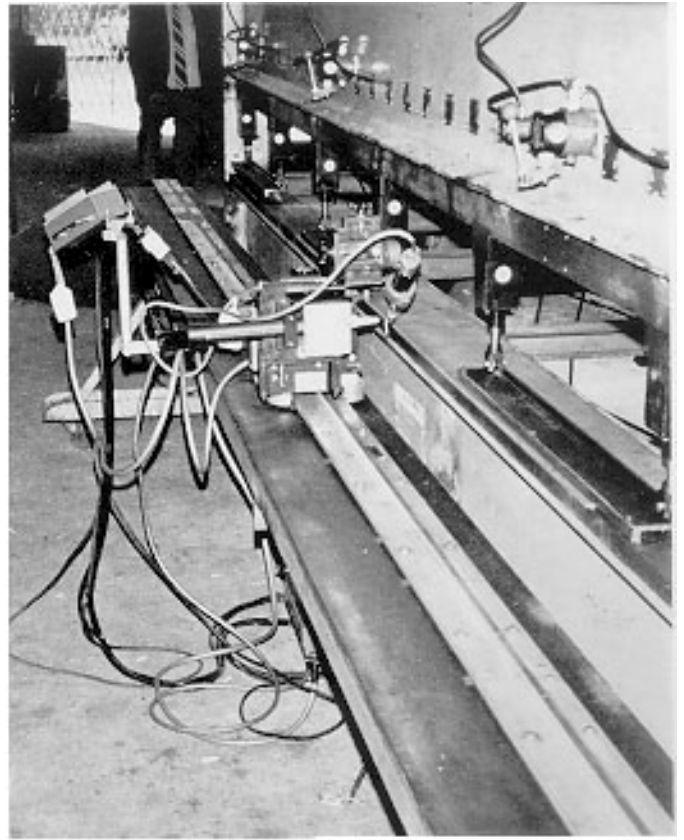


Application: Fabrication of stainless steel condenser panels.

Process: MIG welding.

Equipment: BUG-O DC IV with seam tracker mounted on customer's fixture.

Savings: Welding speed increased 400% without defects.

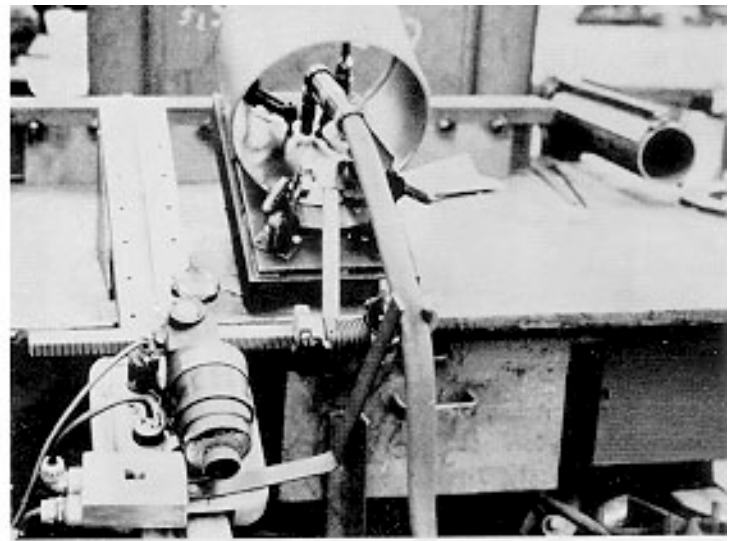
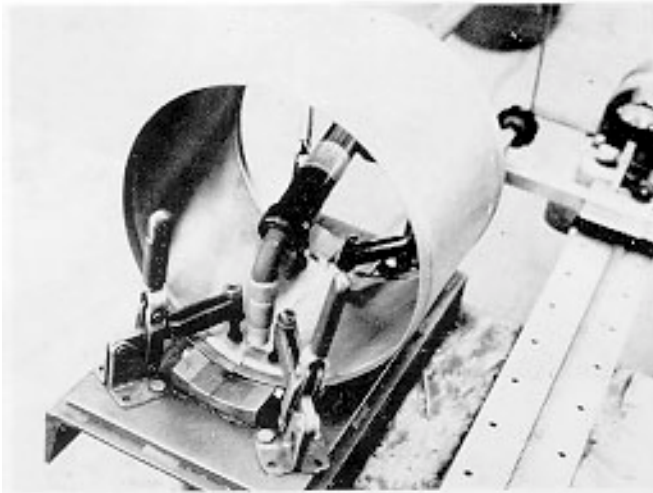


Application: Welding 12" (304 mm) diameter bag collars for dust collection equipment.

Process: MIG welding.

Equipment: BUG-O General Welding Kit.

Savings: 100% penetration, 3 times faster than manual welding, excellent quality.

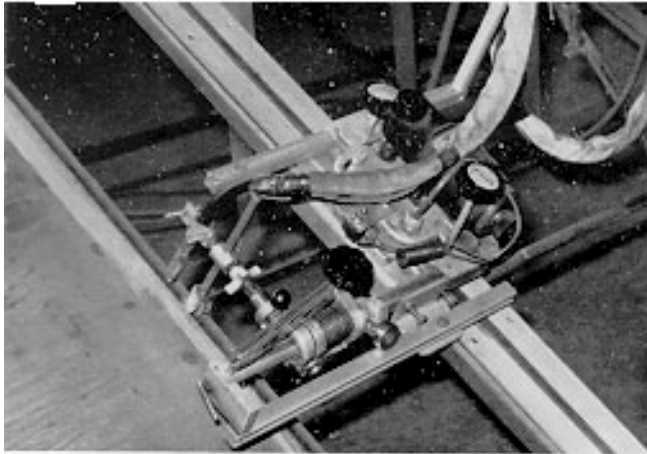
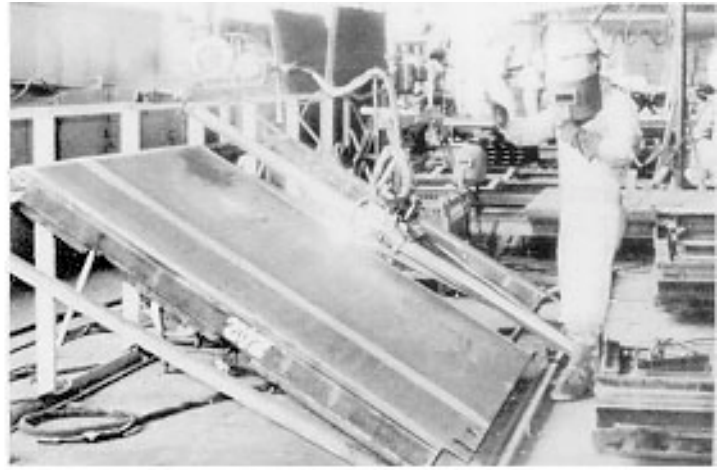


Application: Welding sides of railway cars.

Process: MIG welding.

Equipment: BUG-O General Welding Kit.

Savings: Uniform bead appearance and size, minimum distortion, little grinding and increase in production.

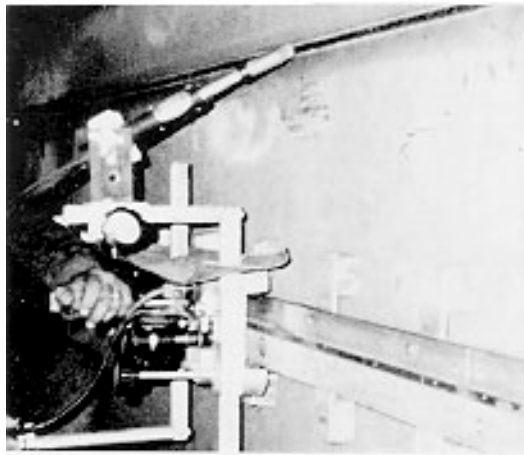


Application: Overhead welding on bridge crane girder to increase capacity.

Process: MIG welding.

Equipment: BUG-O General Welding Kit.

Savings: Fast, consistent welds with minimum distortion and without operator fatigue.

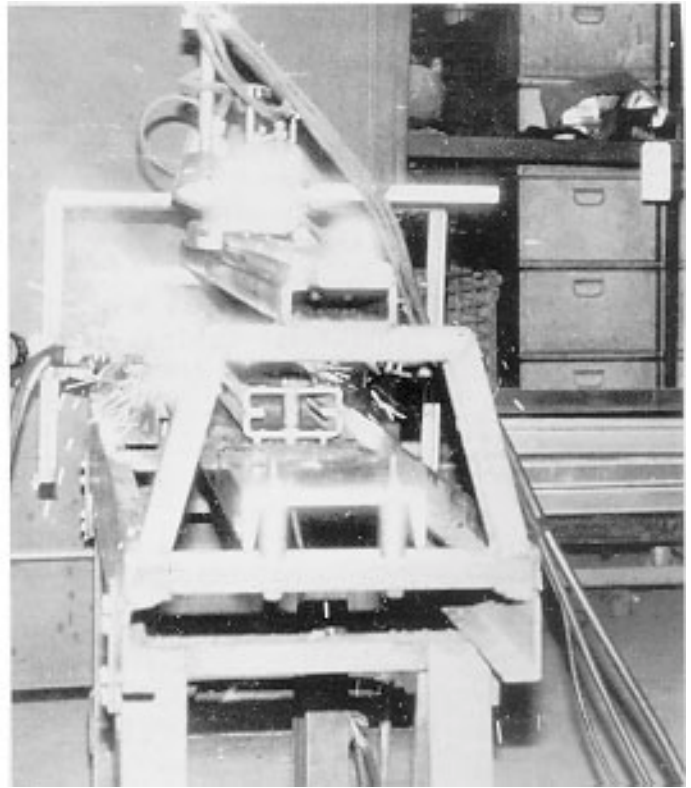
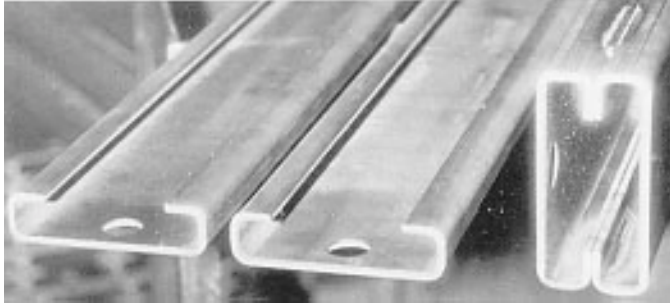


Application: Intermittent (skip) welding on box sections.

Process: Flux cored arc welding.

Equipment: BUG-O Skip Welder, rail, double torch mounting group and cable anchor mounted on customer's fixture.

Savings: 150 man hours per month (investment recovered in 2 months).

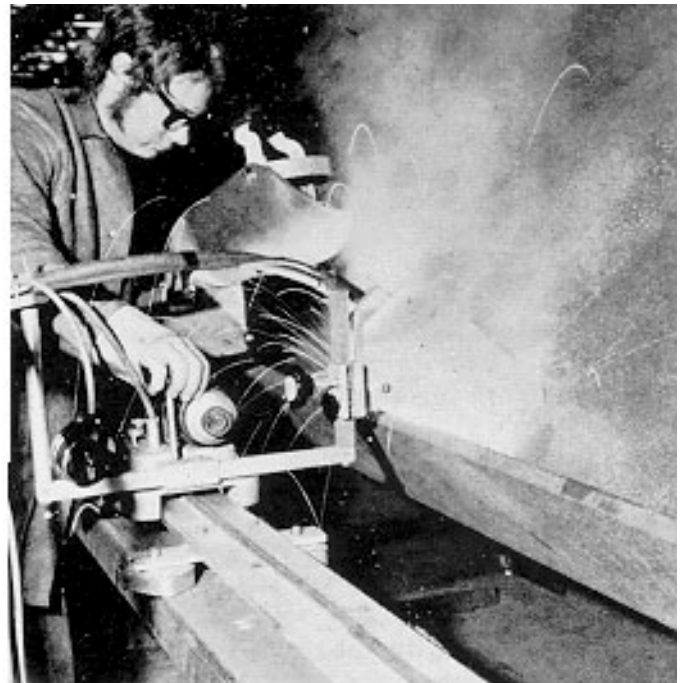
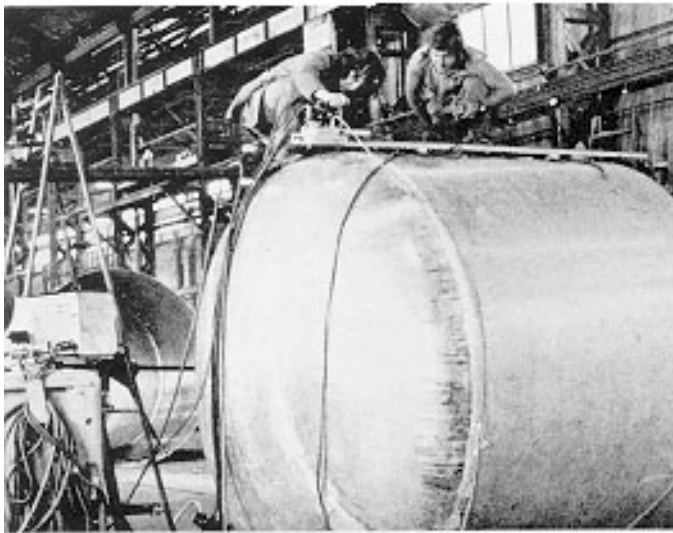


Application: Fabrication of aluminum railway tank cars.

Process: MIG welding.

Equipment: BUG-O General Welding Kit.

Savings: 300% increase in production.

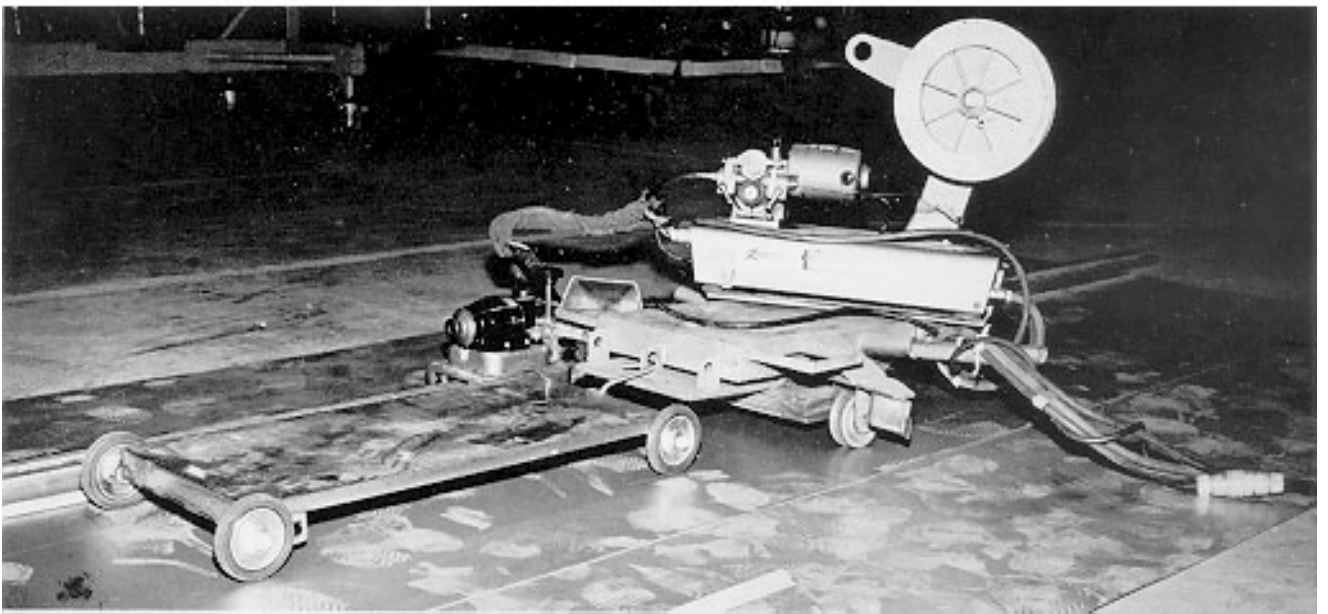


Application: Welding cooling coils on stainless steel tanks.

Process: MIG welding.

Equipment: BUG-O Heavy Duty Welding Kit plus customer's wire feeder and operator.

Savings: Improved quality with substantial savings — welded 40 ft. (12 m) in 20 minutes.

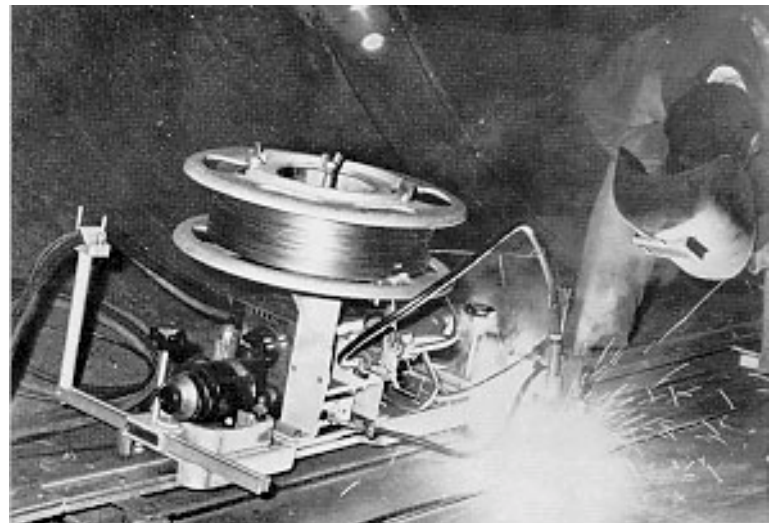


Application: Fabricating double shelled cylinders for ore reclaimer modules.

Process: Flux cored GMA.

Equipment: BUG-O Heavy Duty Welding Kit, wire feeder mounted by customer.

Savings: Substantially increased production.

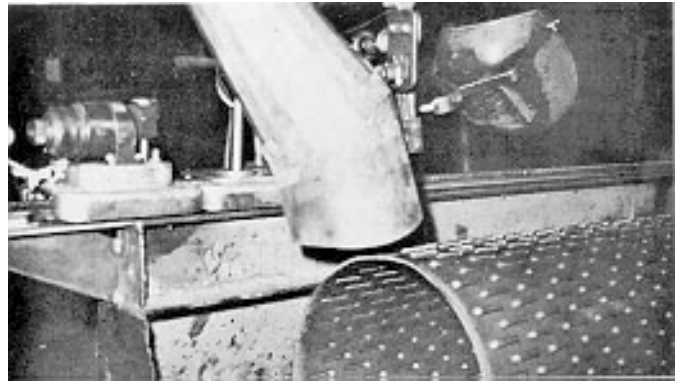


Application: Making long seam welds on well screen.

Process: MIG welding.

Equipment: BUG-O Heavy Duty Welding Kit.

Savings: Unskilled operator welds 800 ft. (244 m) per day, 5 days a week.

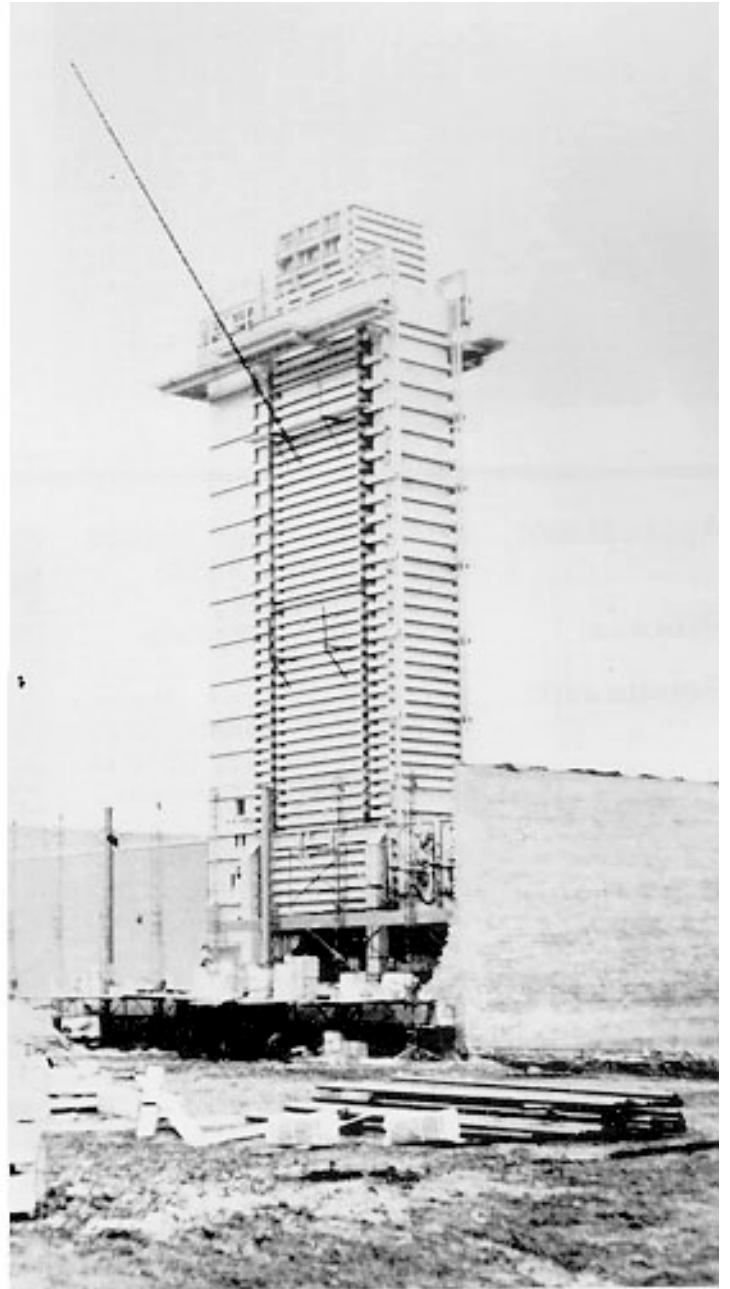


Application: Welding "In-Can" sterilizer towers up to 70 ft. (21 m) high.

Process: Flux cored arc welding.

Equipment: BUG-O General Welding Kit.

Savings: Mechanization increased production 300% with no operator fatigue and no distortion.

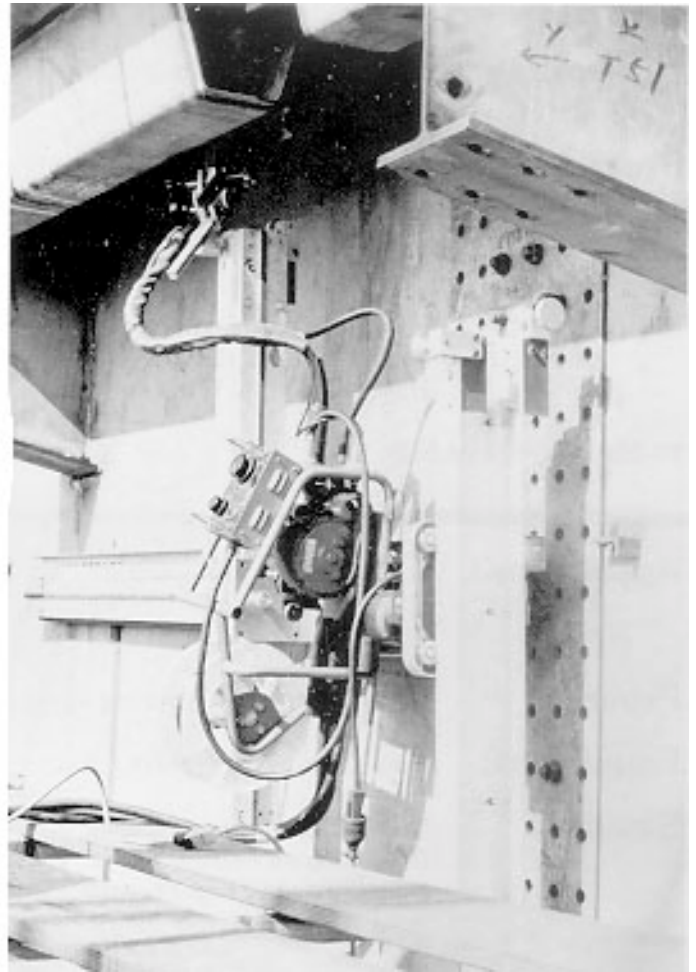


Application: Fabrication of large orthotropic bridge girders.

Process: MIG welding.

Equipment: BUG-O Heavy Duty Welding Kit, two spotting carriages, rails and torchholder, mounted on customer's fixture.

Savings: 40% increase in production rate.



Application: Welding half-pipe sections onto a pipeline barge.

Process: Flux cored arc welding.

Equipment: BUG-O Heavy Duty Welding Kit, double torch mounting group, special trailer made by customer.

Savings: Production increased 16 times — 180 ft. (27 m) welded in one hour.

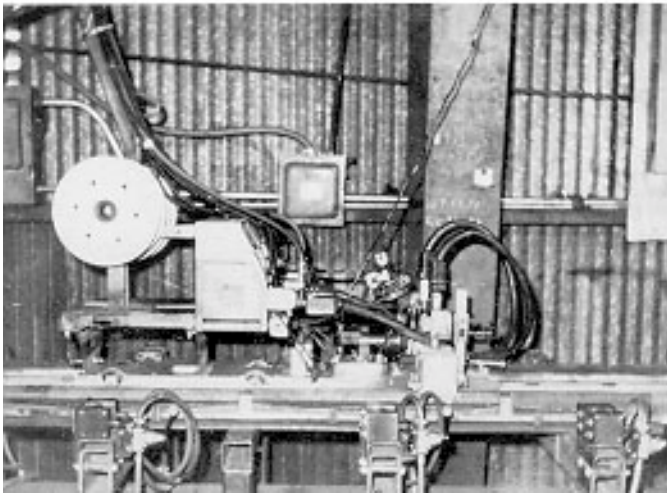
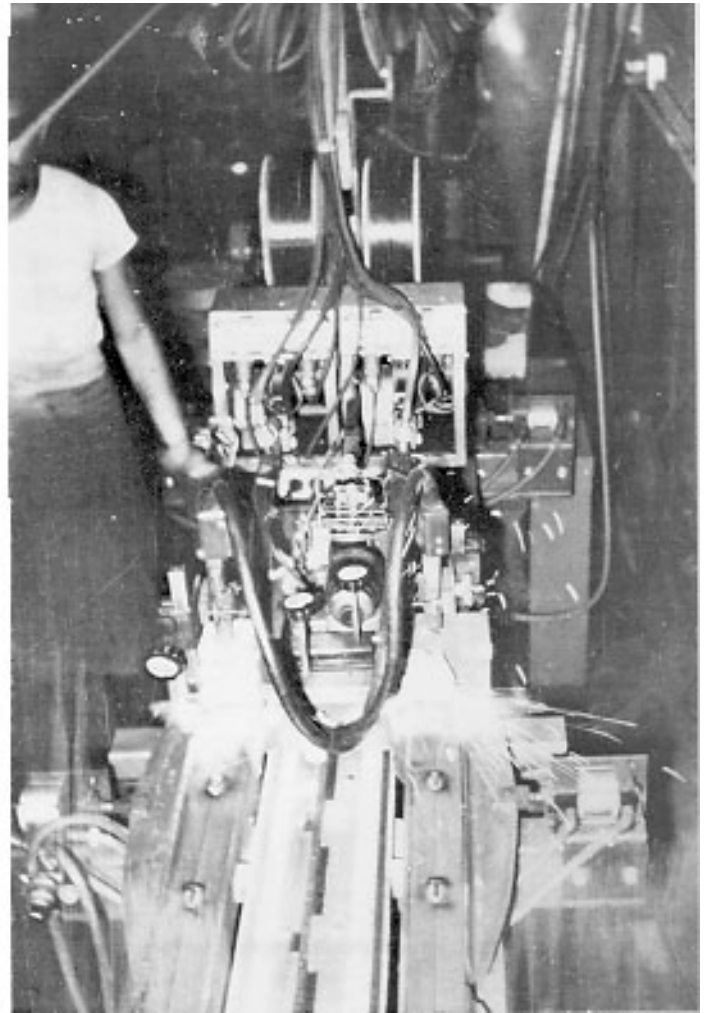


Application: Fabrication of center sills for boat trailers.

Process: Flux cored arc welding.

Equipment: BUG-O Skip Welding Kit and Rail.

Savings: Equipment cost \$200,000 less than custom machine and increased production four times over manual welding.

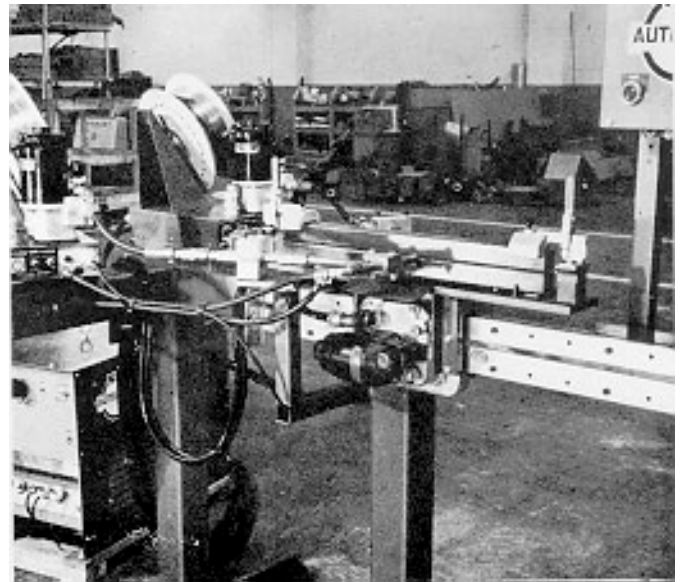


Application: Intermittent (skip) welding of two small box sections — the work is moved past the welding guns.

Process: MIG welding.

Equipment: BUG-O Skip Welding Kit, fixture made by customer.

Savings: Welding speed increased to 42 inches (1.06 m) per minute.

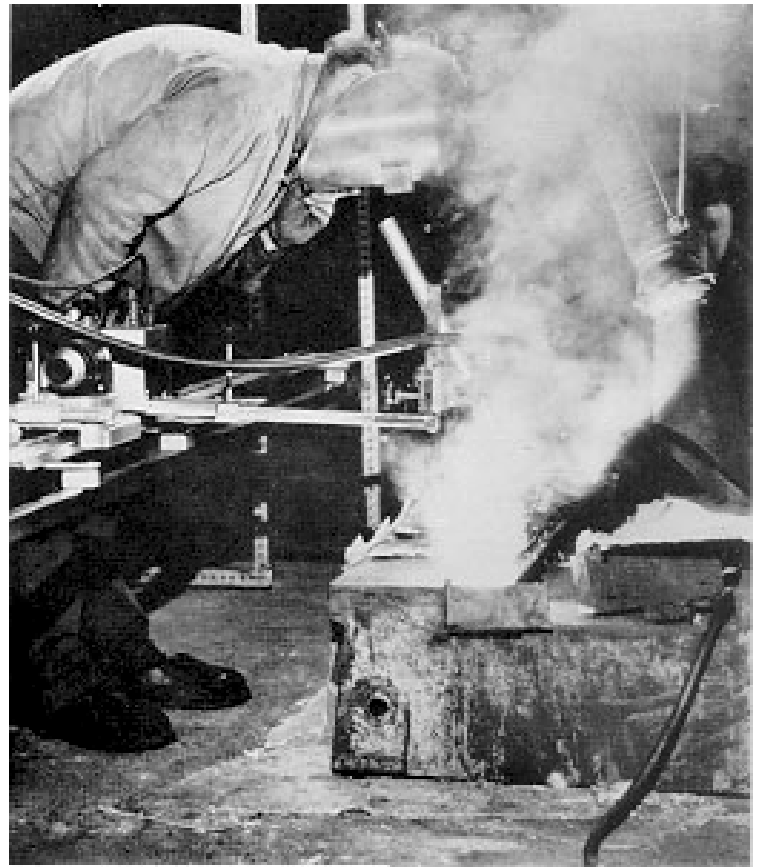


Application: Rebuilding sow blocks on forging hammers (high preheat).

Process: MIG welding.

Equipment: BUG-O Speed Weaving Kit mounted on customer's fixture.

Savings: 17.3 man hours saved on each sow block.

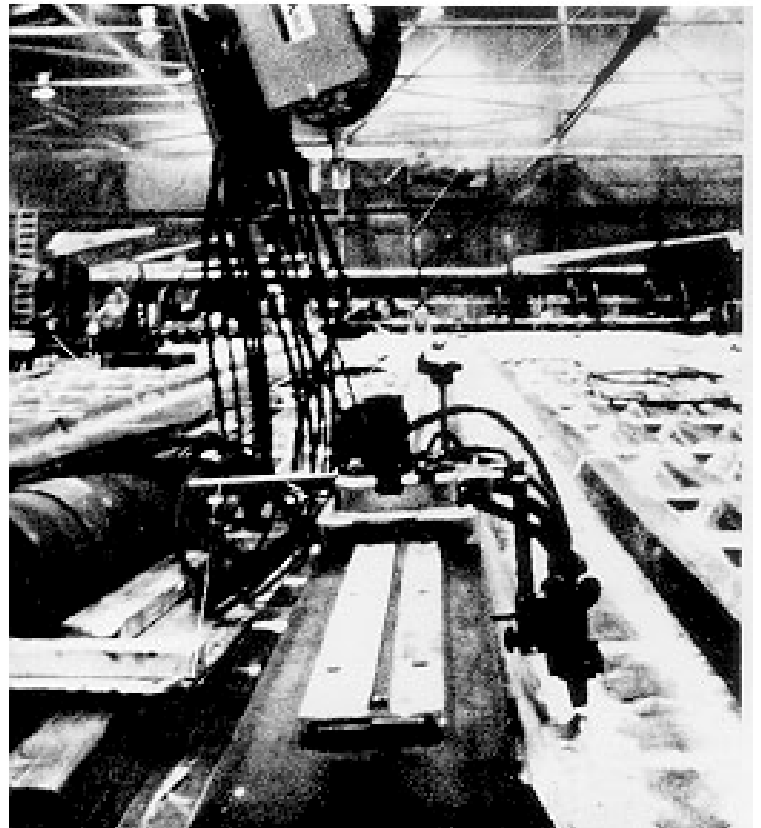


Application: Welding of corrugated aluminum panels for ship construction.

Process: MIG welding.

Equipment: BUG-O Heavy Duty Welding Kit.

Savings: Mechanization provided 95% x-ray perfect welds with minimum distortion and saved 1500 man hours per year.

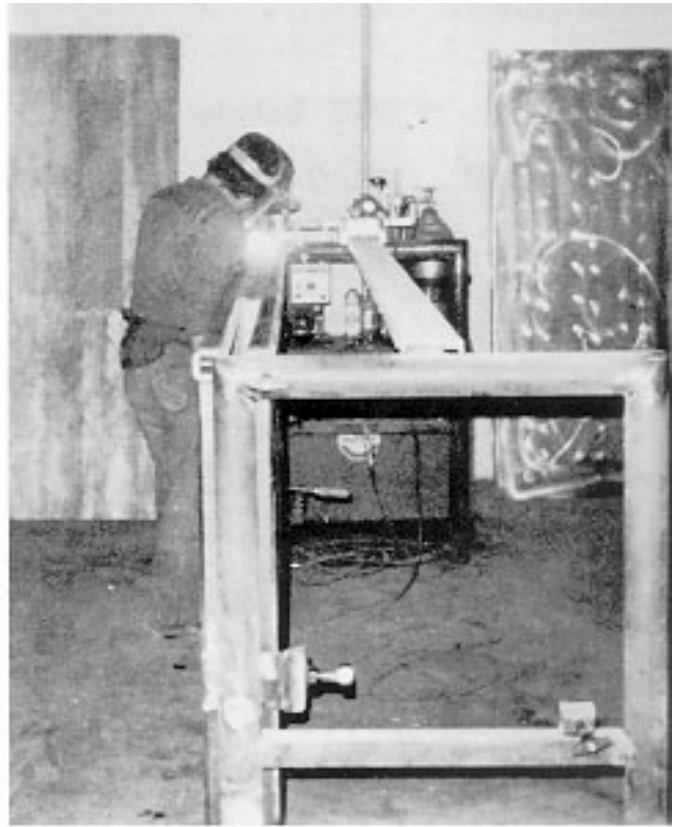
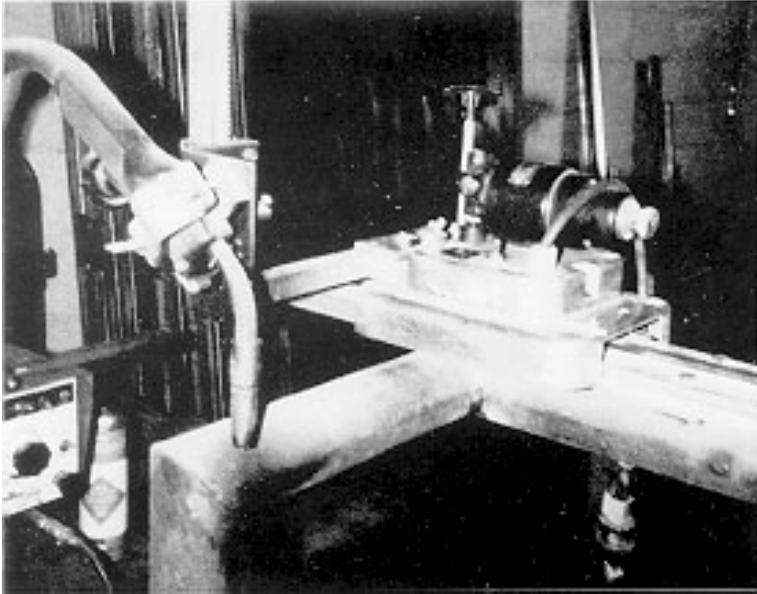


Application: Fabrication of hollow metal doors.

Process: MIG welding.

Equipment: BUG-O General Welding Kit, fixture made by customer.

Savings: Mechanization doubled production.



Application: Welding vertical seams on cold boxes for air separation plant.

Process: MIG welding.

Equipment: BUG-O General Welding Kit.

Savings: Reduced welding time 25% and drastically lowered maintenance costs.

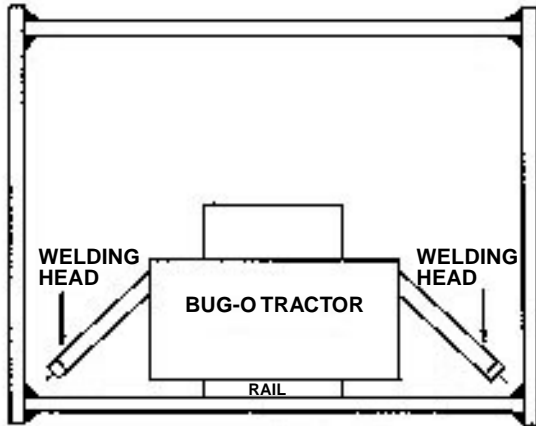
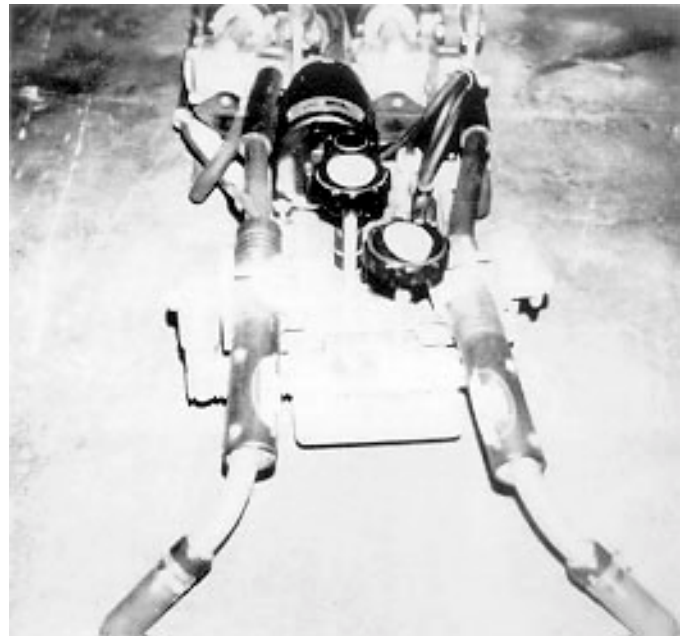


Application: Fabricating long box sections for crane girders.

Process: MIG welding.

Equipment: BUG-O Heavy Duty Welding Kit, Double Torch Mounting Group.

Savings: High speed with minimum distortion exceeded ultrasonic testing requirements.

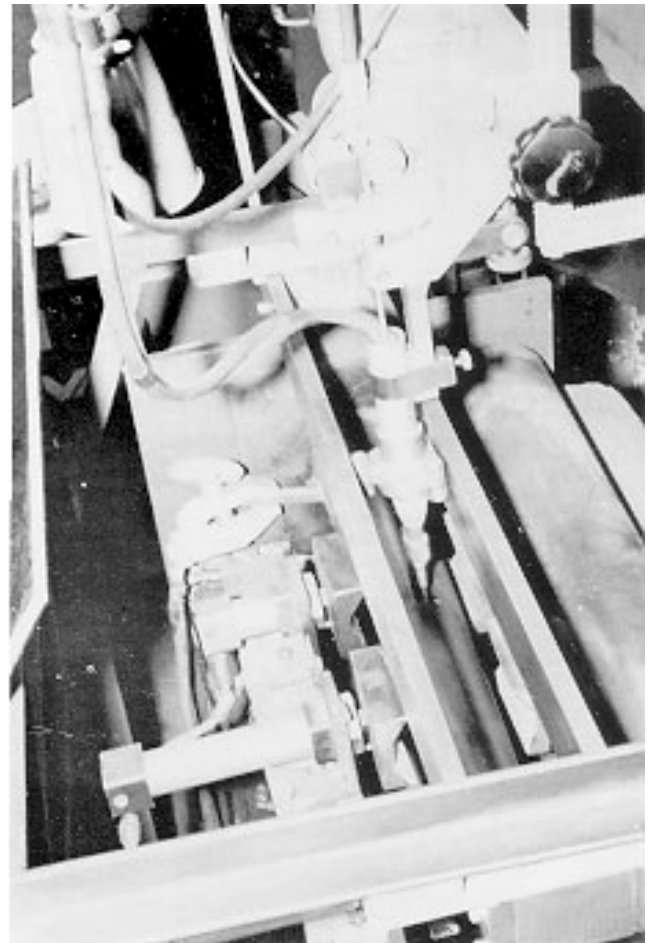


Application: Manufacturing motorcycle mufflers from 20 gauge (.9 mm) mild steel.

Process: MIG welding.

Equipment: BUG-O Skip Welder and Rail mounted on customer's fixture.

Savings: 75% reduction in welding time and distortion free product.

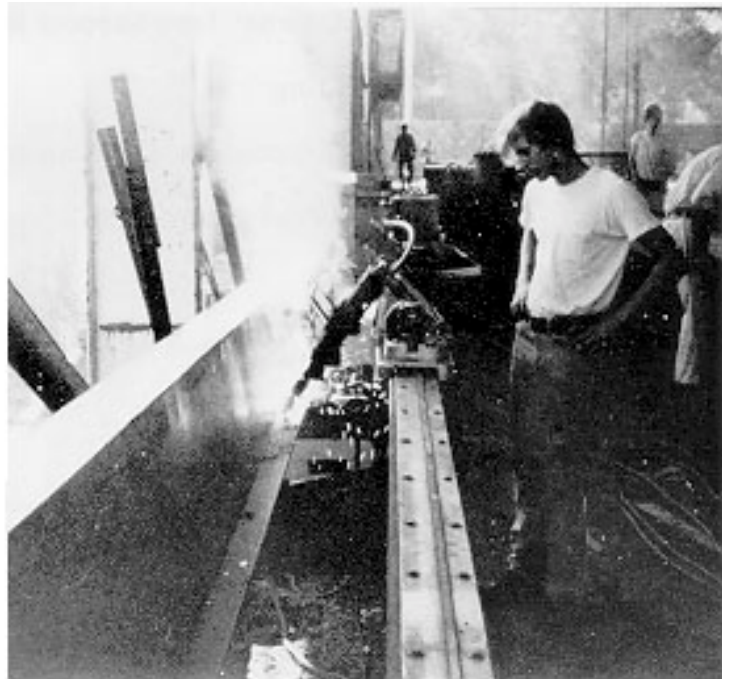


Application: Mechanizing the welding of 48 ft. (15 m) columns.

Process: Flux cored arc welding.

Equipment: BUG-O DC V Drive on MUG-O Carriage with Rail and Torchholder mounted on customer's fixture.

Savings: Increased production and reduced distortion.



Application: Dismantle, move and re-erect large water storage tank.

Process: Oxyfuel; arc gouging and SMAW welding.

Equipment: BUG-O Arcair Mounting Kit, Arcair N-600 Arc Gouging Head, Bug-O Torchholder and Fits-All Clamps on All Position Clamp, Rail and Magnets.

Savings: Precise flame cutting and arc gouging, reduced welding costs.

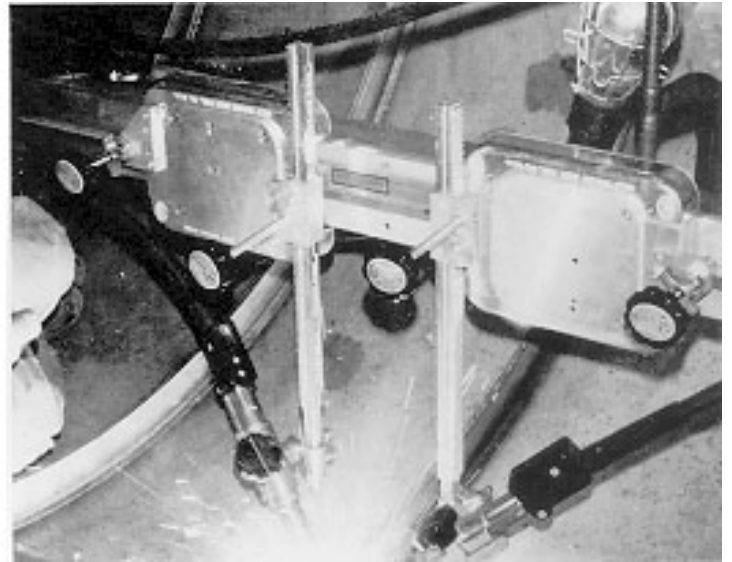


Application: Welding internal tray support rings to stainless vessels.

Process: MIG welding.

Equipment: MUG-O components and standard torch mounts on customer's fixture.

Savings: Increased production 400%.

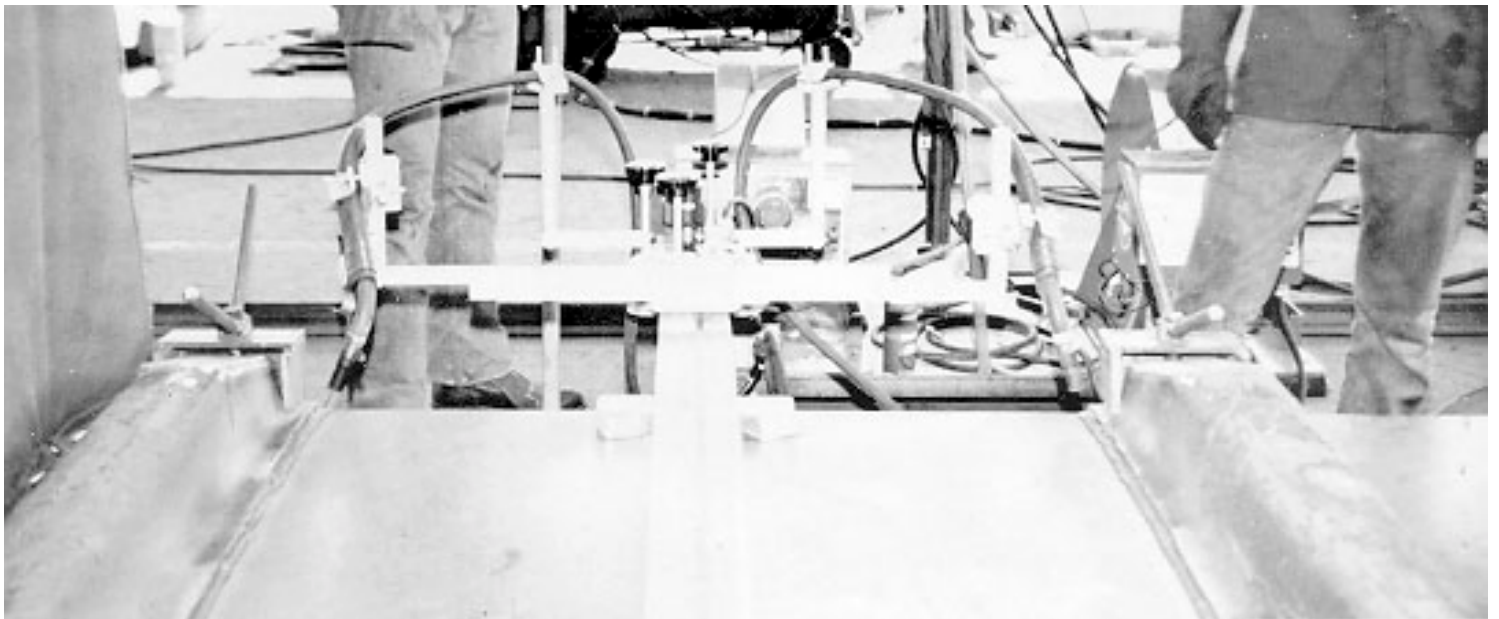


Application: Rebuilding railway cars.

Process: MIG welding.

Equipment: Bug-O DC IV, Double Torch Welding Group, Rail and Magnets.

Savings: Production rate doubled.

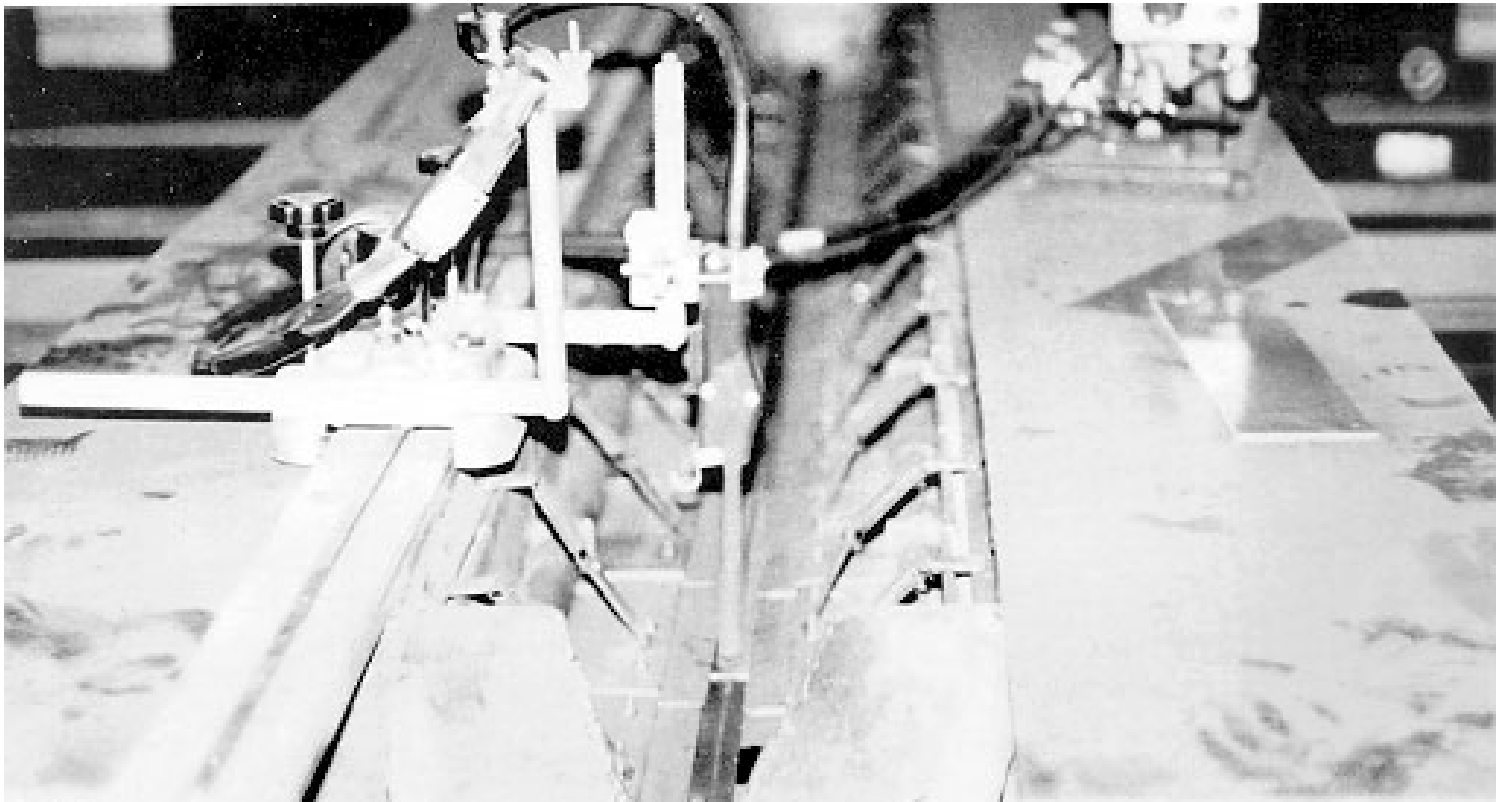


Application: Splicing stainless steel plates.

Process: MIG welding.

Equipment: Bug-O DC Heavy Duty Welding Kit mounted on customer's fixture.

Savings: Full penetration welding without distortion, cleaning and grinding eliminated.

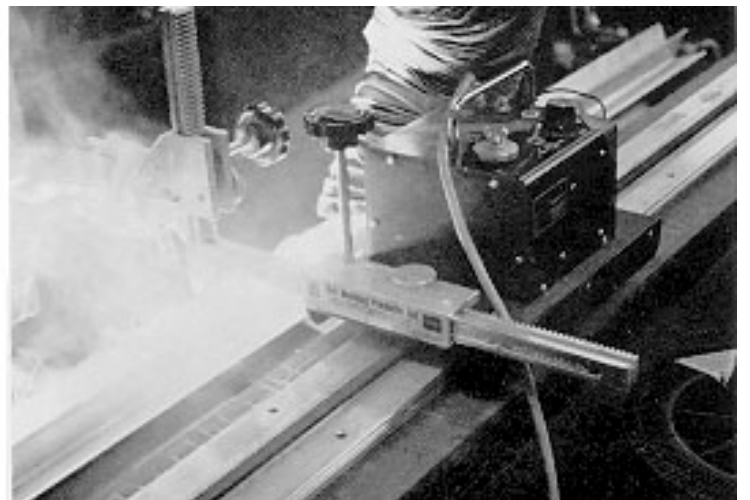
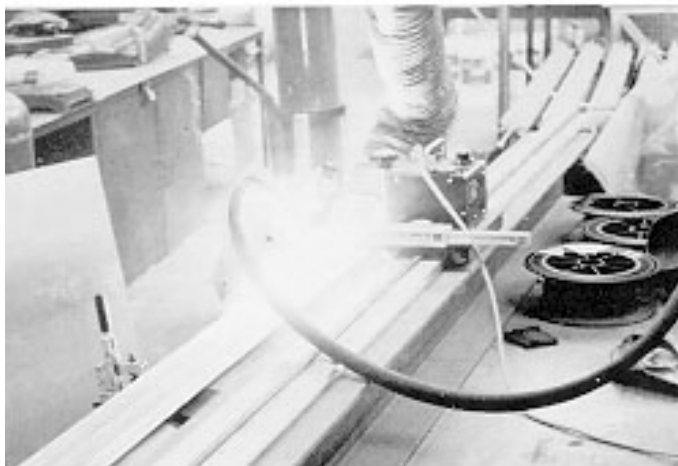


Application: Shrinking aluminum tubing onto stainless pipe.

Process: MIG welding.

Equipment: Bug-O DC General Welding Kit.

Savings: Perfect welds, achieved desired results in minimum time.

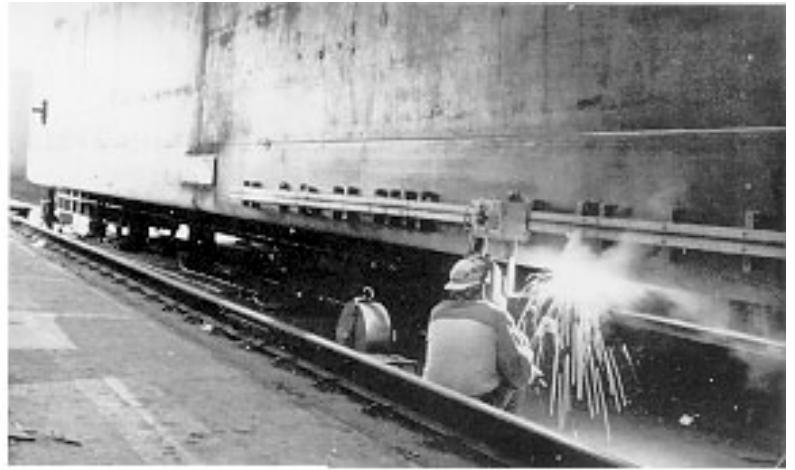


Application: Building jumbo coal barges.

Process: Flux cored arc welding.

Equipment: BUG-O-MATIC.

Savings: Production increased 60%, operator fatigue reduced.

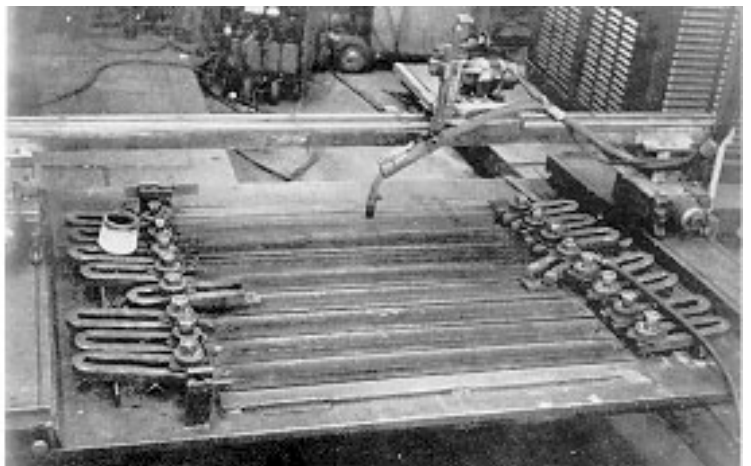
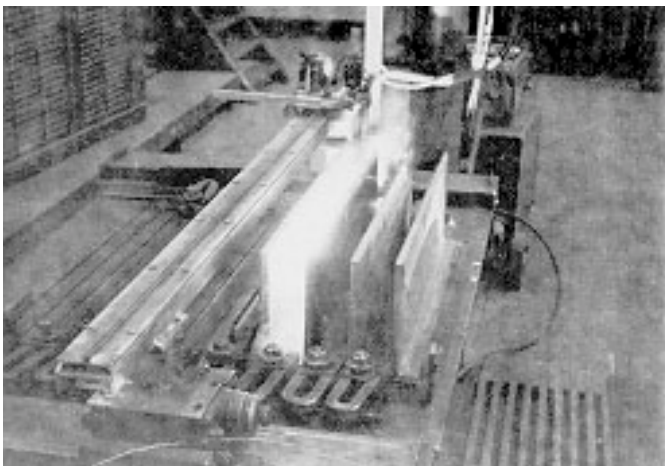


Application: Welding formed cooler blanks for refrigeration equipment.

Process: MIG welding.

Equipment: Bug-O DC General Welding Kit mounted on customer's fixture.

Savings: \$50,000.00 per year.

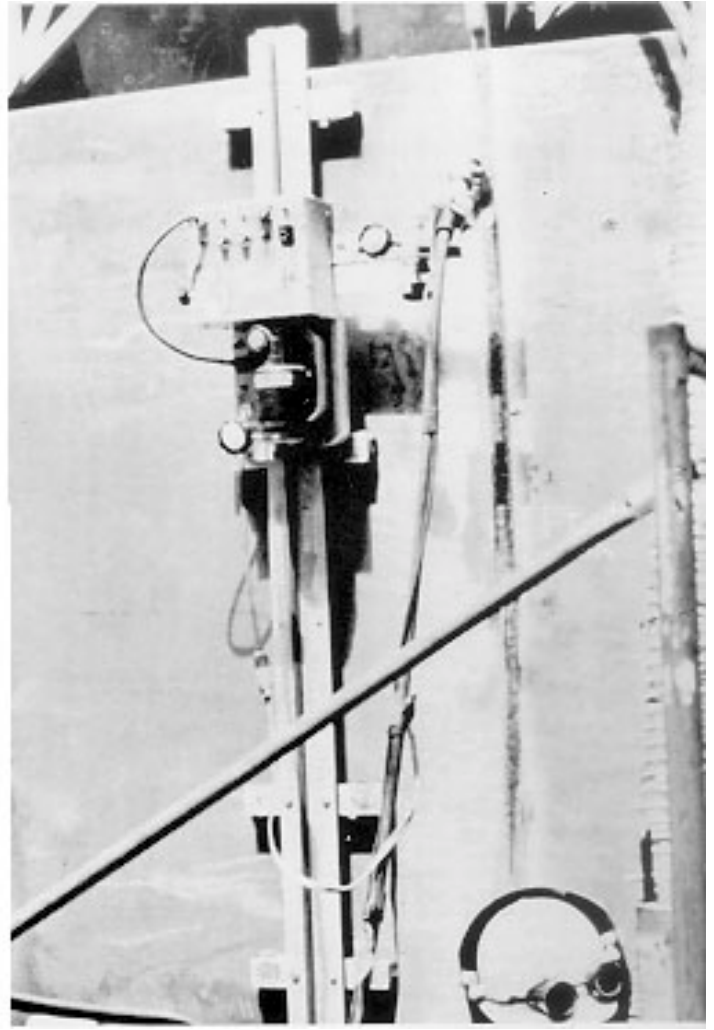
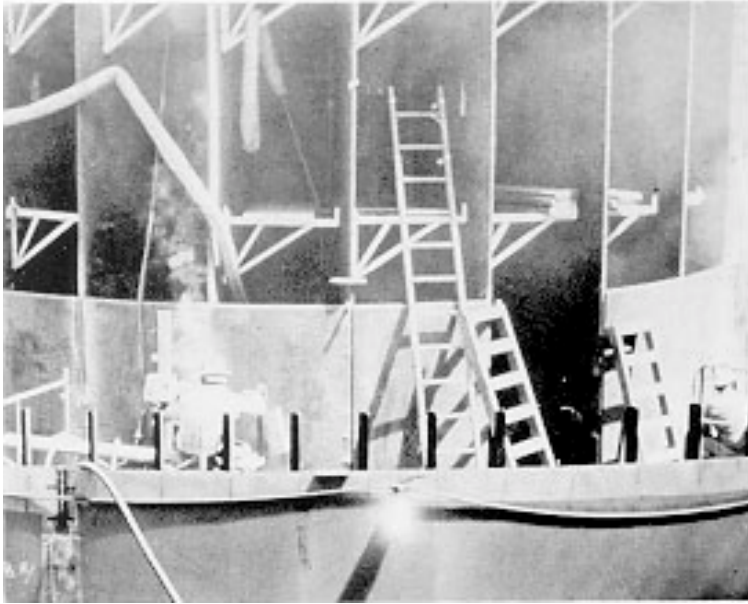


Application: Fabrication of nuclear reactor containment vessel.

Process: Flux cored arc welding.

Equipment: BUG-O Speed Weaving Kit.

Savings: Welding completed in 1/3 estimated time.

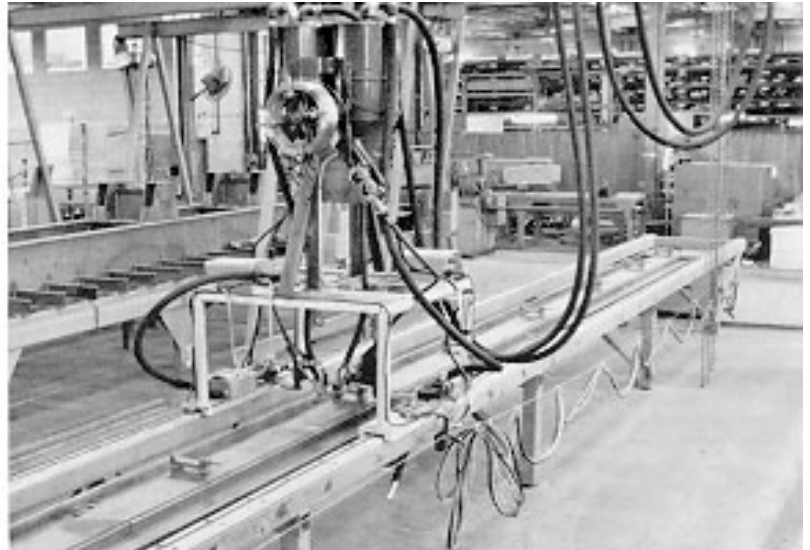
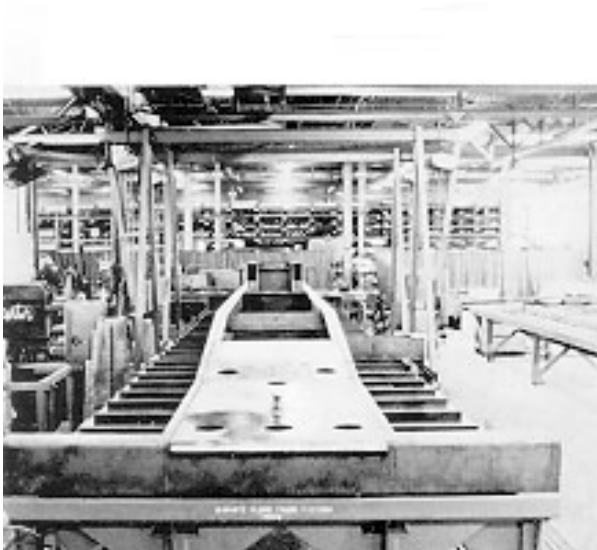


Application: Welding frames for semi-trailers.

Process: Dual sub arc welding.

Equipment: MUG-O components and welding gantry built by customer.

Savings: Productivity increased 12 times with improved quality and appearance.

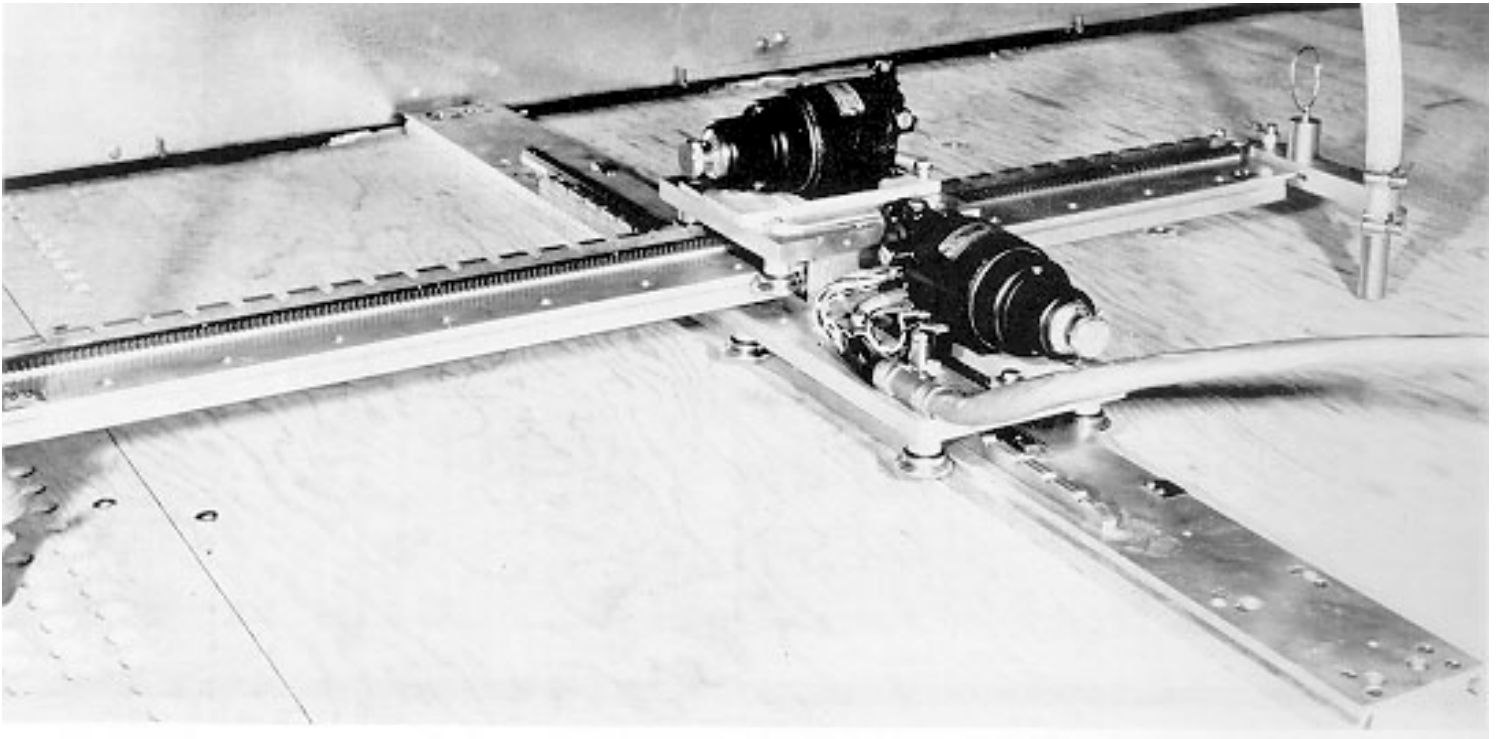


Application: Reactor inspection.

Process: Eddy current testing.

Equipment: (2) Bug-O DC II's, Rail and fixturing by customer.

Savings: Reduction in shutdown time for inspection and greater accuracy of probe placement.

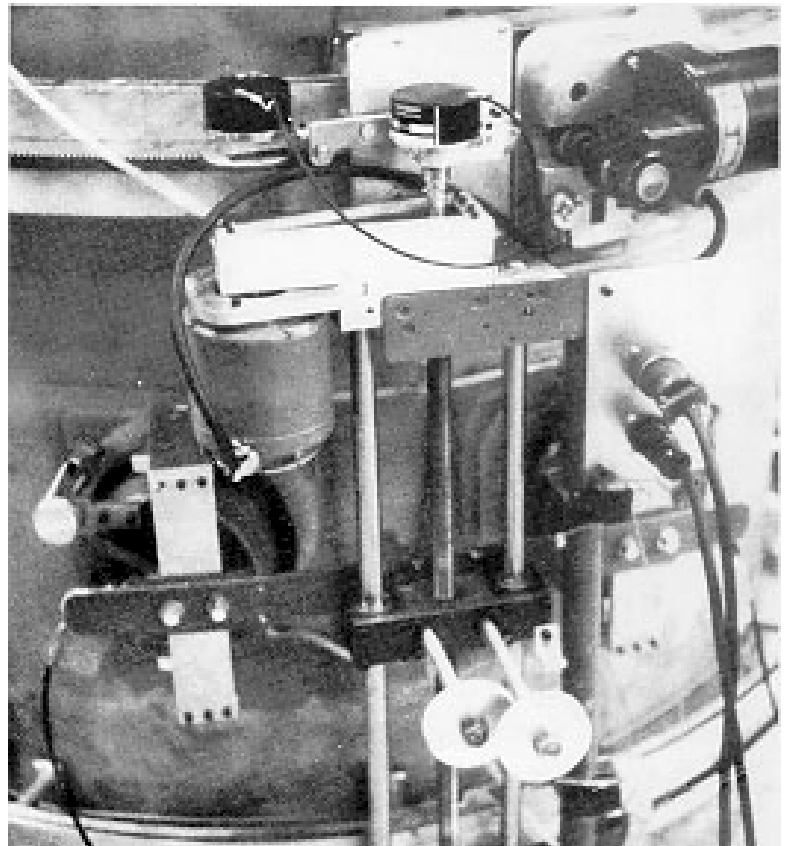


Application: Holographic scanning of missiles.

Process: Holography

Equipment: Bug-O Bent Rails, ROL-O Carriage and Trailer mounted on customer's fixture.

Savings: Portable inspection device solved difficult inspection problem.





Applications

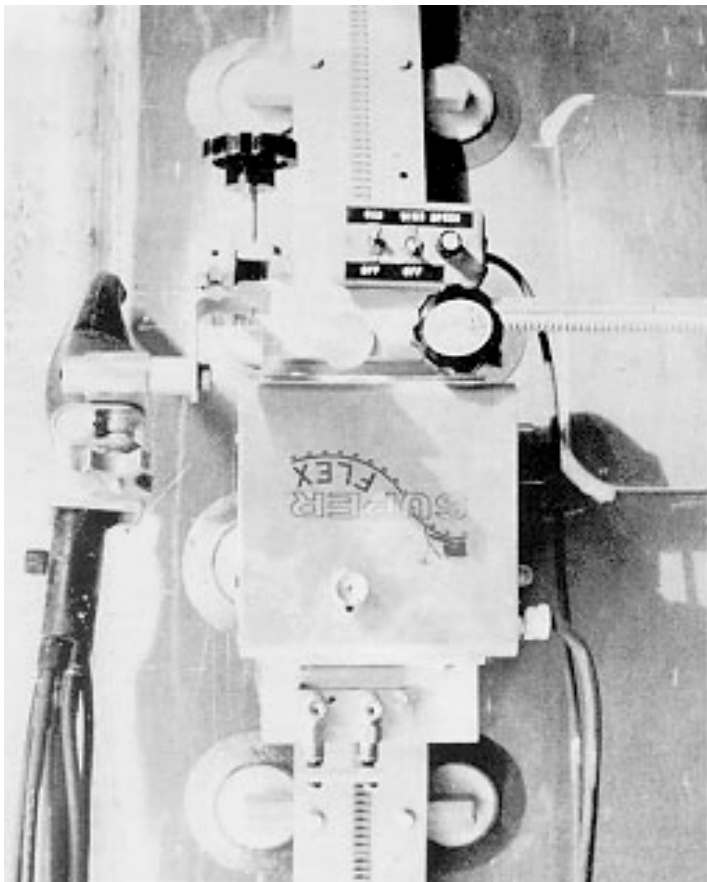
Circular or Radial Welding

Application: Increase length of Aluminum Liquefied Gas Trailers.

Process: TIG welding.

Equipment: Super-Flex Welding Kit with Vacuum Support Kit.

Savings: Welding time reduced 20% without distortion.

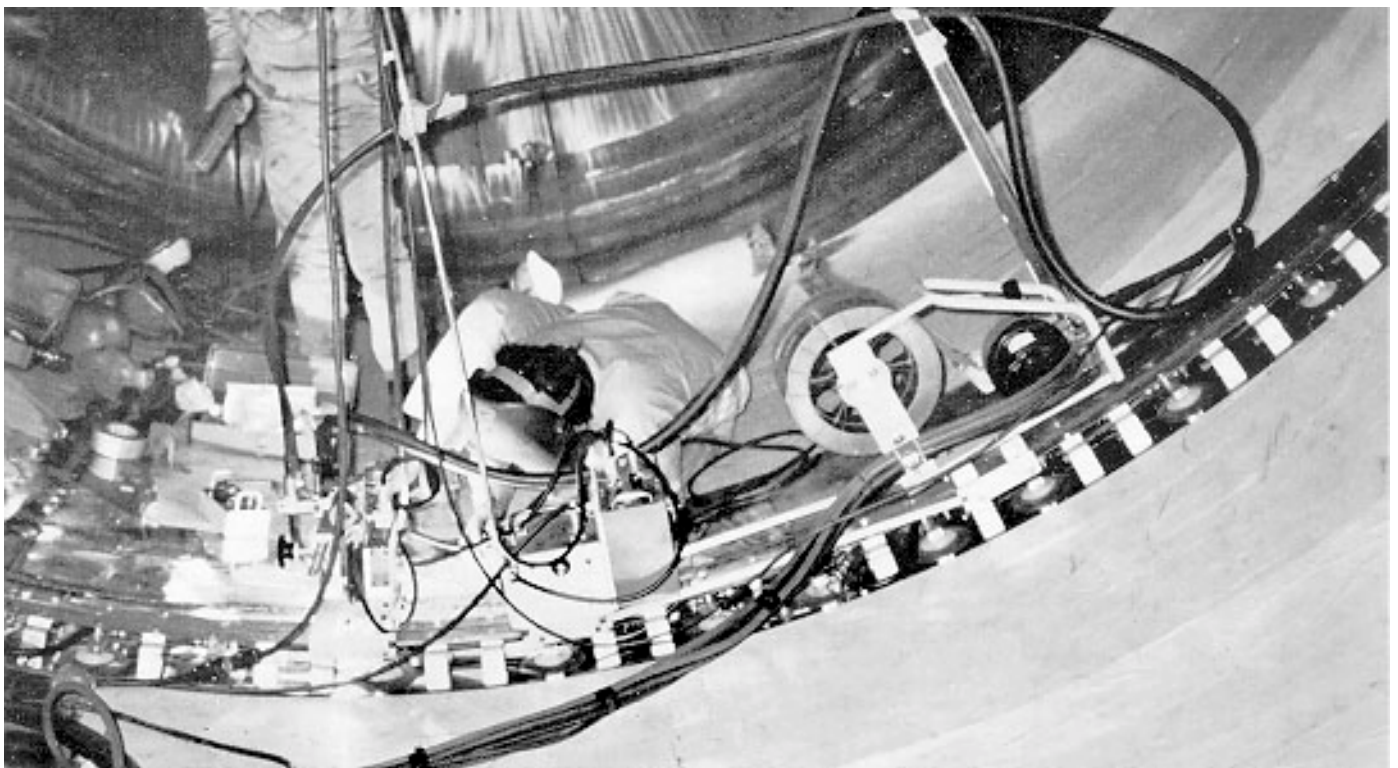
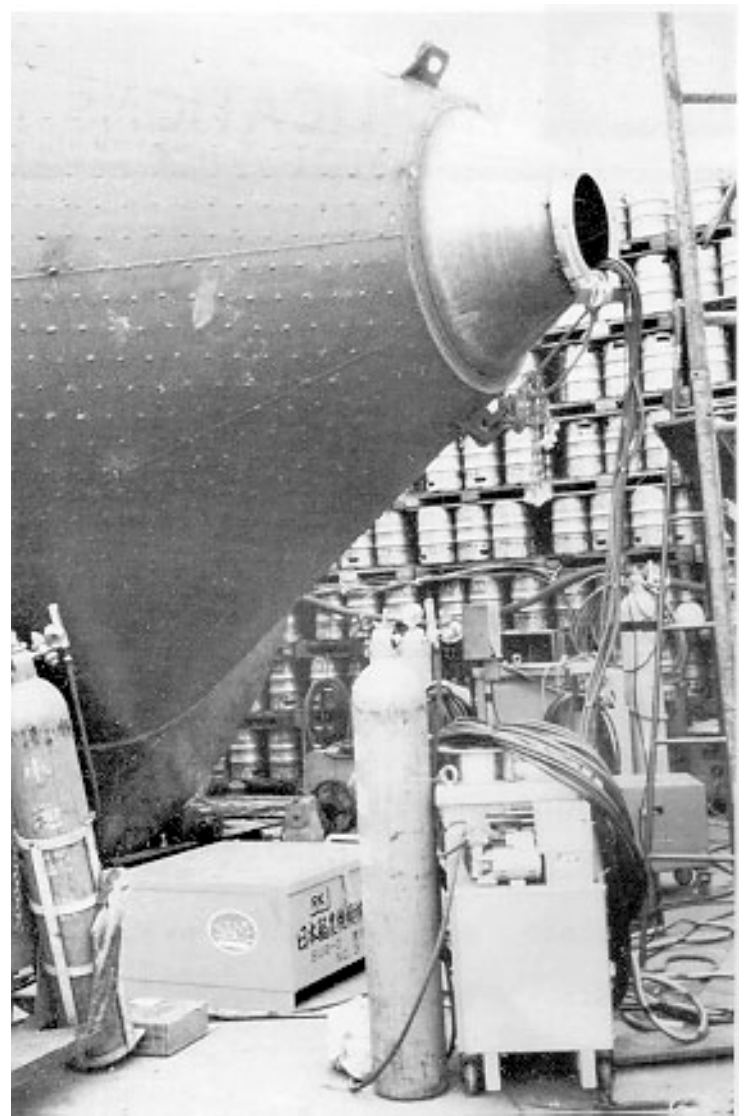
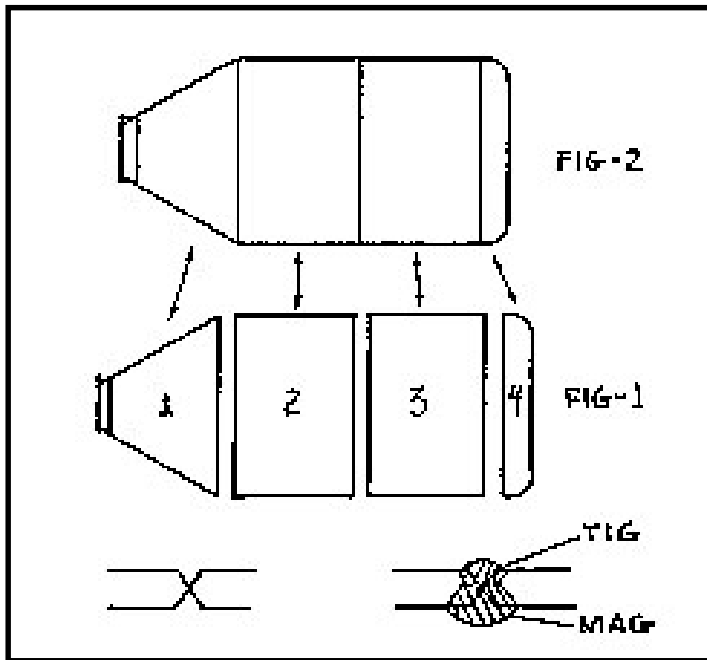


Application: Field assembly of large Aluminum Tank with restricted access.

Process: TIG and MAG welding.

Equipment: Super-Flex and turning rolls used to keep welding at 5:00 - 7:00.

Savings: 75 - 85% reduction in welding time with excellent quality.

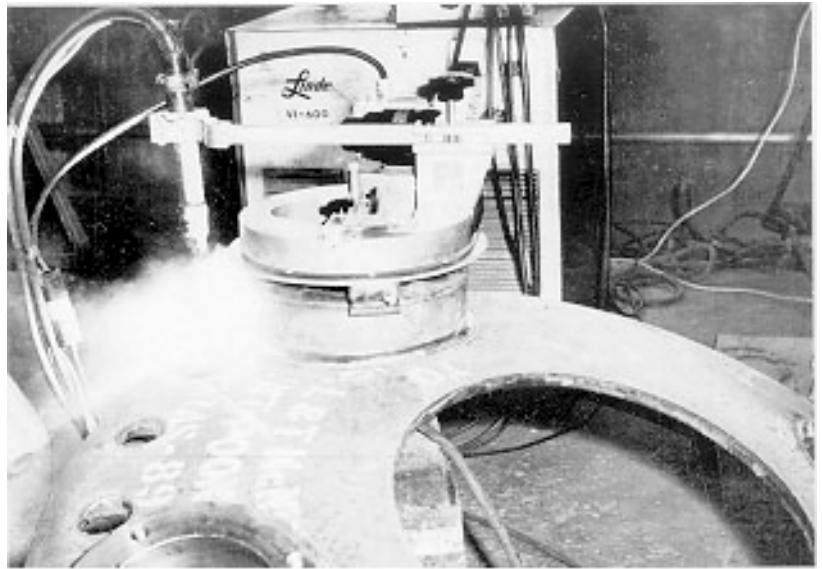


Application: Welding 3" (95 mm) thick nozzles to 1" (25 mm) thick heads, 59" (1500 mm) in diameter.

Process: MIG welding.

Equipment: HOB-O.

Savings: 50% on labor and 15% on consumables.

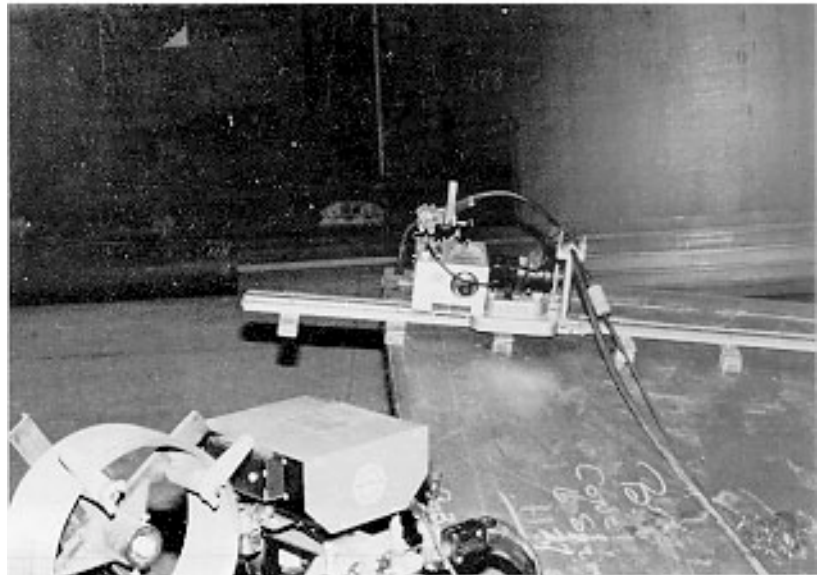


Application: Fabricate large cones for water storage tanks.

Process: Flux cored arc welding.

Equipment: Bug-O Speed Weaving Kit.

Savings: 72 man hours per cone over manual welding.



Application: Assembly of tubular tower.

Process: MIG welding.

Equipment: Bug-O ROL-O carriage and bent rails with magnets.

Savings: Reduced distortion and increased high quality production.

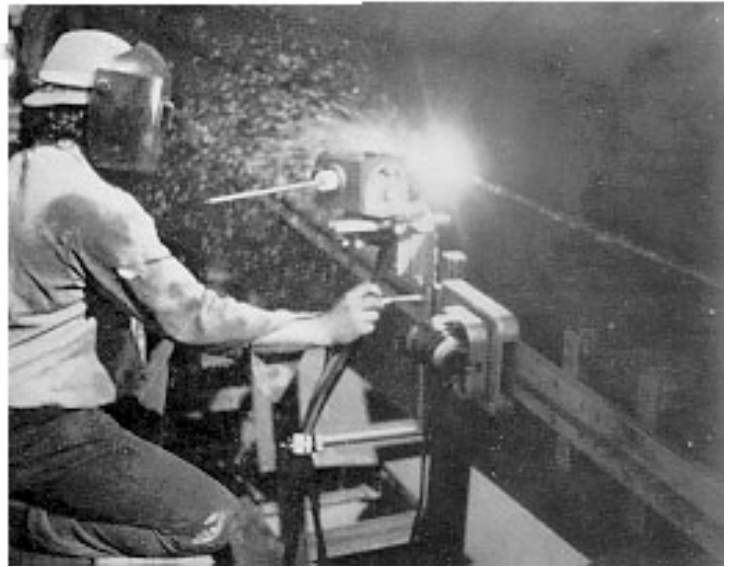
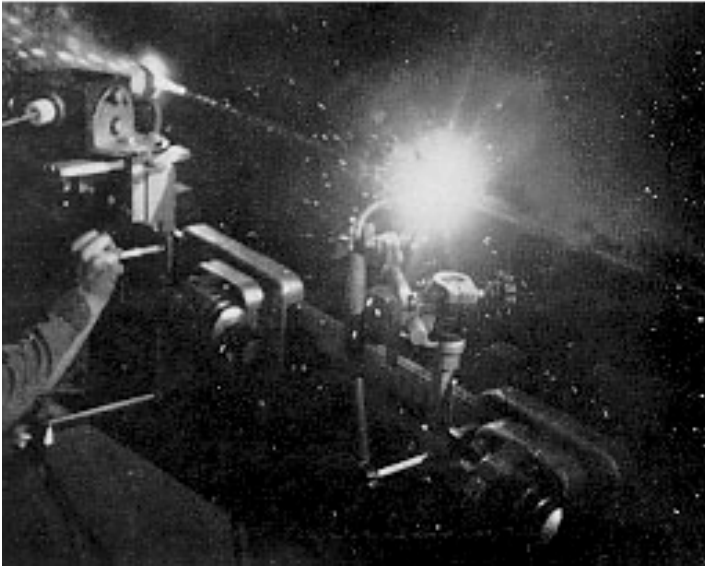


Application: Welding ships hulls.

Process: Automatic arc gouging and Flux cored arc welding.

Equipment: Bug-O General Welding Kit and Flex Rail.

Savings: Welding time reduced 75% and stub waste decreased 50%.

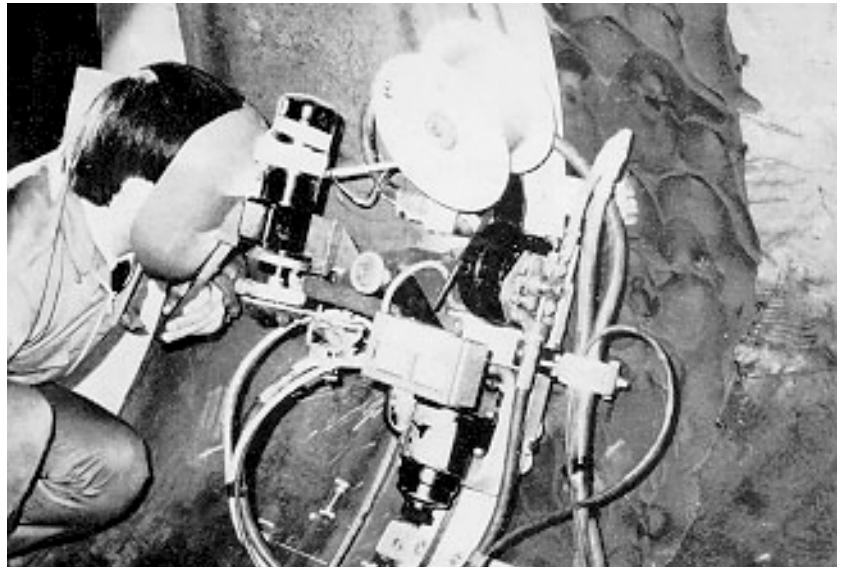


Application: Welding inside water line pipe.

Process: MIG welding.

Equipment: Bug-O ROL-O Carriage and Trailer on Bent Rails with Magnets and Wire Feeder mounted by customer.

Savings: Easy set up produced quality joints — twice as fast as manual welding.

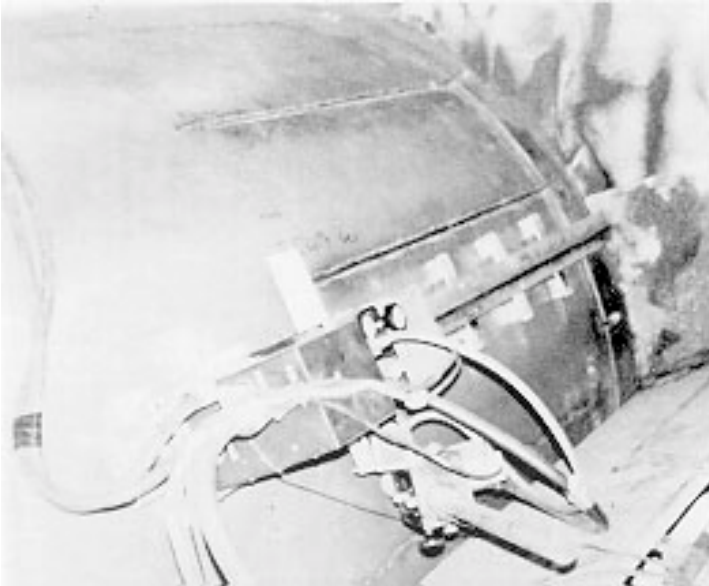


Application: Shrink inner yoke of generator housing.

Process: Arc gouging, oxyfuel gas cutting and MIG welding.

Equipment: Bug-O ROL-O Carriage, Trailer and Automatic Arc Gouging Unit.

Savings: 5 -7 days less downtime that calculated for repair saved \$800,000.00.



Application: Tube to tubesheet welding.

Process: MIG welding.

Equipment: HOB-O mounted on customer's fixture.

Savings: 50% reduction in welding time, substantial improvement in appearance and quality.

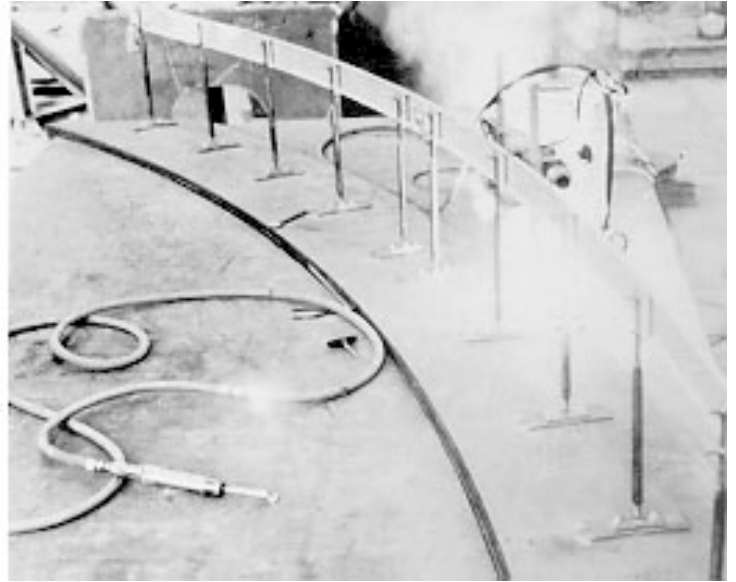
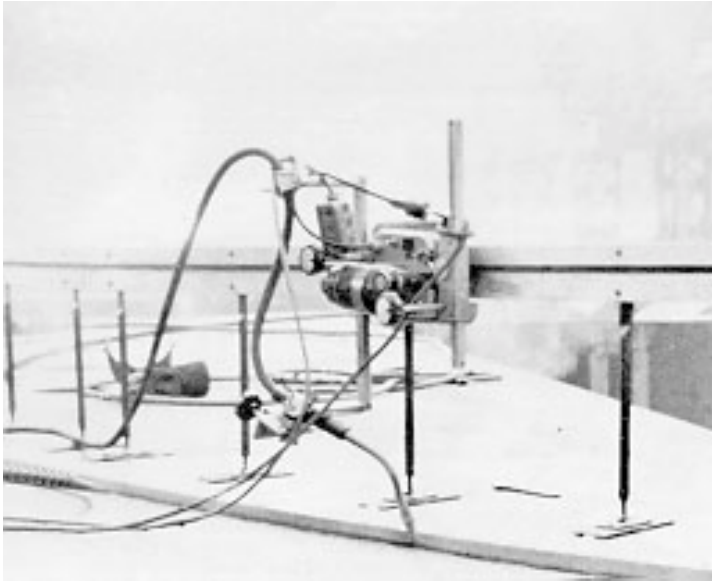


Application: Welding roller path flange plate on power shovel dragline.

Process: Semiautomatic sub arc welding.

Equipment: Bug-O DC III and Flex Rail.

Savings: High Quality, repeatable welds and reduced material handling.



Application: Welding rollers for asphalt pavers.

Process: Flux Cored arc welding.

Equipment: HOB-O

Savings: Production increased 150% with improved quality and appearance.

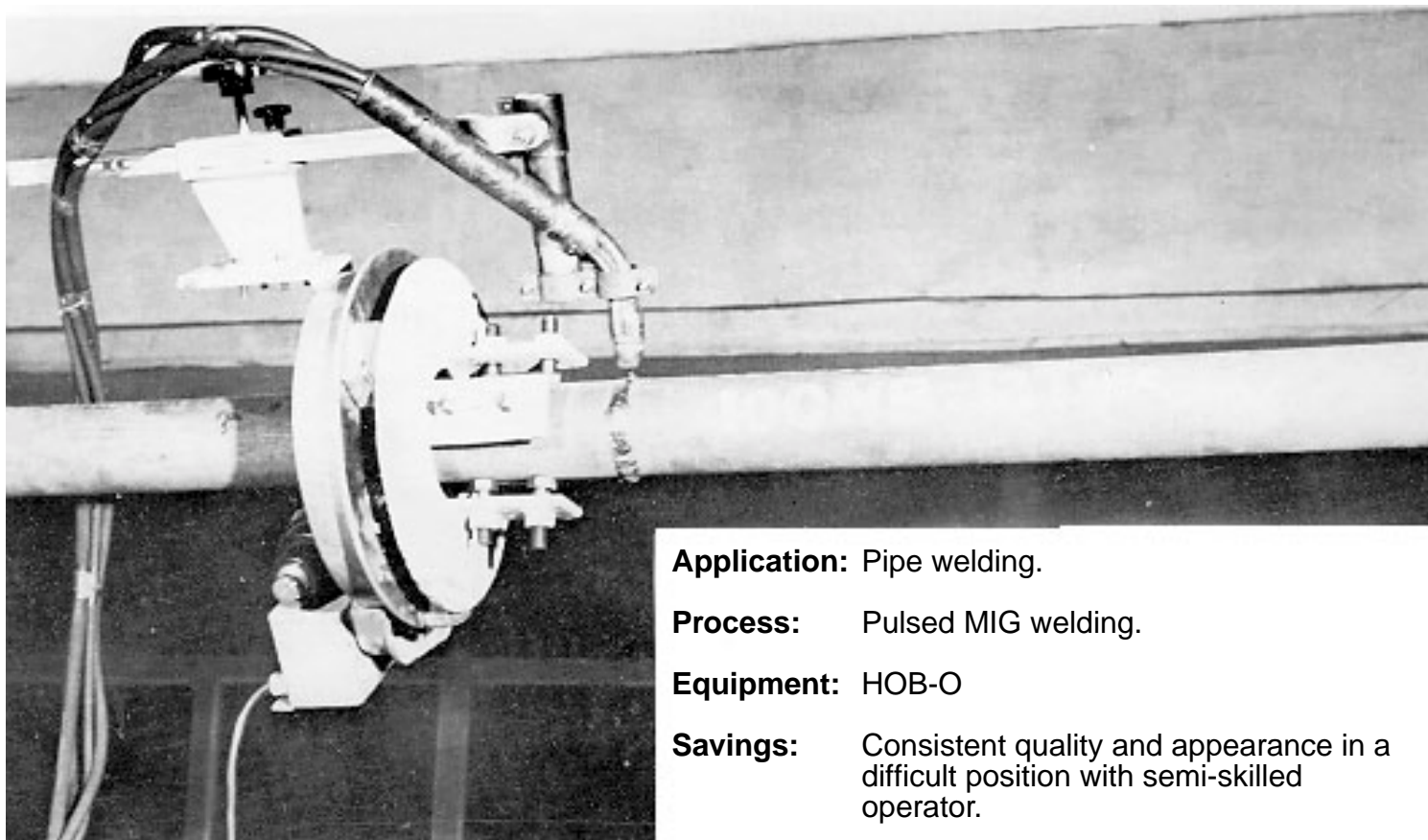
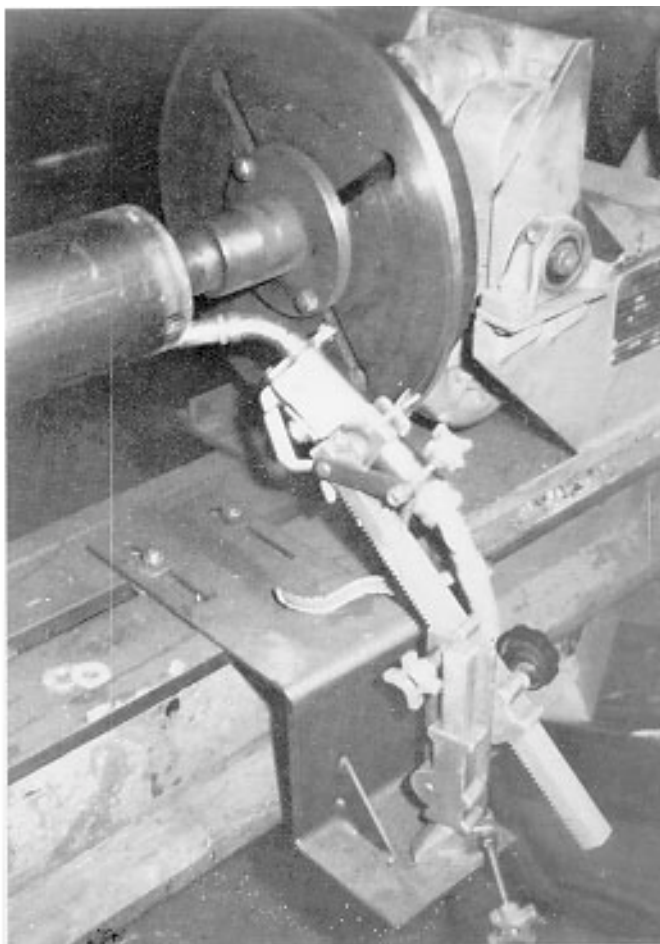
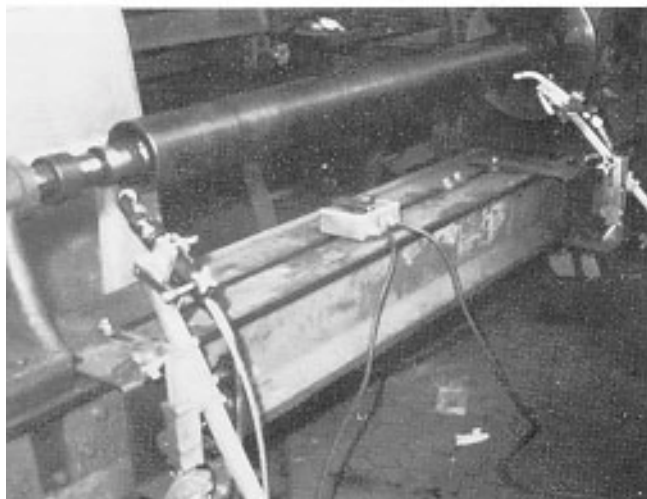


Application: Welding heads on the ends of rolls.

Process: MIG welding.

Equipment: Bug-O Four Motion Torch Support Group.

Savings: Reduced cost by using standard components.



Application: Pipe welding.

Process: Pulsed MIG welding.

Equipment: HOB-O

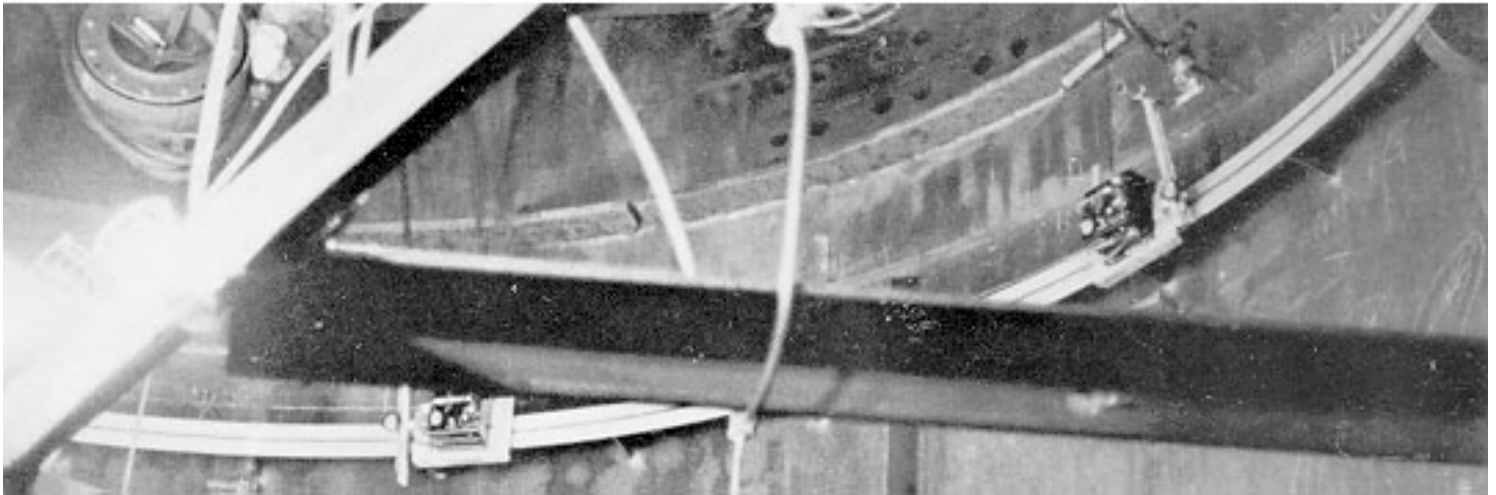
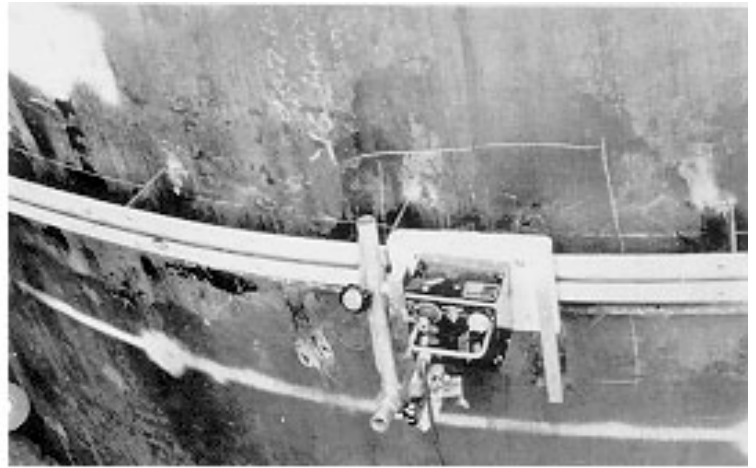
Savings: Consistent quality and appearance in a difficult position with semi-skilled operator.

Application: Welding sections of basic oxygen furnaces.

Process: Flux cored arc welding.

Equipment: Bug-O DC III, Heavy Duty Torch Mounting Groups and Semi-Flex Rails.

Savings: 500 man hours and operator comfort improved greatly.



Application: Welding nozzles on small tanks.

Process: MIG Welding.

Equipment: CON-4404 mounted on customer's fixture.

Savings: Production increased 400%.





Applications

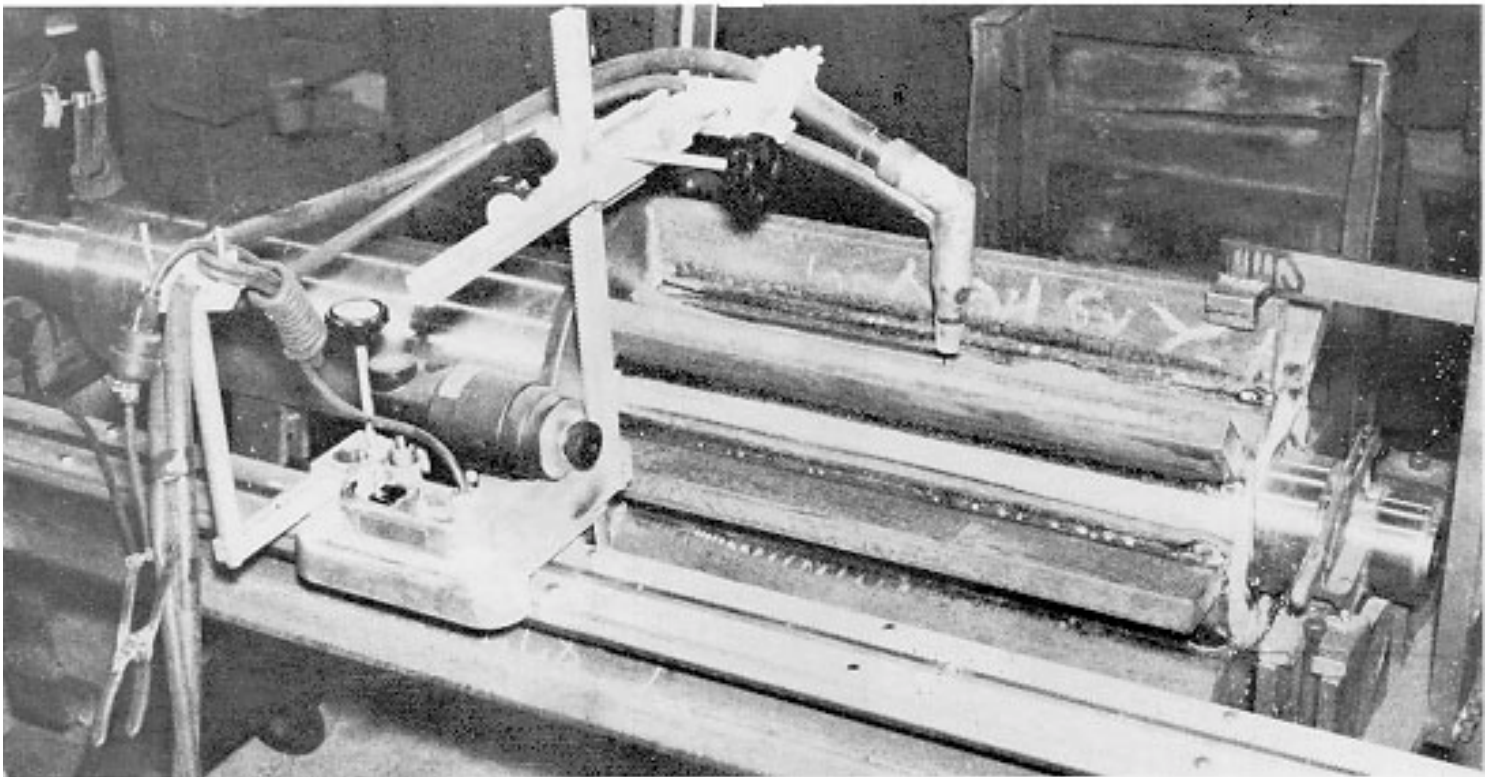
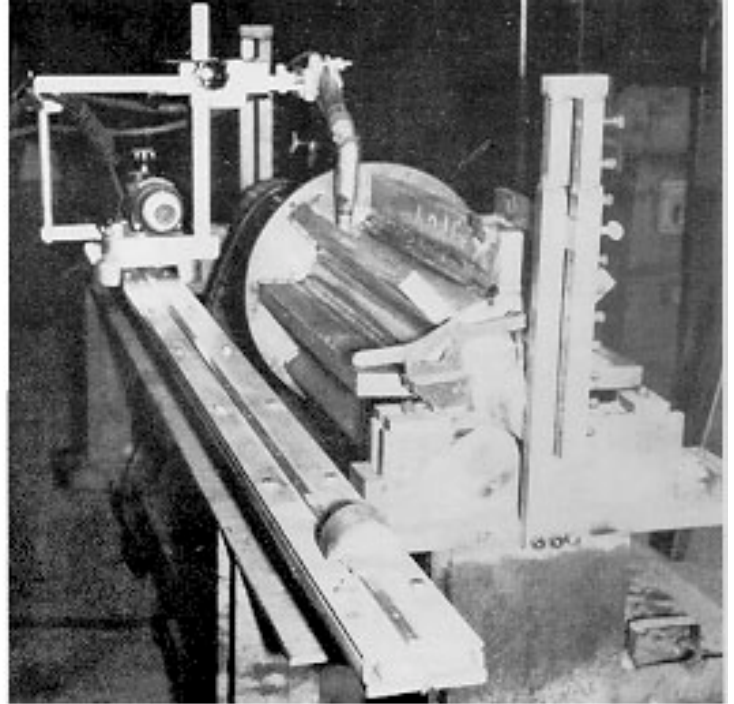
Sub Arc Welding

Application: Welding ribs to a shaft.

Process: Sub arc welding.

Equipment: Bug-O General Welding Kit.

Savings: Welding time reduced 38% with improved quality and appearance.

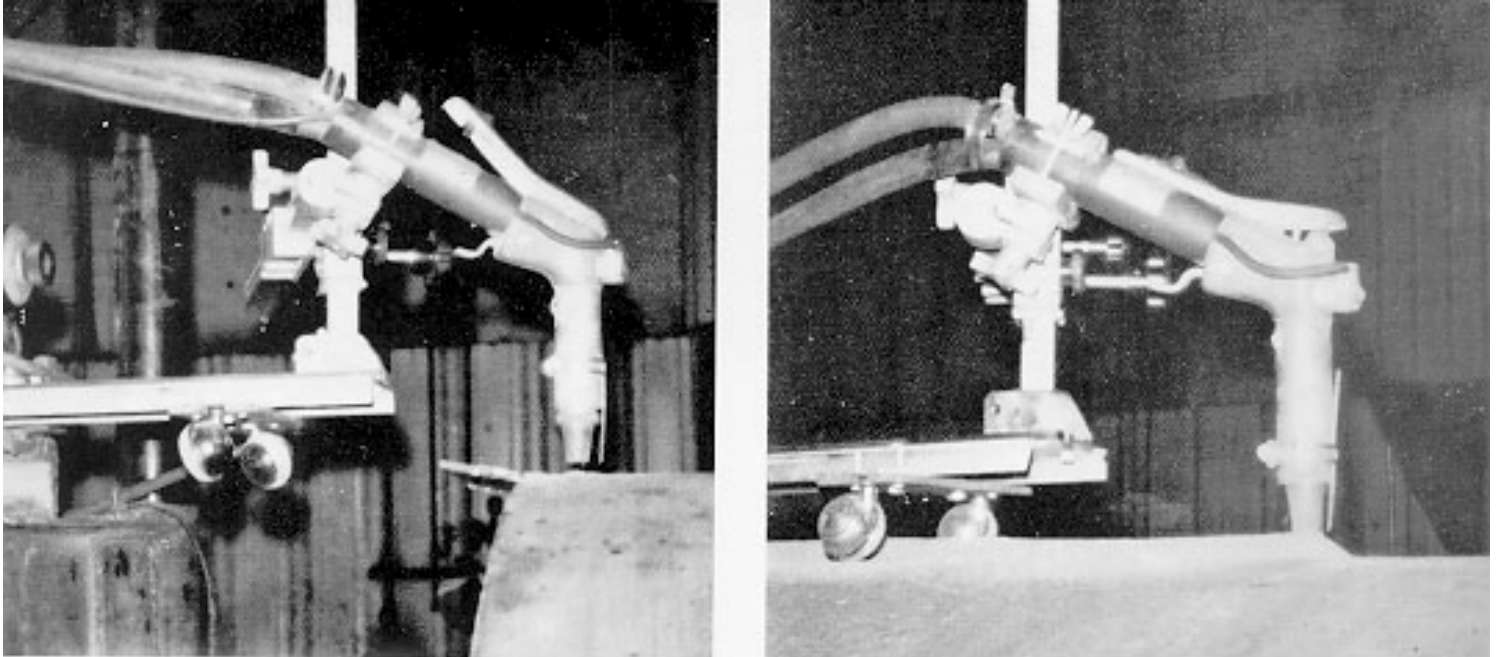


Application: Longitudinal welding on stainless steel tanks.

Process: Sub arc welding.

Equipment: Bug-O General Welding Kit with wheels supplied by customer.
Note: Carriage is fixed on table and rail with rollers and is moved along weld joint.

Savings: Achieved the benefit of using a manipulator with a low cost kit.

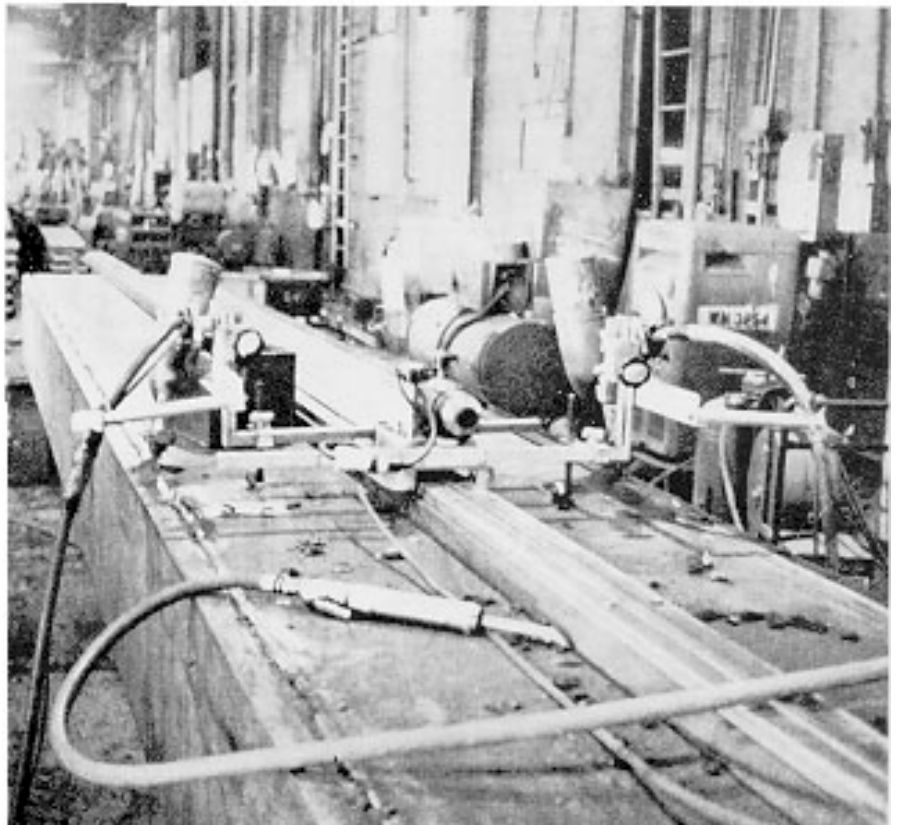


Application: Dual welding on box girder.

Process: Sub arc welding.

Equipment: Bug-O General Welding Kit with Double Torch Welding Group.

Savings: One operator made two welds simultaneously saving \$1,200.00 on 46 box girders.



Application: Welding bearing journals and stubs.

Process: Sub arc welding.

Equipment: HOB-O with adaptor made by customer.

Savings: Weld quality and appearance greatly improved with portable unit which reduced material handling.

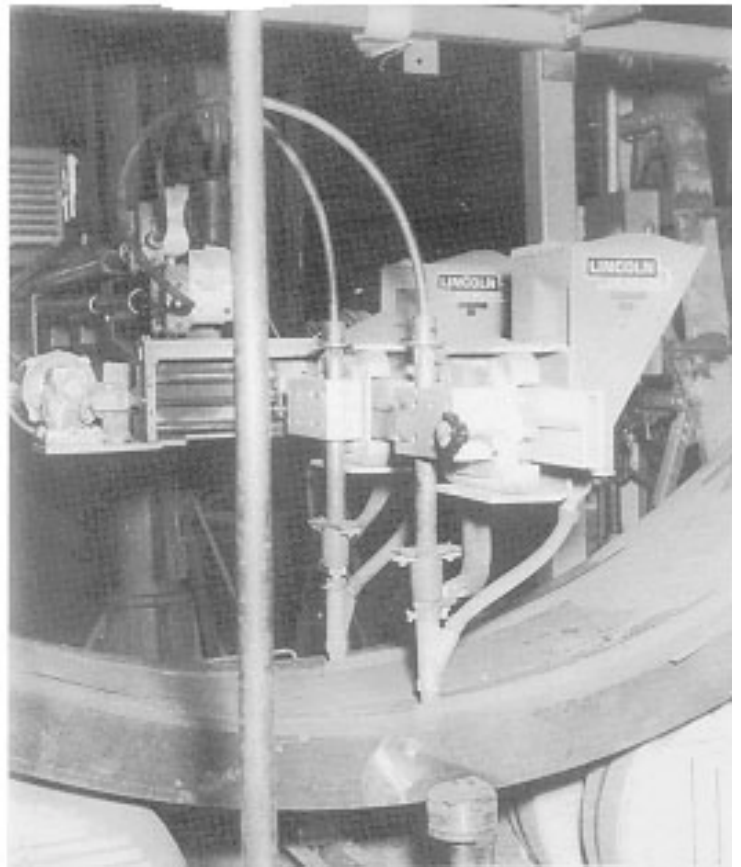


Application: Make fixture to mount two automatic welding heads.

Process: Sub arc welding.

Equipment: MUG-O Spotting Carriages and Heavy Duty Rail mounted on Manipulator.

Savings: Fixturing enabled use of second welding head which doubled production.

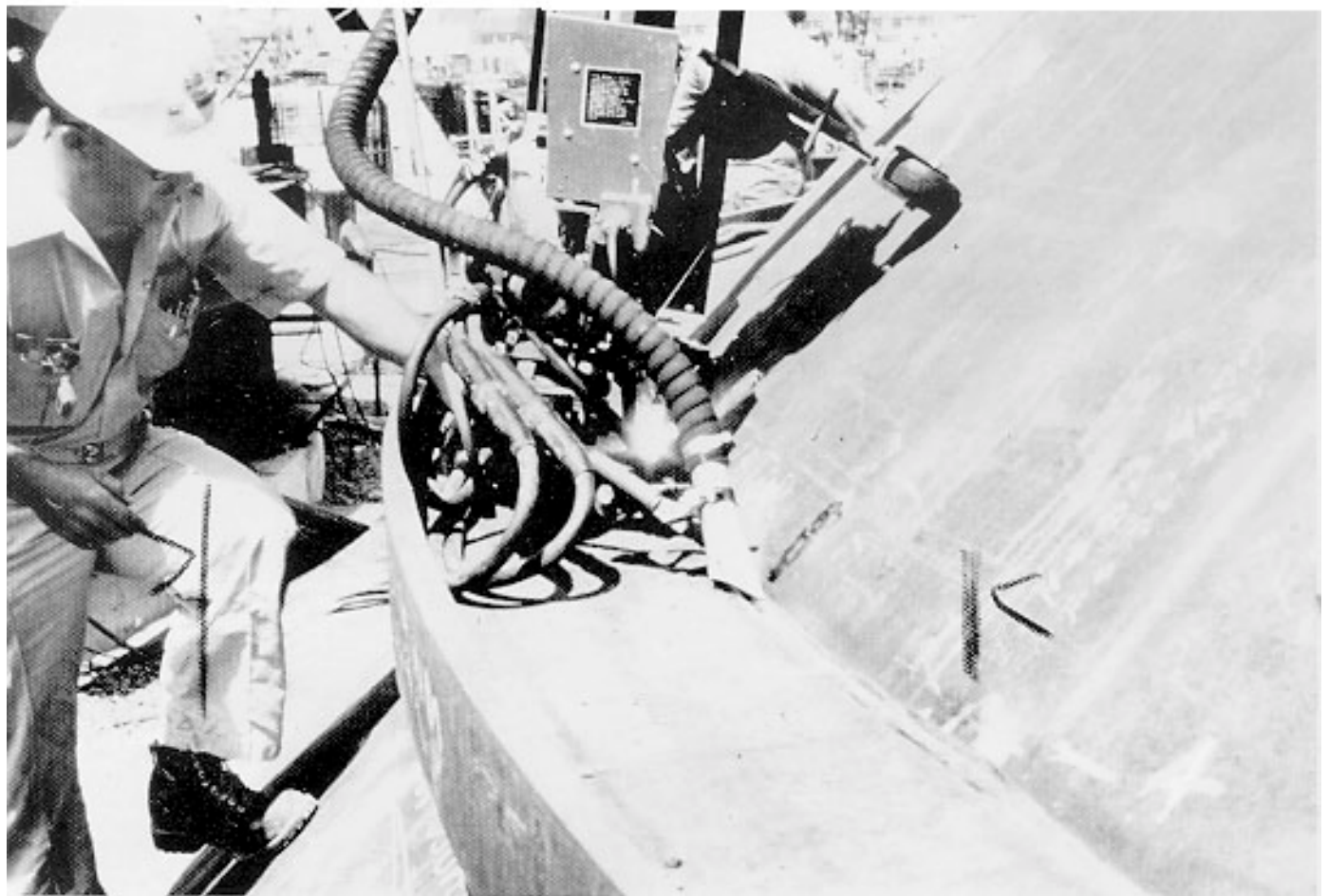
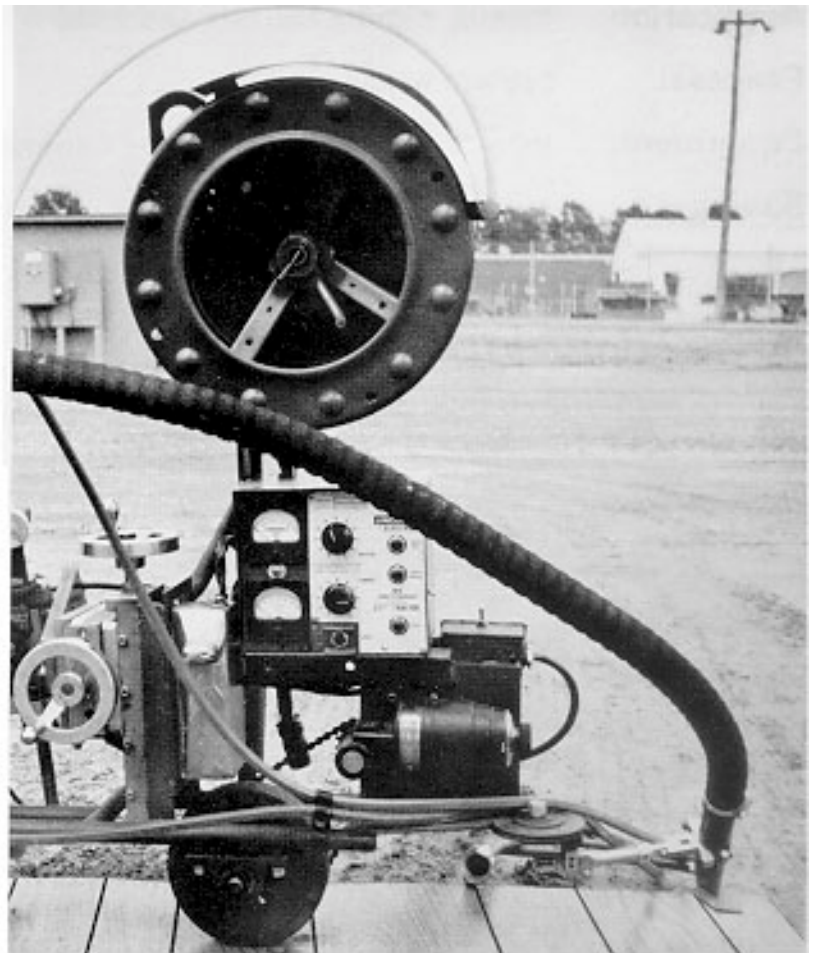


Application: Mechanizing custom made tractor.

Process: Sub arc welding.

Equipment: Bug-O Drive.

Savings: 28% increase in deposition efficiency plus substantial time savings.





Applications

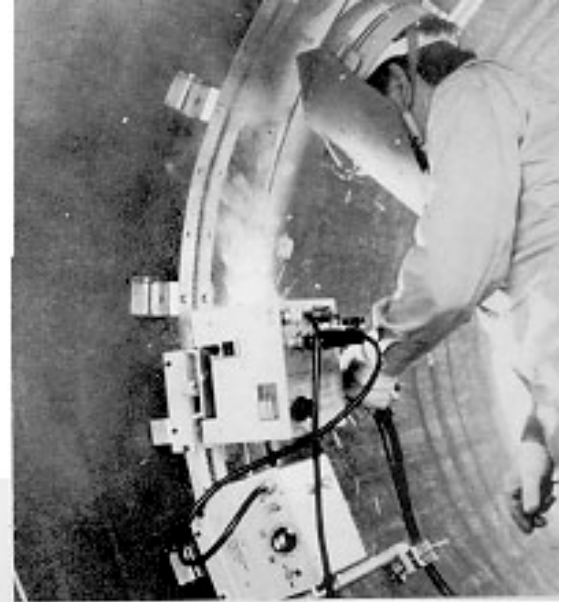
Weld Weaving

Application: Welding underground water pipe.

Process: Flux cored arc welding.

Equipment: Super-Flex speed weaving kits.

Savings: 10 times faster than manual welding with better quality and appearance.

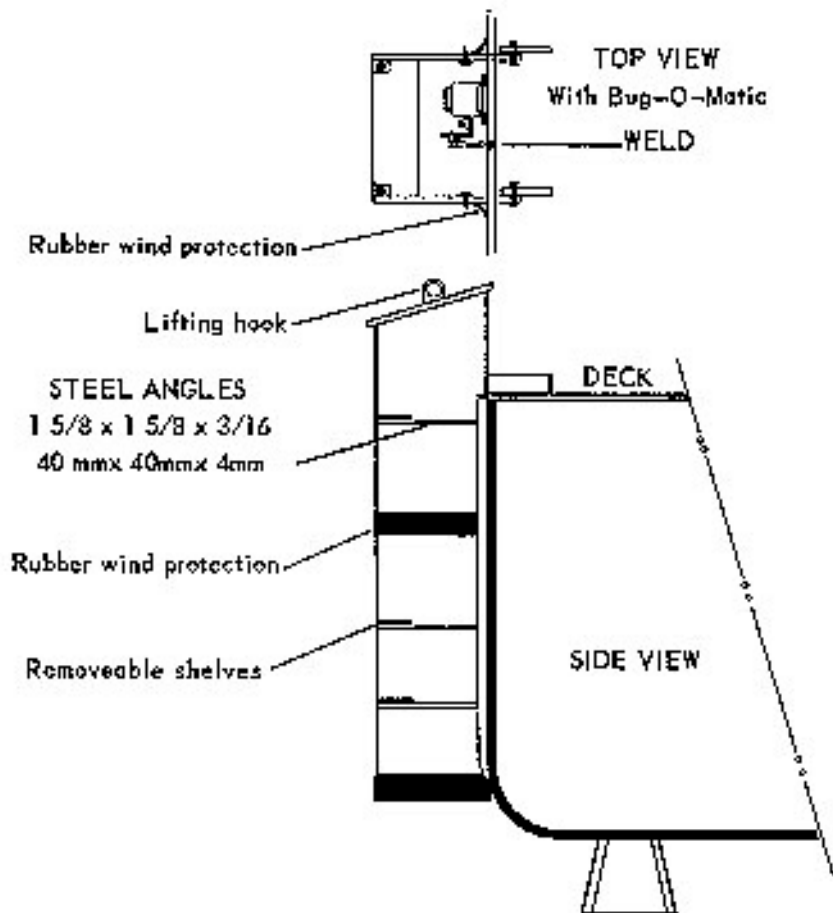


Application: Vertical welding on ship hull.

Process: MIG welding.

Equipment: Bug-O-MATIC with special cage supplied by distributor.

Savings: Customized cage and scaffolding protected weld against wind and made it easy for operator to follow the weld.

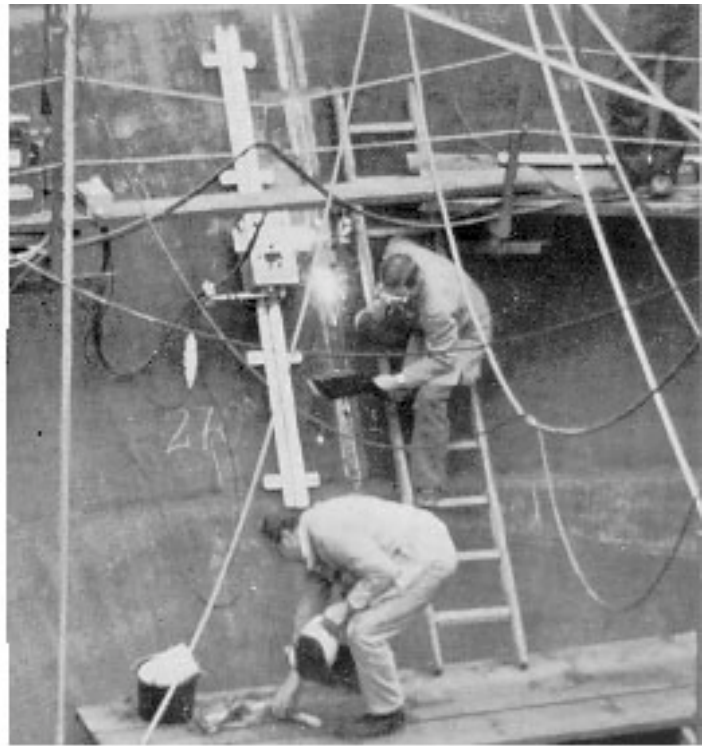
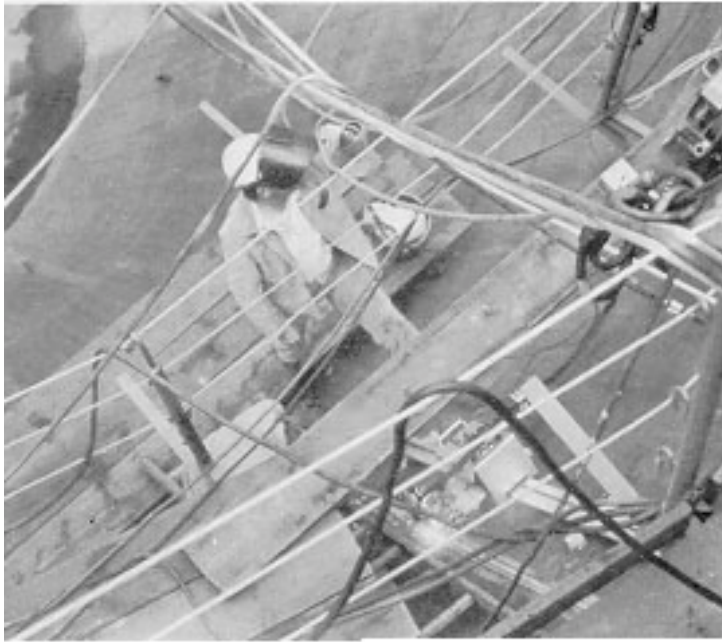


Application: Fabrication of a conical water tank.

Process: Flux cored arc welding.

Equipment: Bug-O-MATIC and flex rail.

Savings: 60% faster than manual welding.

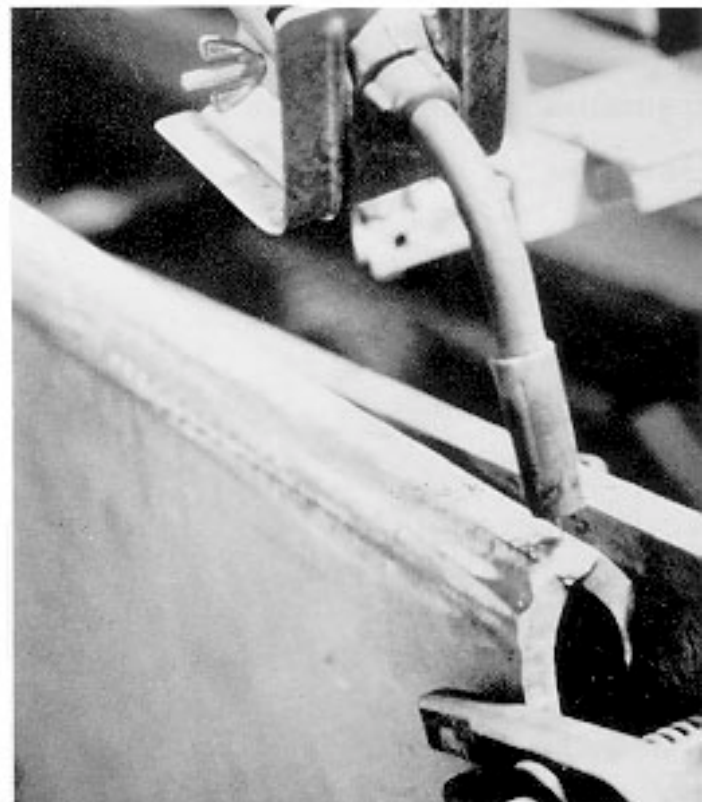


Application: Welding irregular shaped vacuum chamber.

Process: MIG welding.

Equipment: Bug-O Speed Weaving Kit mounted on customer's fixture.

Savings: 400% increase in production.

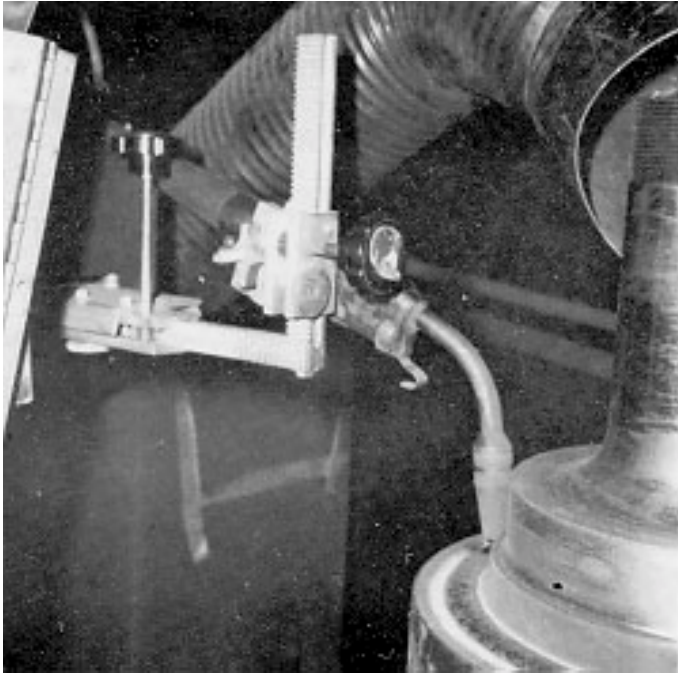


Application: Mechanize welding of plate and blanket cylinders with stainless steel tubes.

Process: MIG welding.

Equipment: Bug-O Speed Weaver.

Savings: Production increased 25% which saved \$450.00 per week.

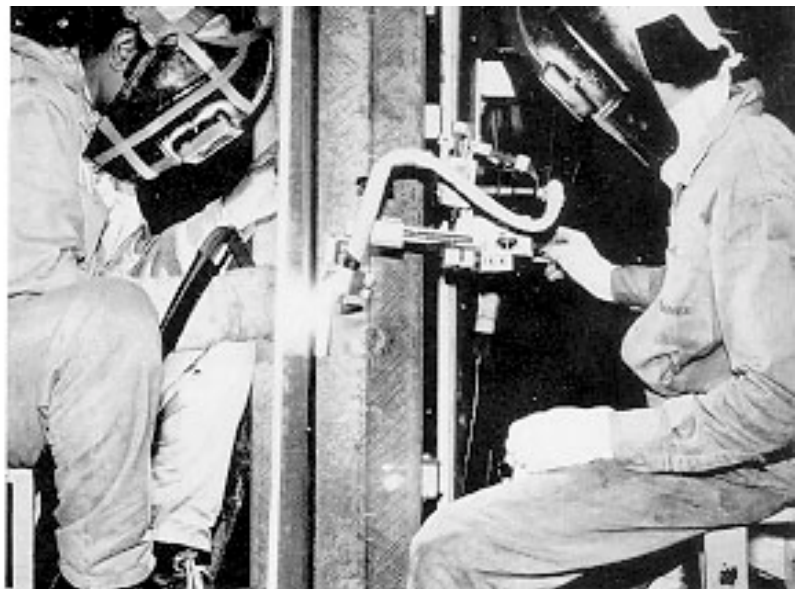
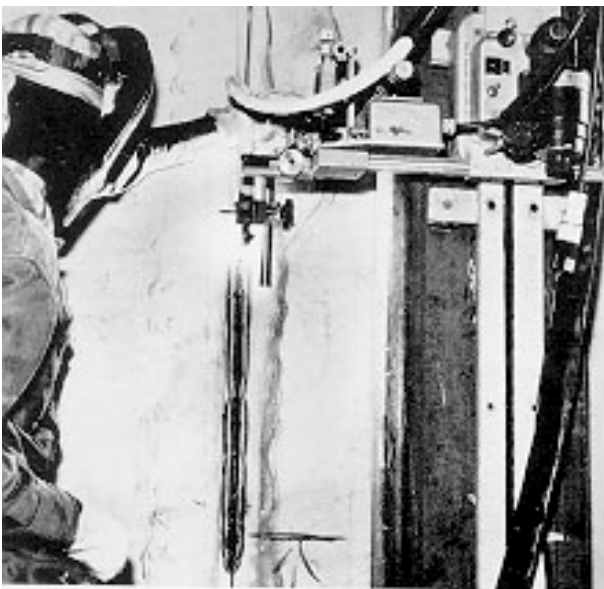


Application: Fabrication of stainless steel furnace cover shells.

Process: MIG welding.

Equipment: Bug-O Speed Weaving Kit on one side — manual welding on opposite side.

Savings: 55% savings in man hours with improved quality.

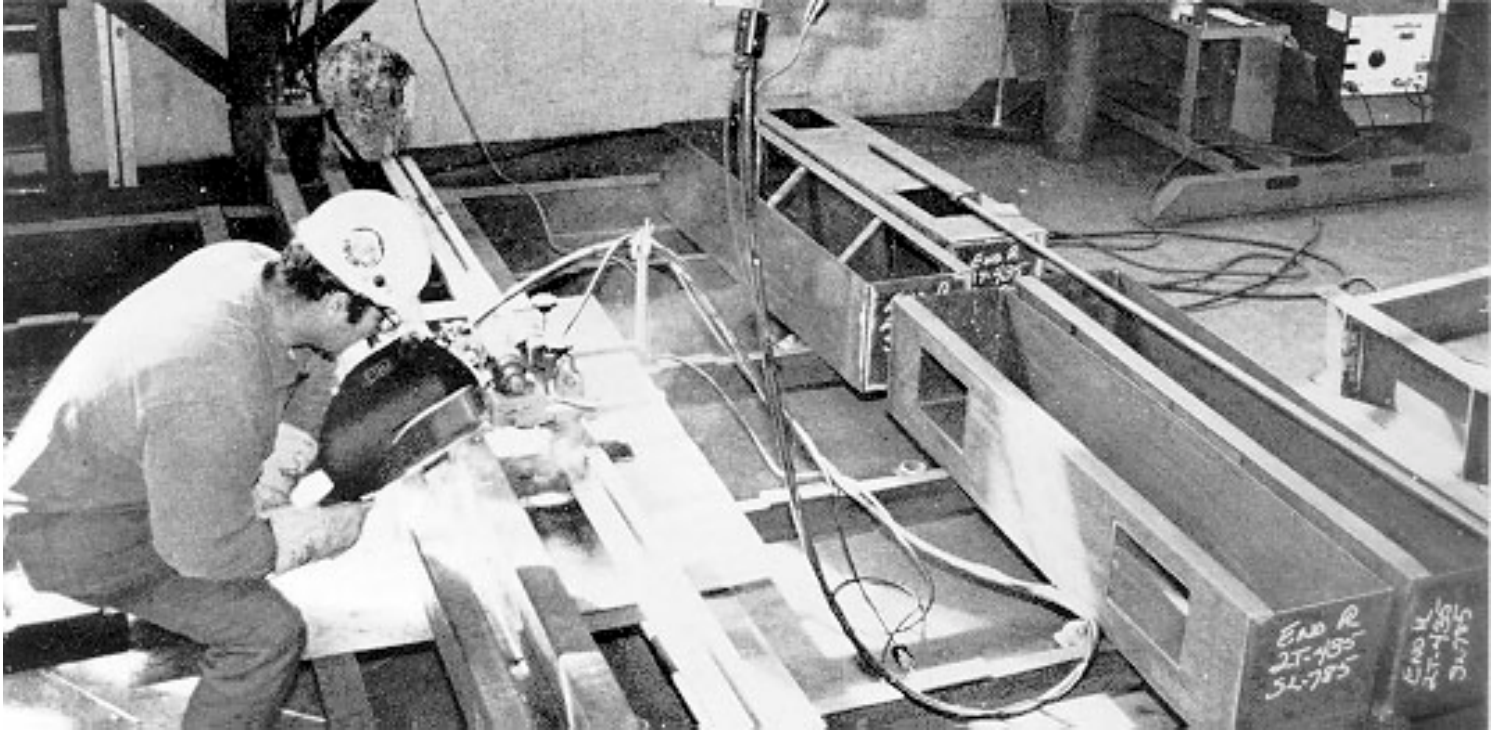


Application: Increase production of water treatment equipment.

Process: MIG welding.

Equipment: Bug-O Speed Weaving Kit.

Savings: Production increased with improved quality.

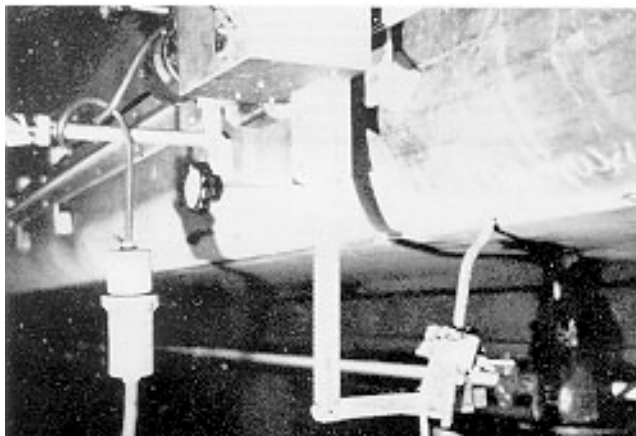
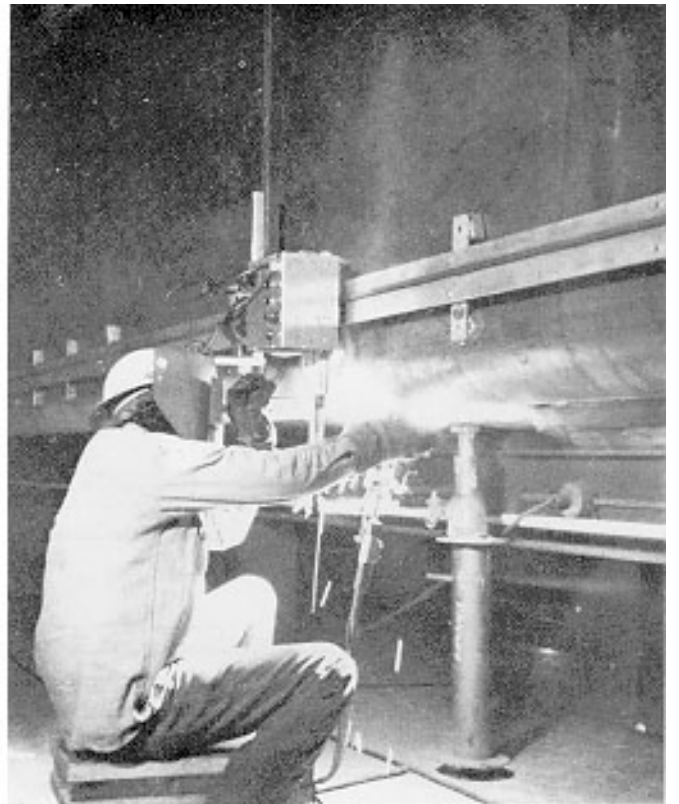


Application: Overhead welding on river barges.

Process: Flux cored arc welding.

Equipment: Bug-O Speed Weaving Kit.

Savings: 300% increase in production without operator fatigue.

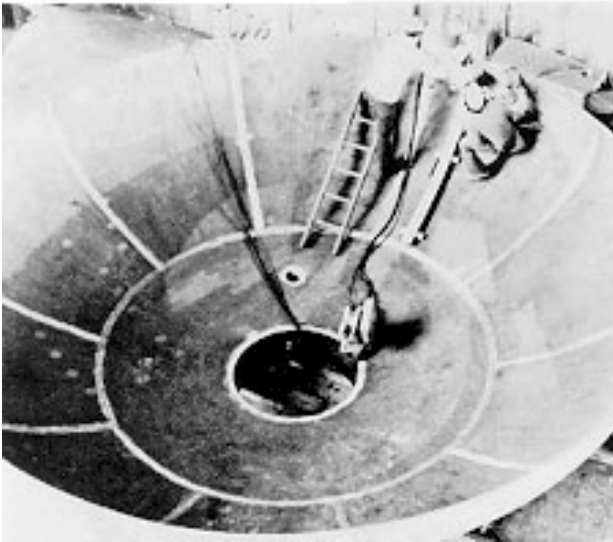
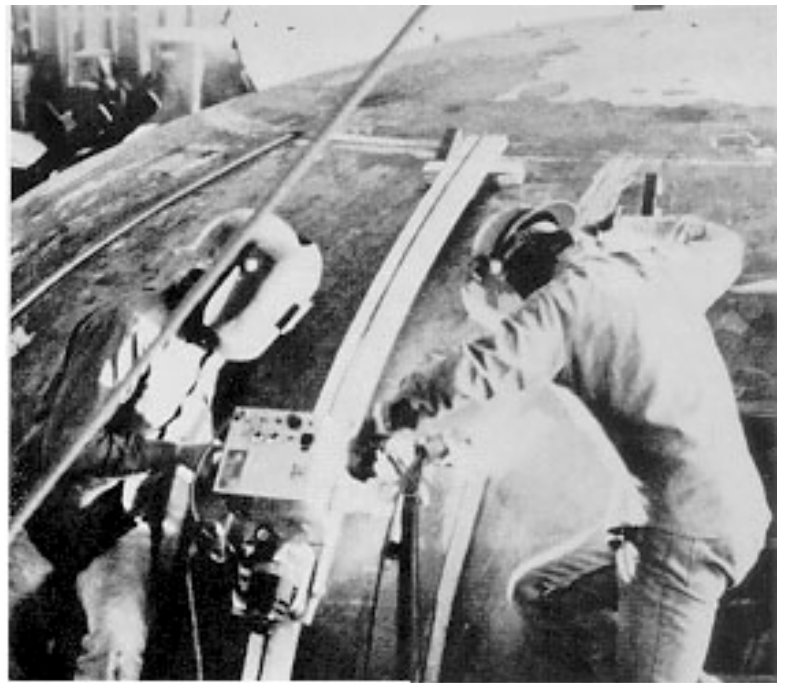


Application: Fabricating hemispherical heads.

Process: MIG welding.

Equipment: Bug-O Speed Weaving Kit and Bent Rails.

Savings: \$7,200.00 saved on welding/cleaning time.

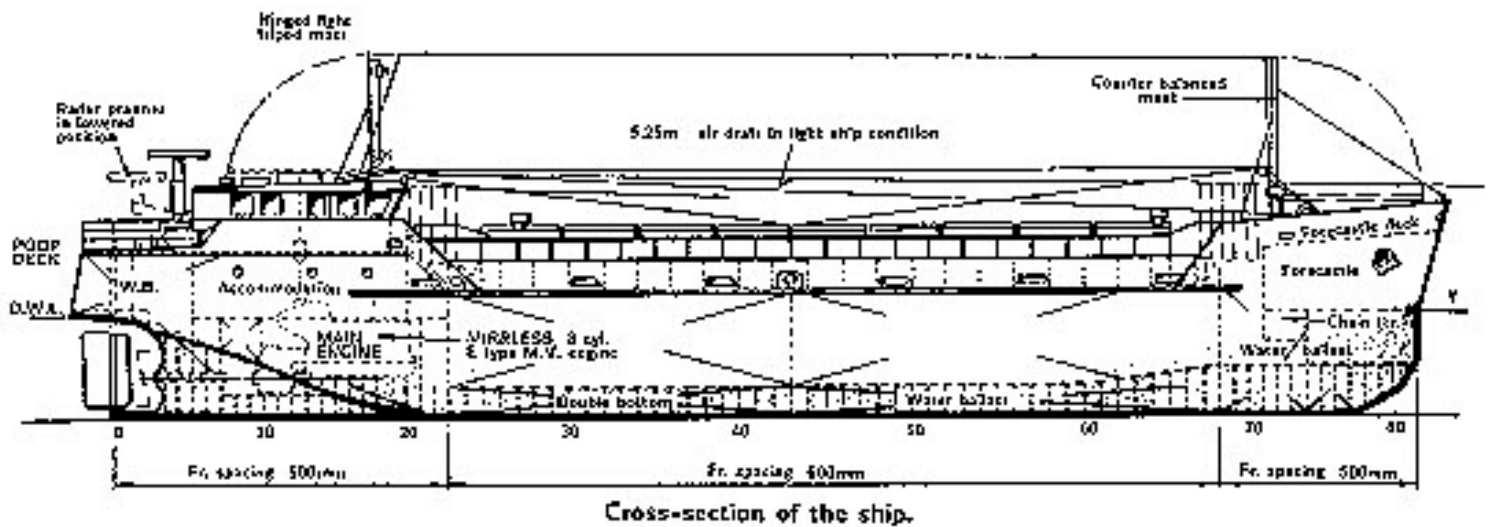


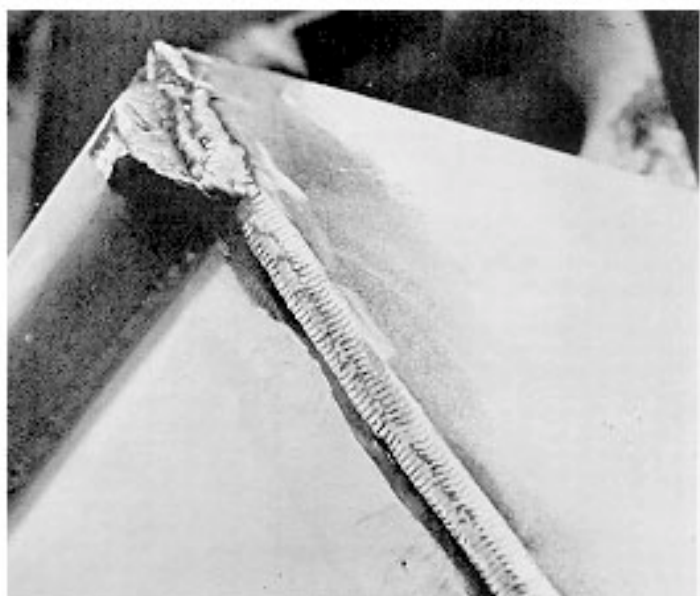
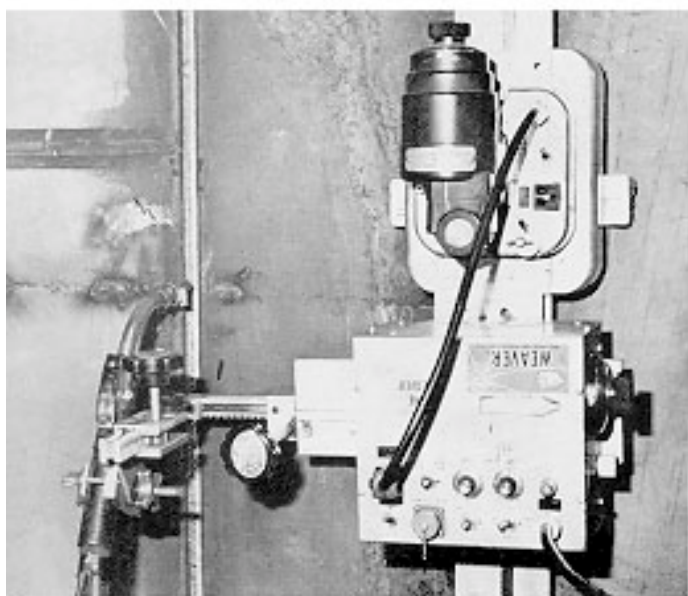
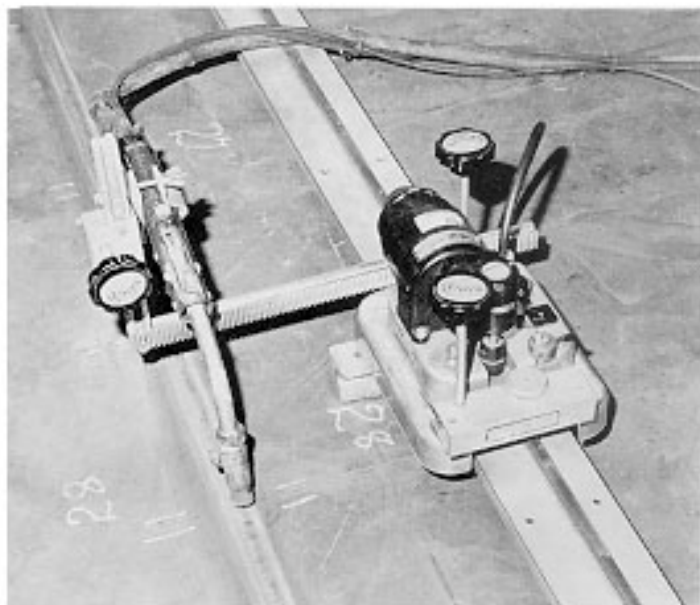
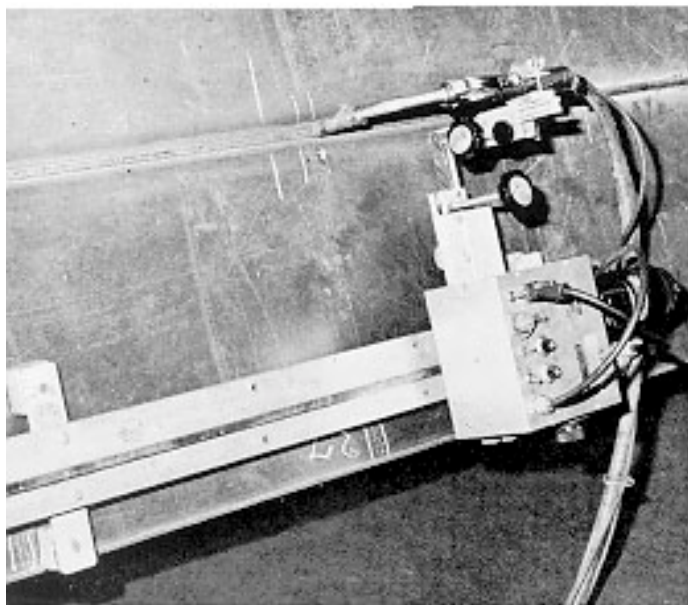
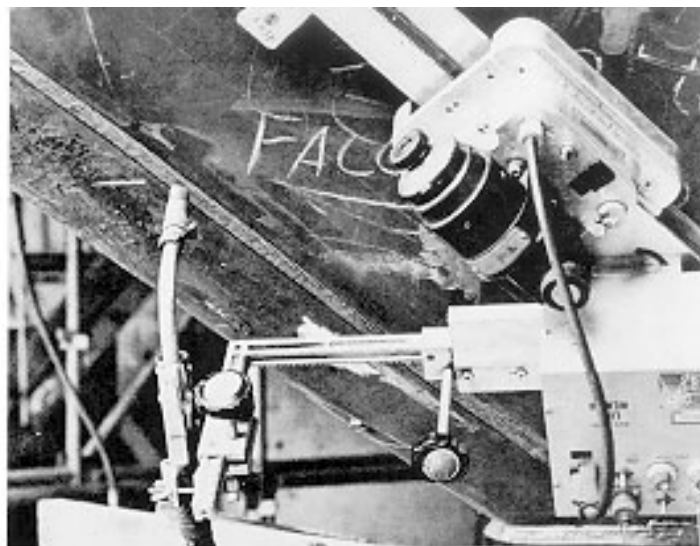
Application: Shipbuilding.

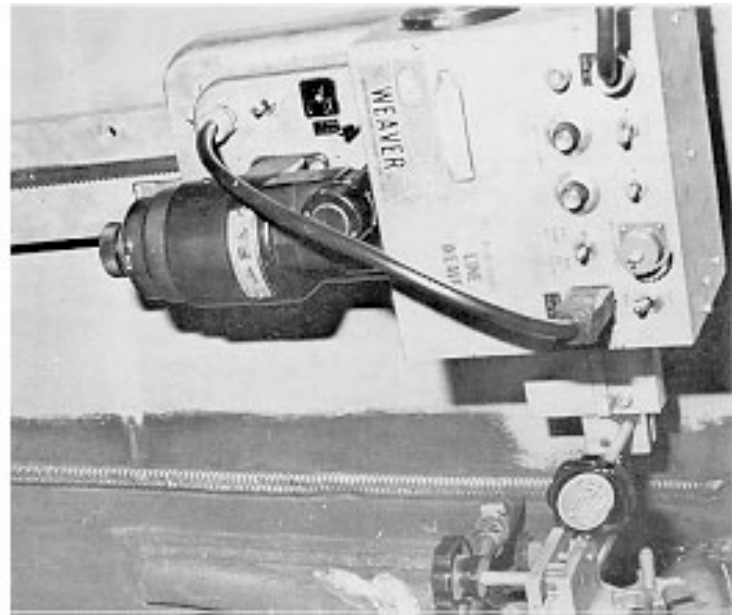
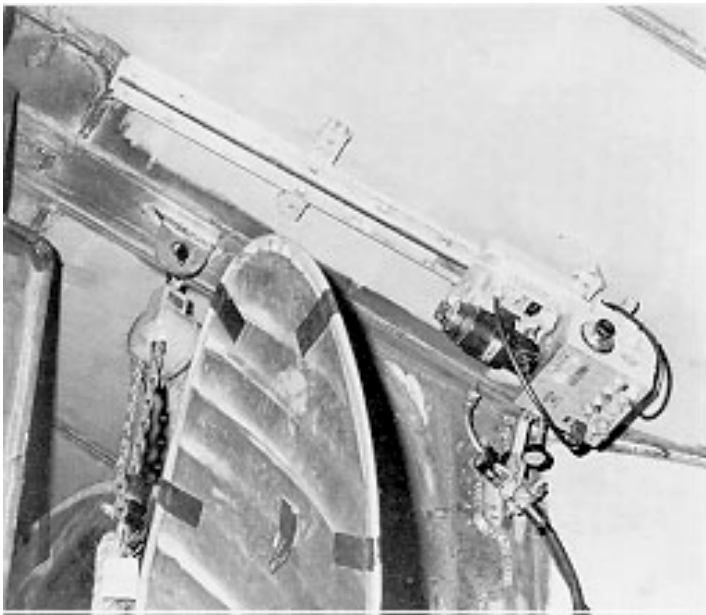
Process: MIG welding.

Equipment: Bug-O Speed Weaving Kit, Bug-O General Welding Kit.

Savings: 75% reduction in welding time.







Application: Penstock erection.

Process: MIG welding.

Equipment: Bug-O Speed Weaving Kit and bent rail - shield supplied by customer.

Savings: 2000 man hours, 50% of estimated welding time.

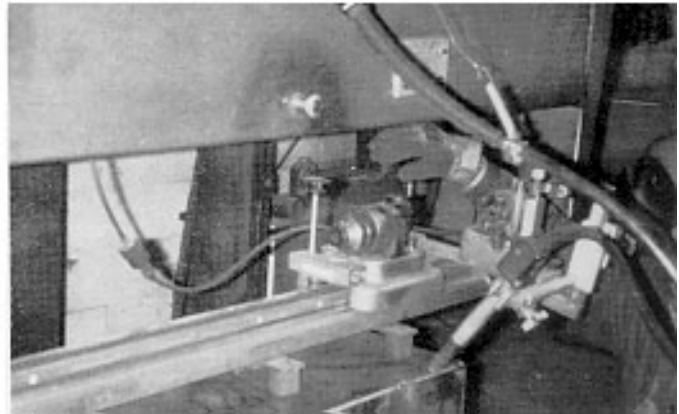
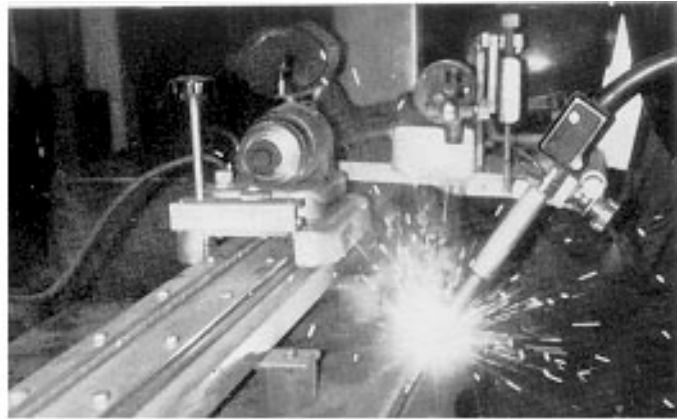


Application: Manufacture of hot rolled steel trays.

Process: MIG welding.

Equipment: Bug-O Weaving Kit.

Savings: Substantial increase in production with improved quality and appearance.

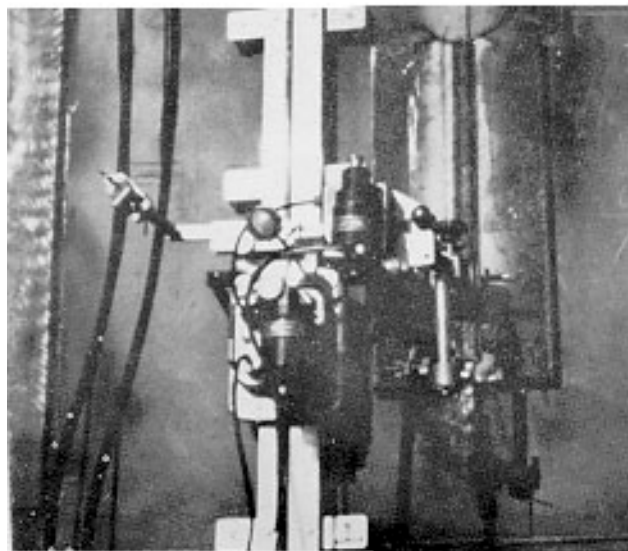


Application: Field assembly of dragline.

Process: Flux cored arc welding.

Equipment: Bug-O Weaving Kit.

Savings: 712 man hours plus uniform improved weld quality.

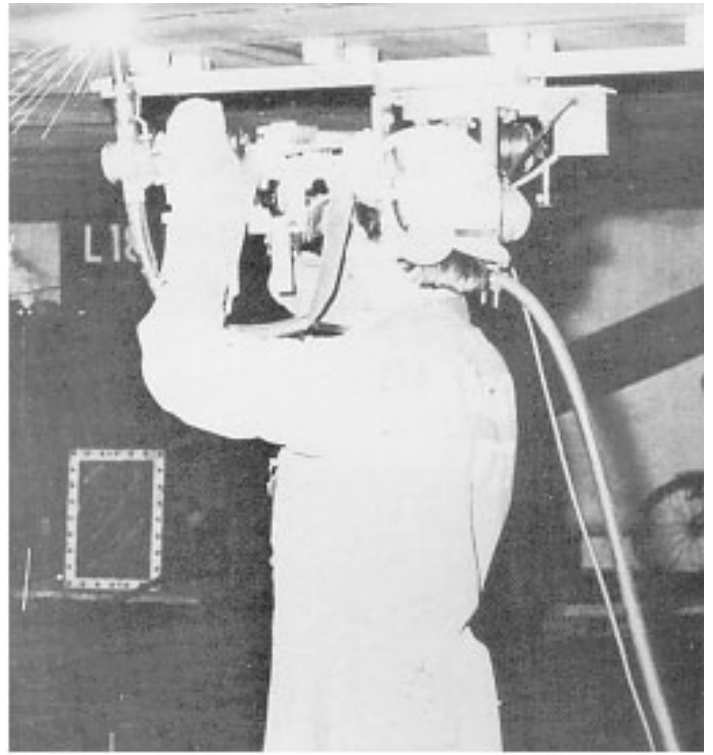
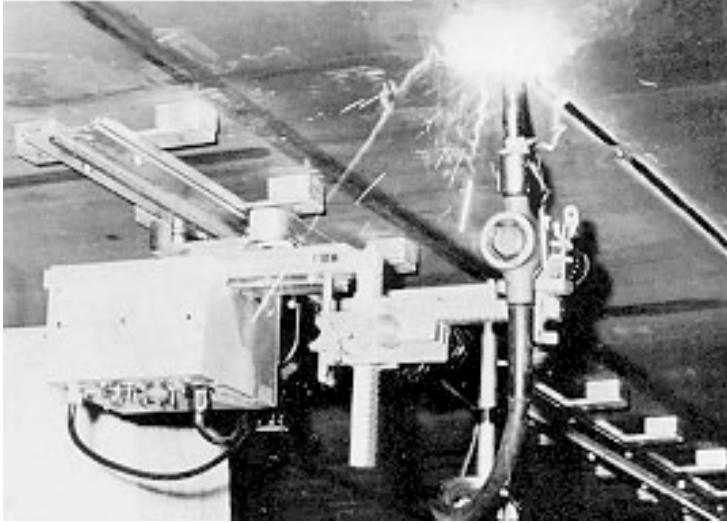


Application: Overhead welding on ships.

Process: Flux cored arc welding.

Equipment: Bug-O Speed Weaving Kit.

Savings: Welding time reduced 50% with better quality and uniform welds.

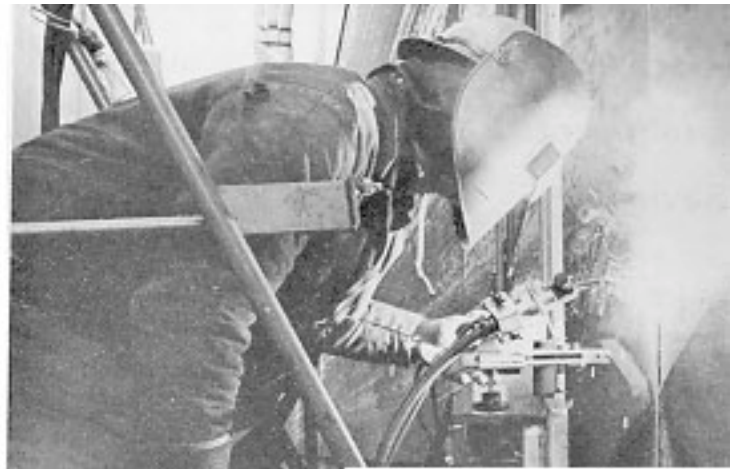


Application: Shipbuilding, vertical welds.

Process: Flux cored arc welding.

Equipment: Bug-O Speed Weaving Kit.

Savings: \$87,782.00 per year.





Applications

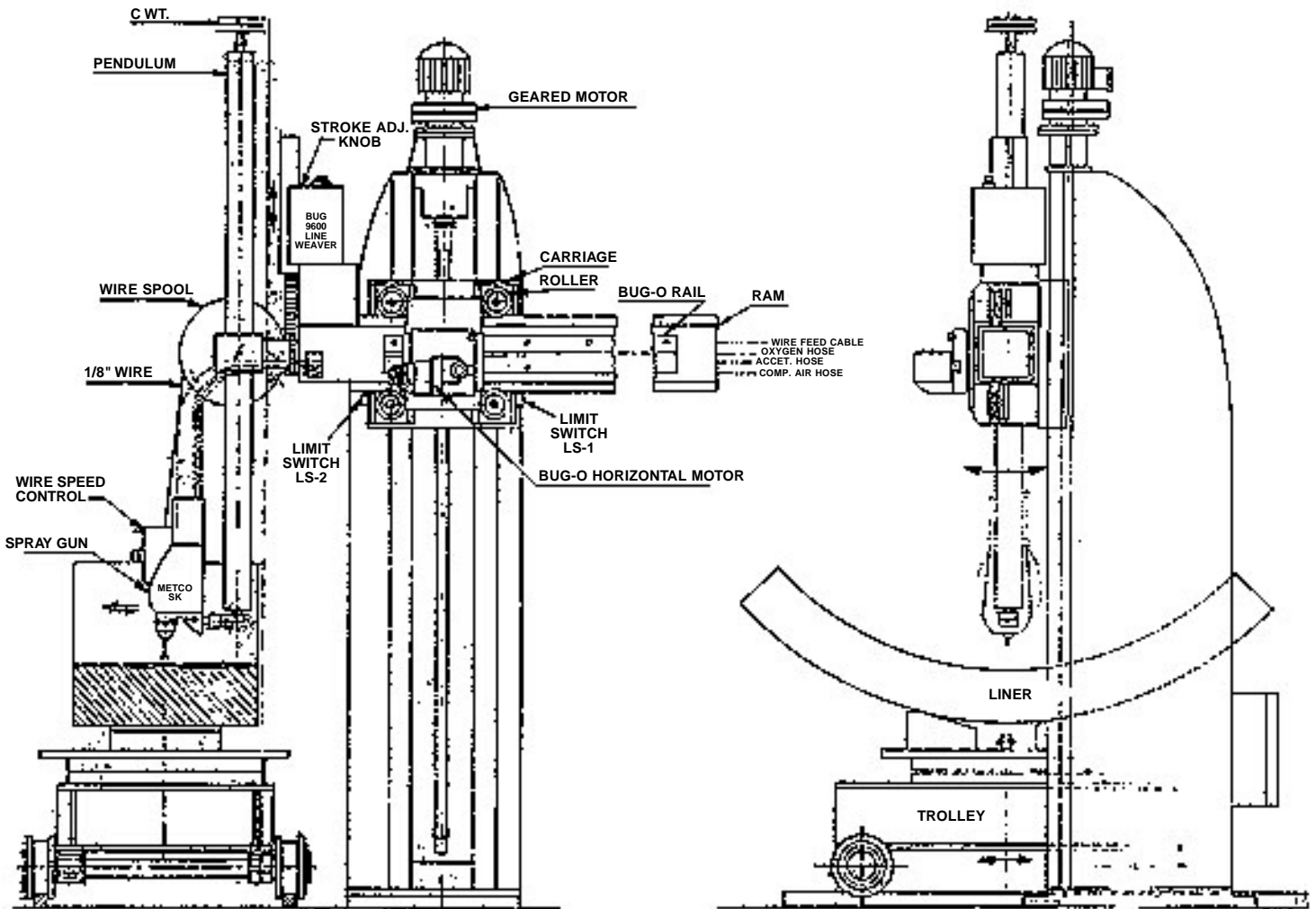
Overlay, Hardfacing, Metalizing

Application: Overlaying bearing liners on cement kilns.

Process: Metco spraying.

Equipment: Bug-O Weaving Kit and accessories mounted on our customer's fixture.

Savings: 35-40% reduction in machining time and 2000-2500 man hours per year.

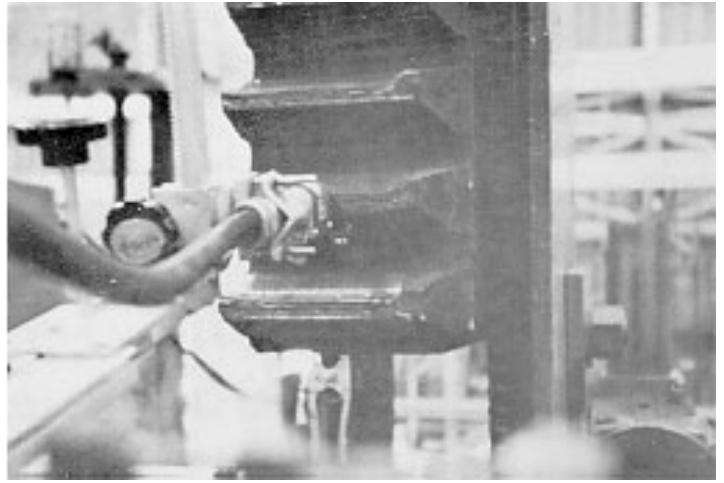
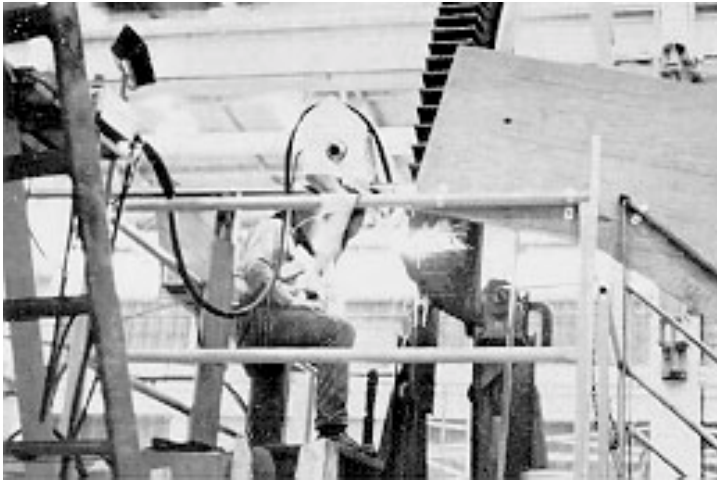


Application: Repair of drag line gears.

Process: MIG welding.

Equipment: BUG-O-VERLAY

Savings: Salvaging worn gears saved \$195,000.00

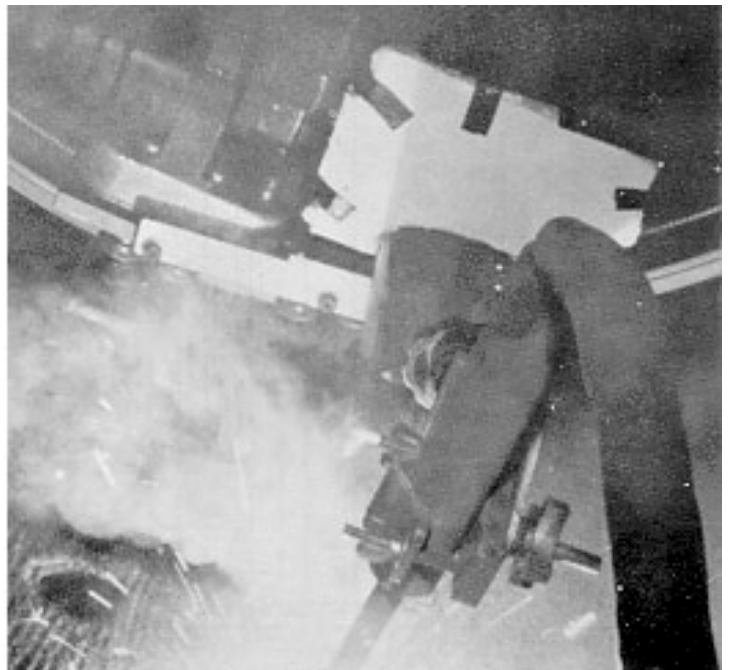
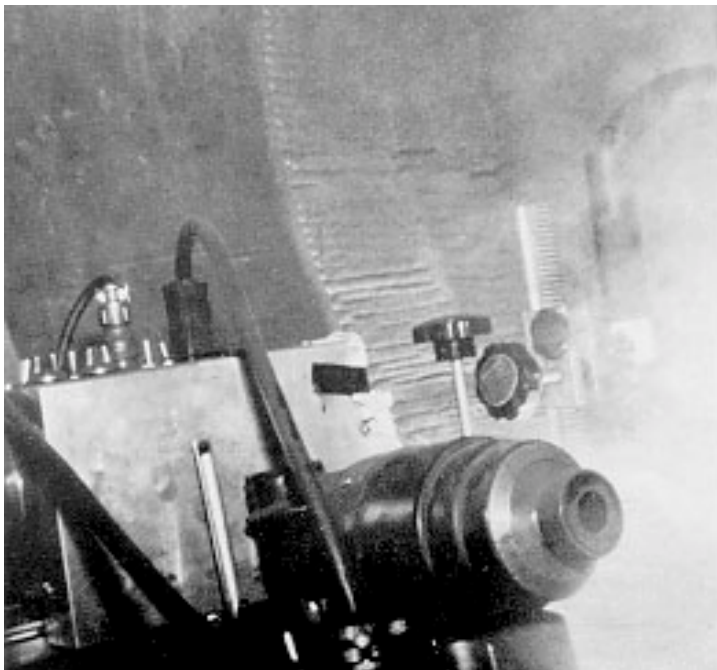


Application: Overlaying 44" (1120 mm) cylindrical mixing vessels.

Process: Flux cored arc welding.

Equipment: Bug-O ROL-O Carriage, Bent Rail and Weaver with Pendant Controls, turning rolls supplied by customer.

Savings: 75% reduction in labor cost and substantial savings of material plus uniform, thickness and appearance.

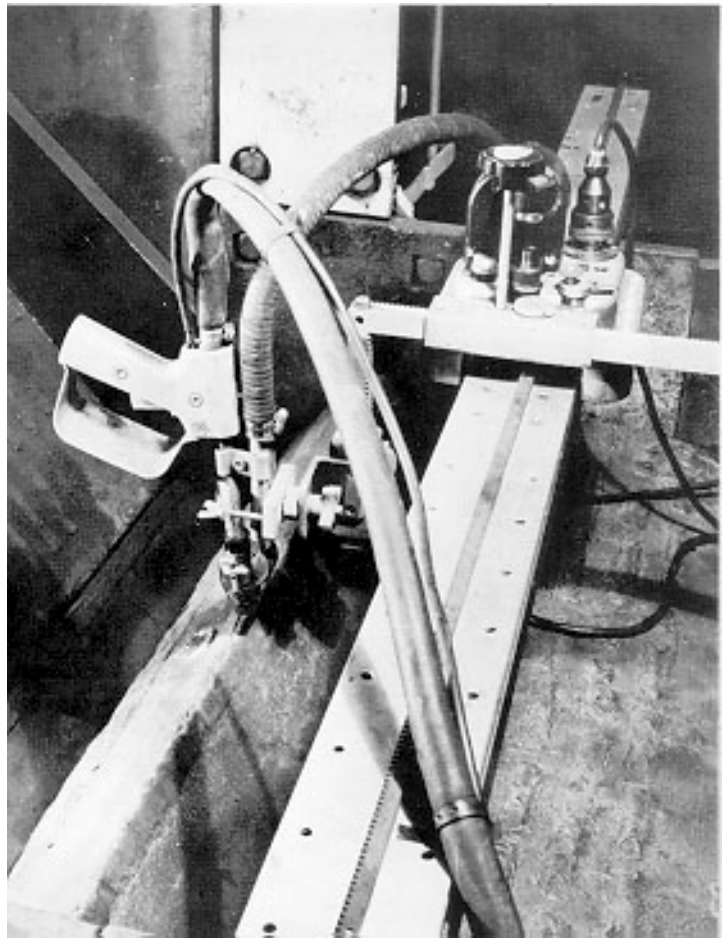
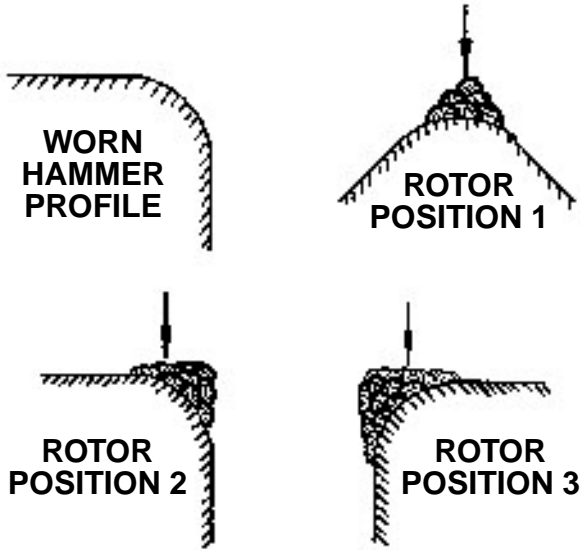


Application: Rebuilding crusher rotors.

Process: Flux cored arc welding.

Equipment: Bug-O General Welding Kit with Pendant Control.

Savings: 150% increase in productivity and improved working conditions.

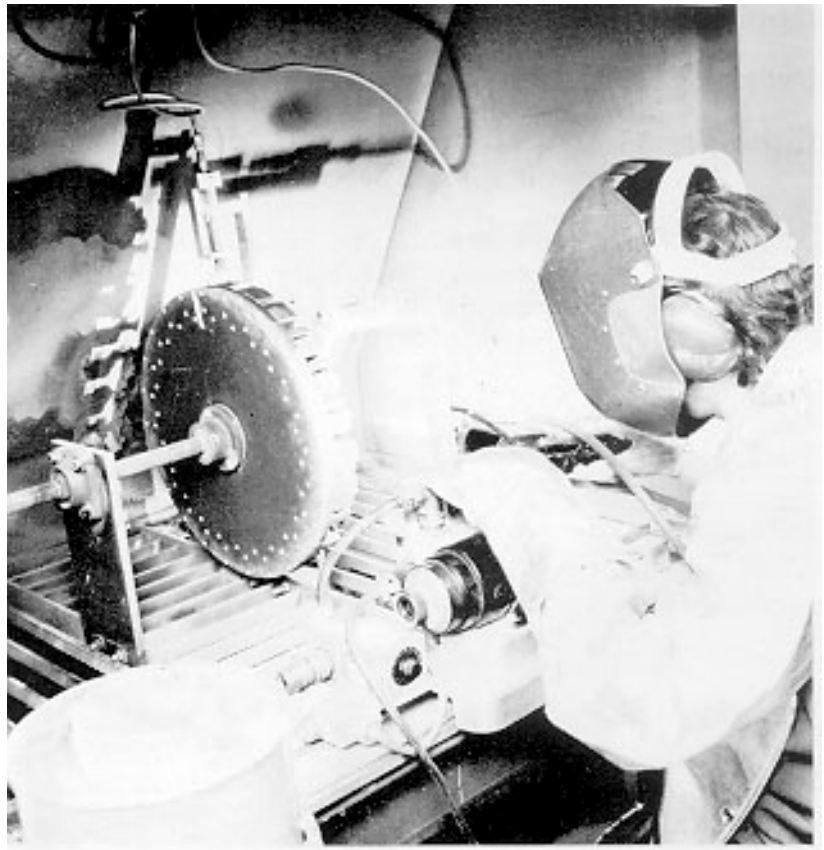


Application: Deposit of wear resistant coatings.

Process: Plasma spraying.

Equipment: Bug-O DC Cycler on DC III, IV with auxiliary relay and rail.

Savings: Uniform coatings with excellent wear characteristics.

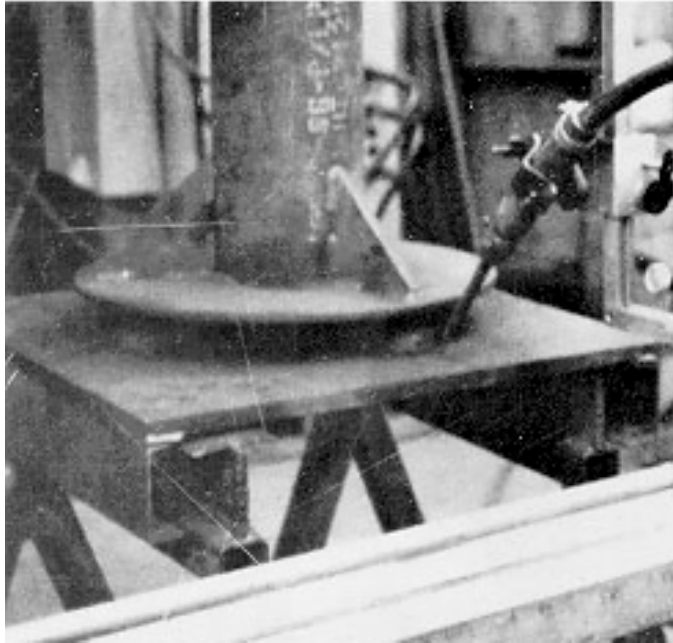
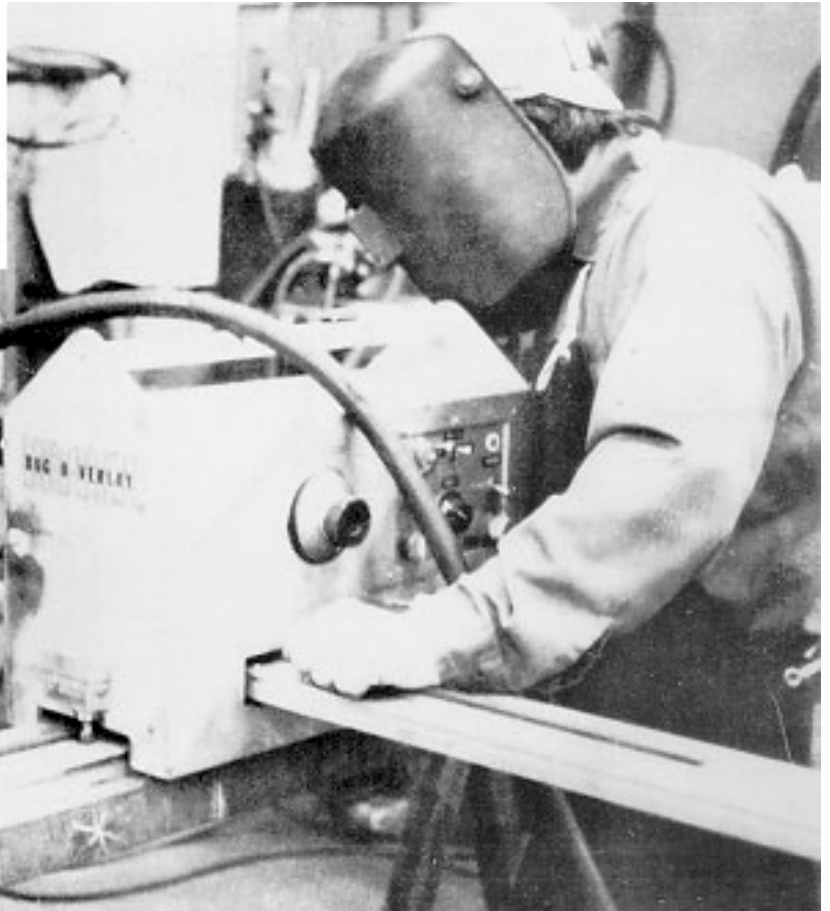


Application: Overlaying parts of scrubber units used in primary metals and foundry production.

Process: MIG welding.

Equipment: BUG-O-VERLAY

Savings: \$8,090.00 on four jobs.

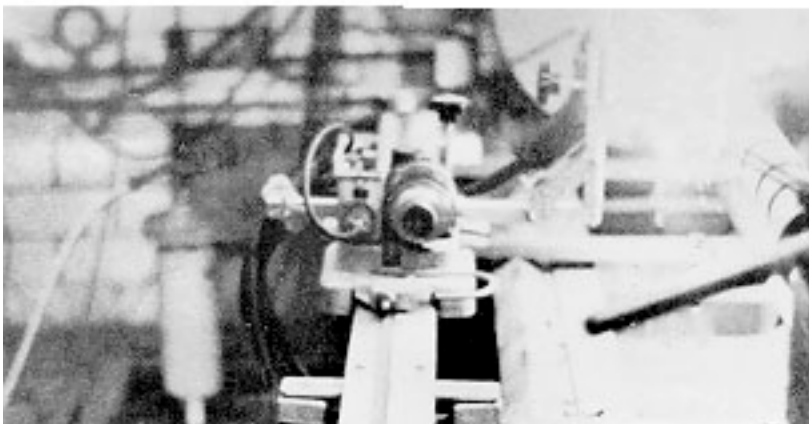
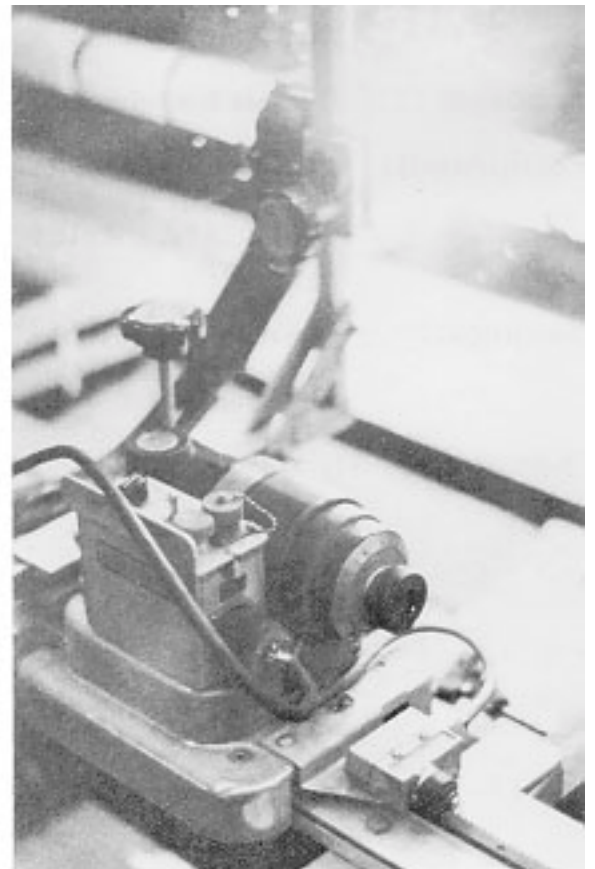


Application: Hardfacing percussion drilling pistons.

Process: Plasma spraying.

Equipment: Bug-O DC Cycler on DC III, IV, lathe and fixture supplied by customer.

Savings: 50% reduction in man hours, 40% reduction in powder, 20% reduction in grinding time, uniform deposition; $\pm .002$ " (.05 mm)



Application: Develop a welding station to demonstrate the welding process and provide samples for testing.

Process: MIG welding.

Equipment: Bug-O General Welding Kit.

Savings: Effective, economical work station.

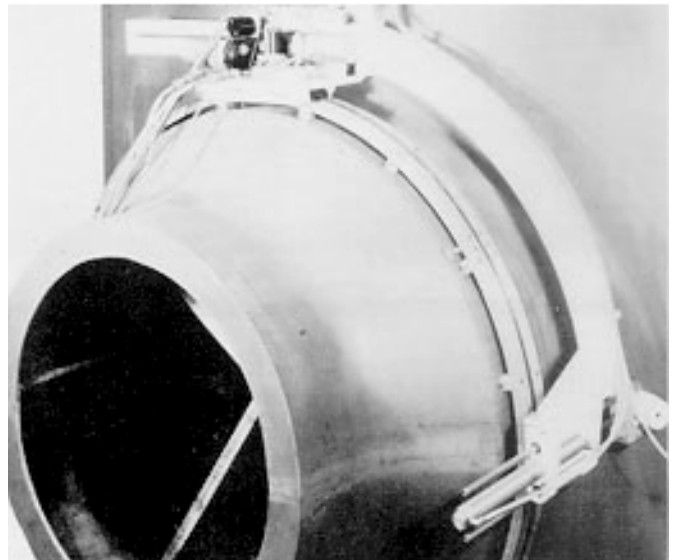


Application: Build an inspection device for nozzle-to-shell weld in a reactor vessel.

Process: Ultrasonic inspection.

Equipment: Bug-O Bent Rail, with special carriage, drives and fixture made by customer.

Savings: Enabled inspection without shutting down the reactor.

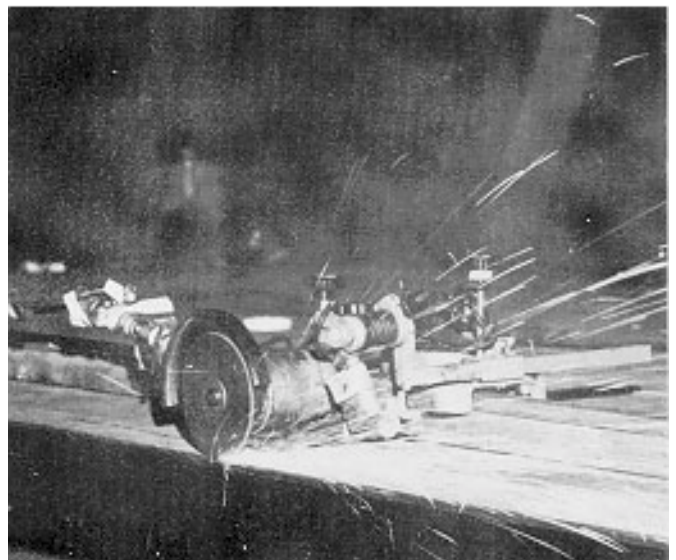


Application: Removal of cladding adjacent to weld.

Process: Grinding.

Equipment: Bug-O DC III, Panograph, Rail and Magnets.

Savings: 50% less time required to prepare surface.

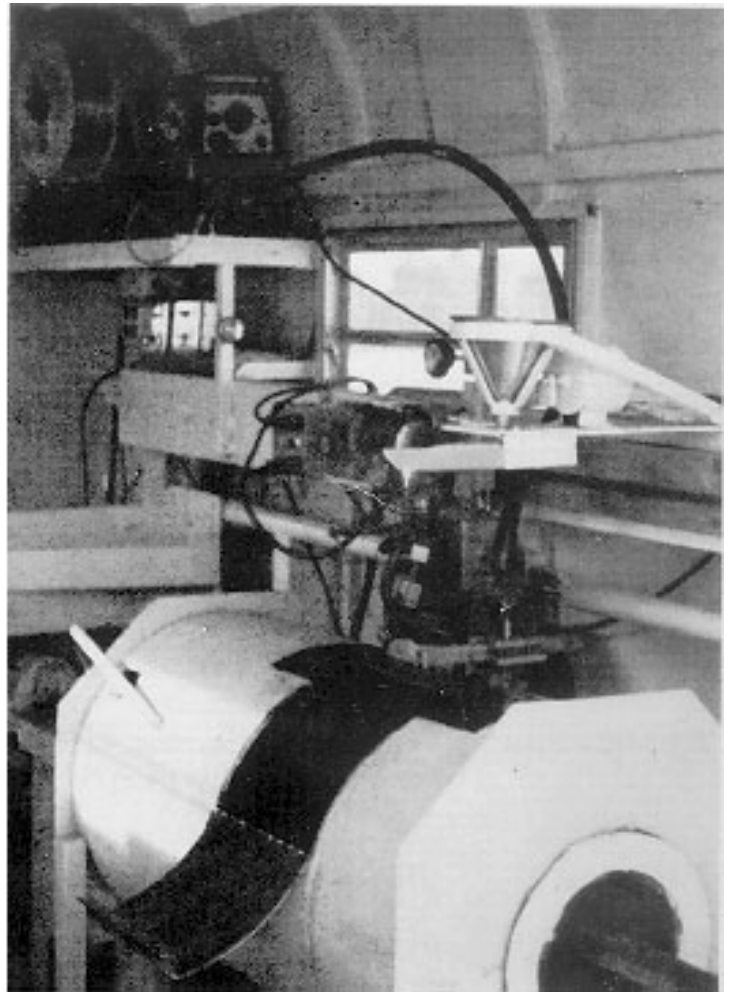


Application: Hardfacing drill pipe joints.

Process: Flux cored arc welding.

Equipment: Bug-O Weld Weaving Kit and Stepping Module, fixture supplied by customer.

Savings: \$75,000.00 per year per drill rig.

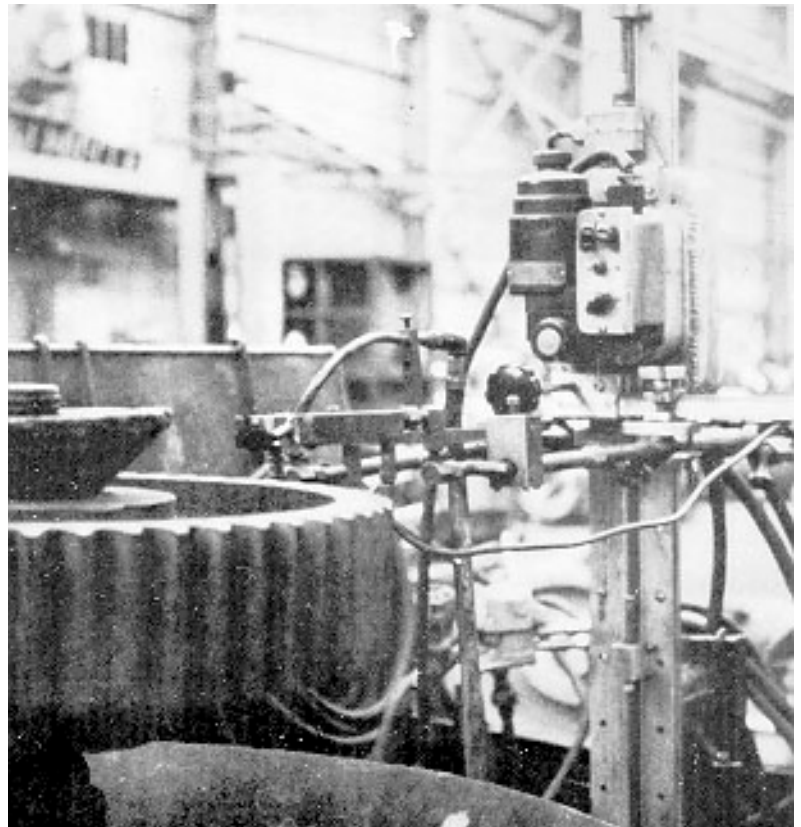


Application: Flame hardening gear teeth.

Process: Oxyfuel.

Equipment: Bug-O DC Cycler on DC III, IV, fixture made by customer.

Savings: Improved quality and production without maintenance problems.





Applications

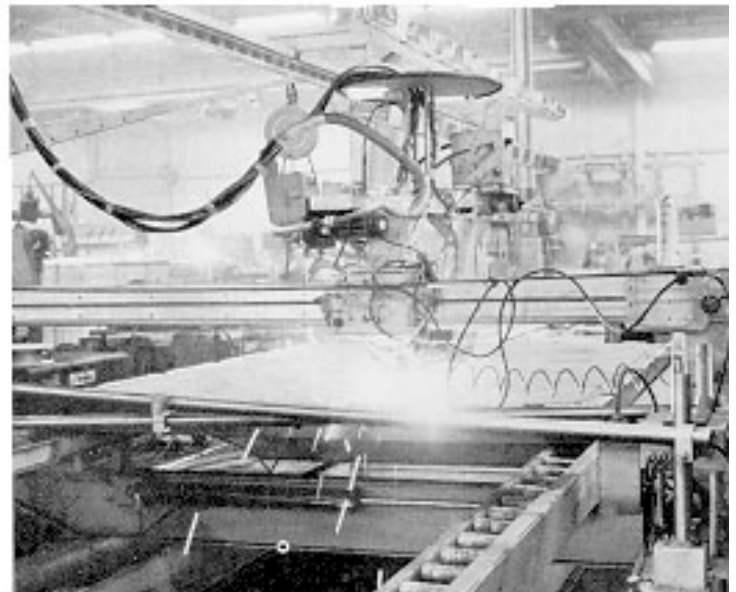
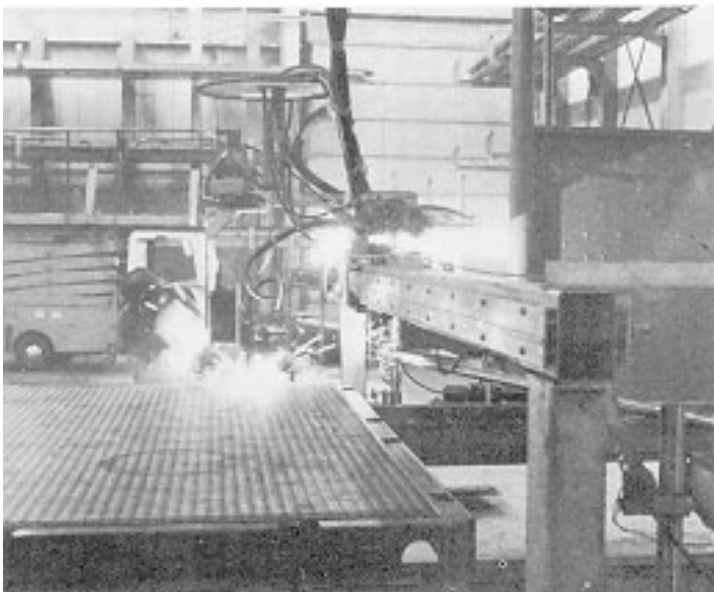
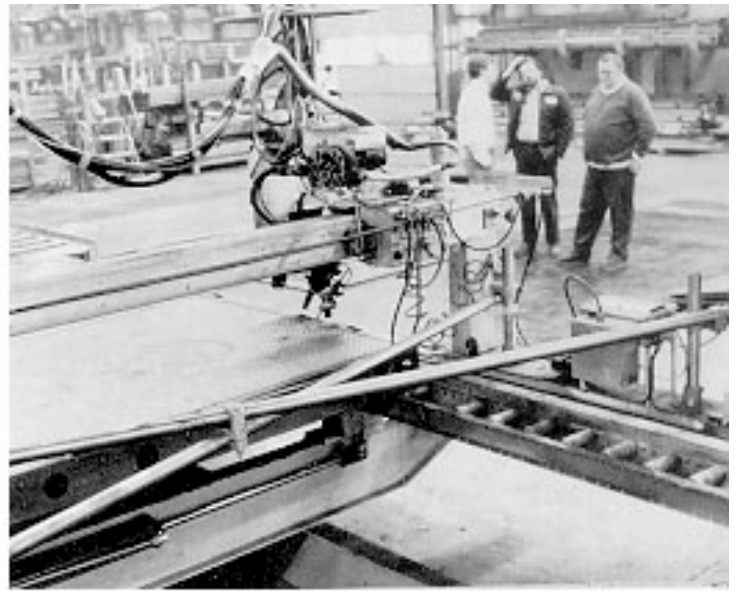
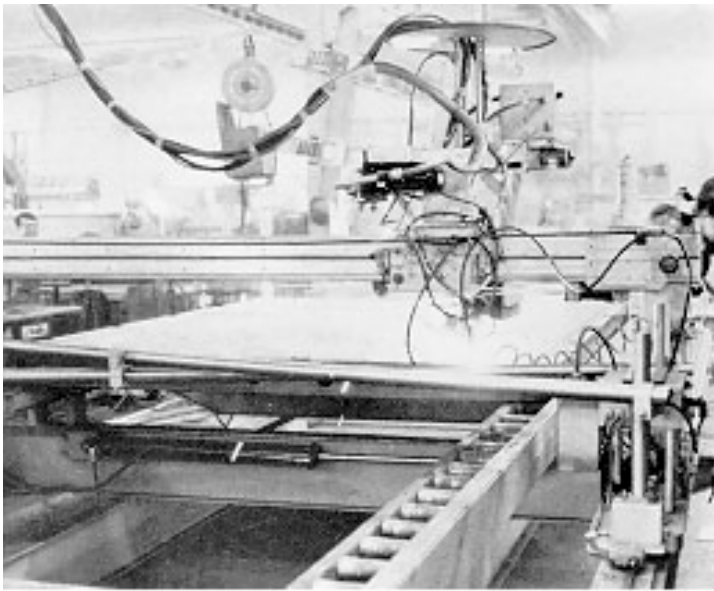
Fixturing for Welding

Application: Mechanized fillet welding.

Process: MIG welding.

Equipment: MUG-O Welding Gantry with special controls supplied by customer.

Savings: Improved quality and appearance in 1/10 the time required for manual welding.

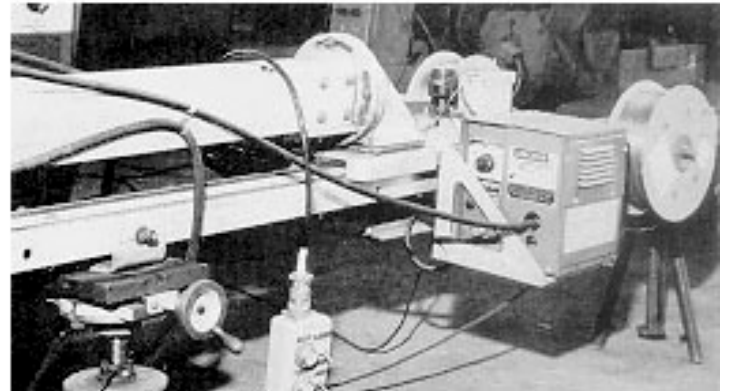
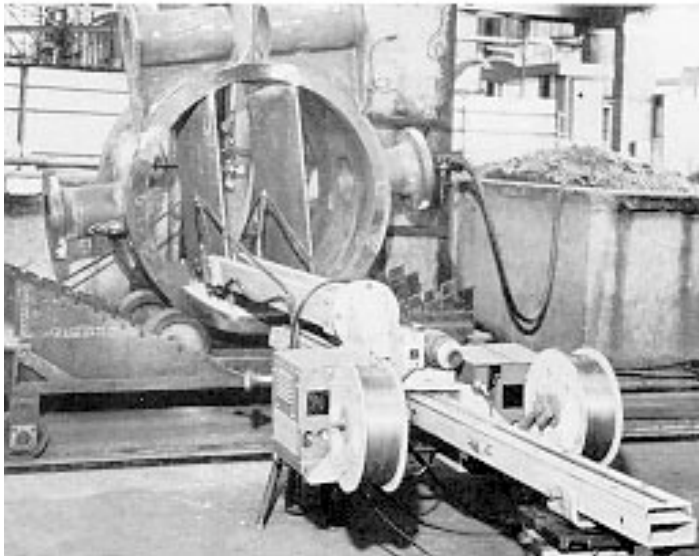
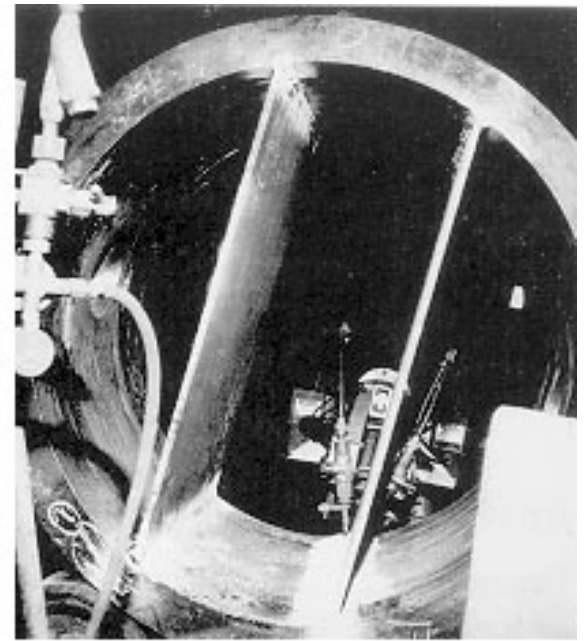


Application: Mechanized simultaneous fillet welding.

Process: Dual flux cored arc welding.

Equipment: Bug-O DC IV, Carriage, Rail and fixturing made by customer.

Savings: Eliminated distortion and provided annual savings of \$6,000.00.

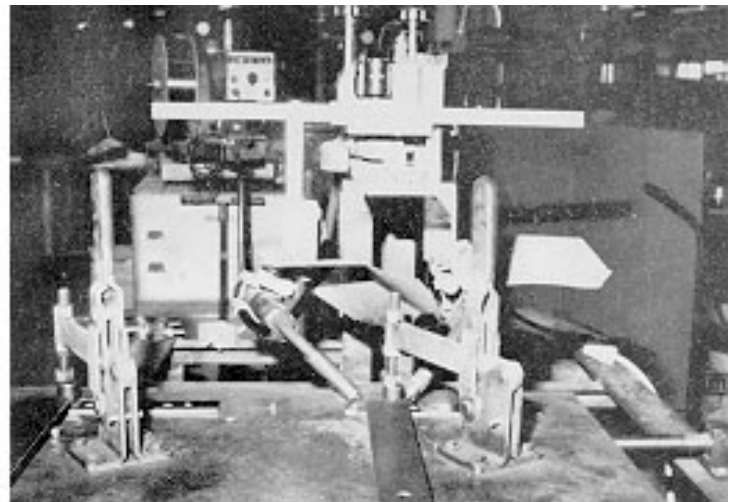
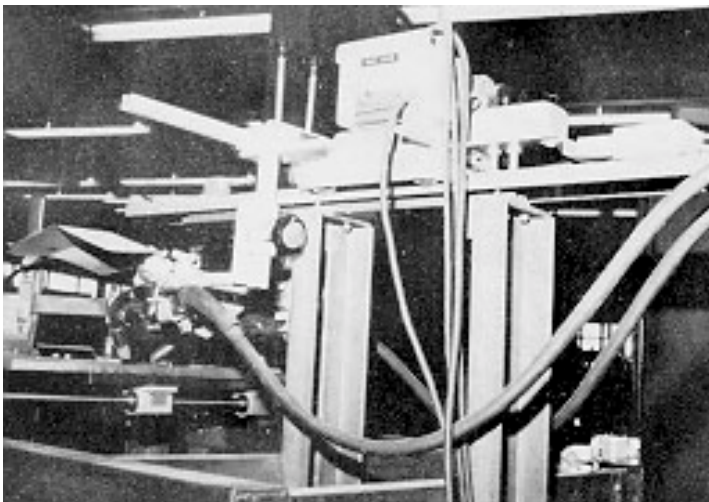


Application: Welding stamped parts to plate.

Process: Dual MIG welding.

Equipment: Bug-O DC Skip Welding Kit on customer's fixture.

Savings: Production increased 85%, work handling was reduced and skill level reduced.



Application: Intermittent welding of stainless steel strip to stainless box section.

Process: Dual flux cored arc welding.

Equipment: Bug-O DC Skip Welder mounted on customer's fixture.

Savings: Weld defects reduced from 10-12% to 2-3%, distortion eliminated, one operator instead of three.

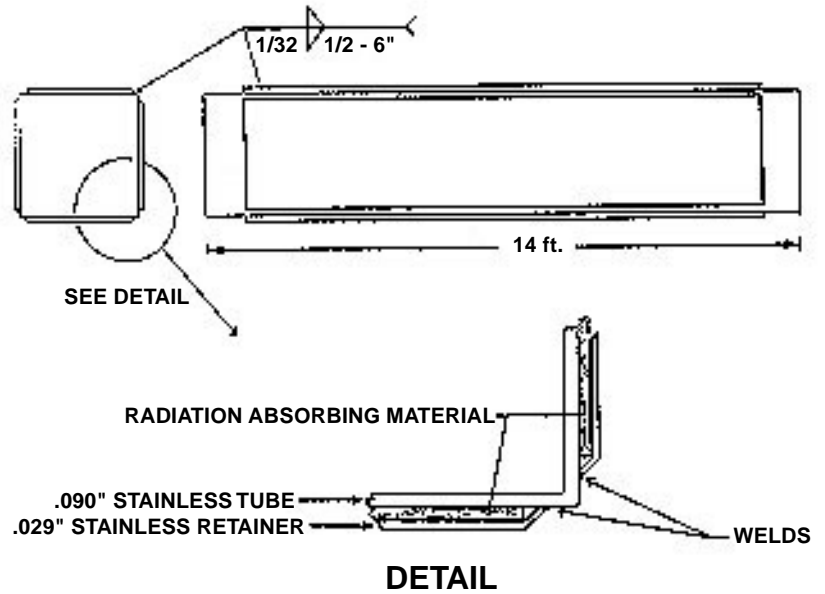


EXHIBIT NUMBER 1

BASIC FIXTURE LAYOUT

1. TUBE
2. HYDRAULIC MOUNTED BOOM
3. HYDRAULIC TUBES
4. BUG-O TRACTOR
5. MIG GUN
6. SPOOLED WIRE
7. CARRIAGE
8. SPRING LOADED HOLD DOWN CLAMPS
9. BUG-O TRACK
10. PNEUMATIC LIFTS

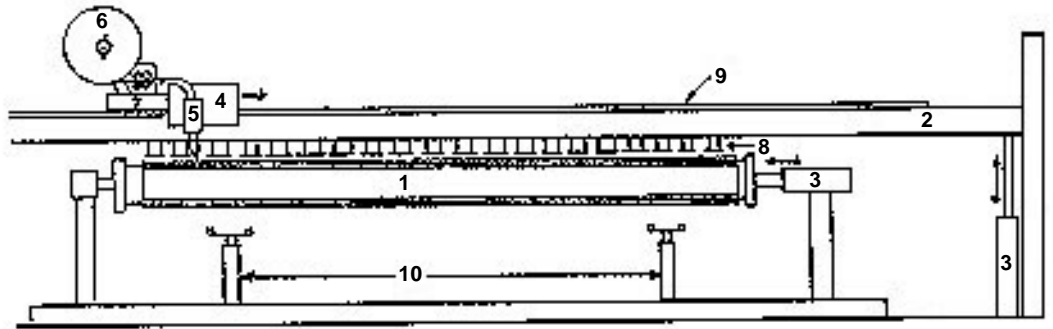
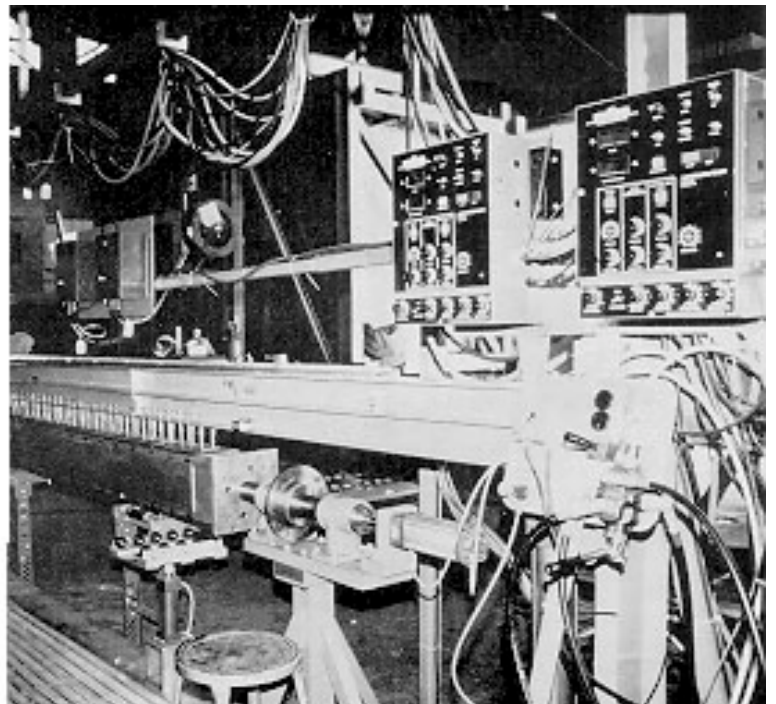
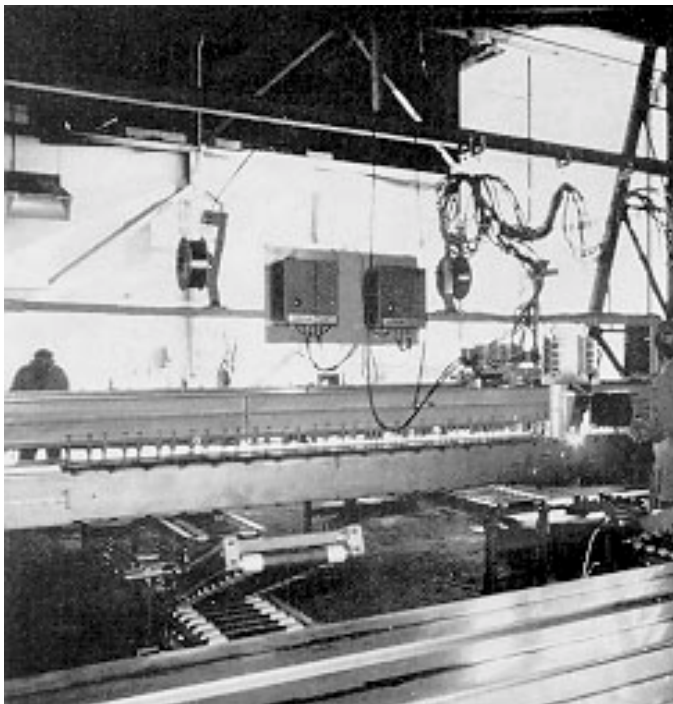


EXHIBIT NUMBER 2

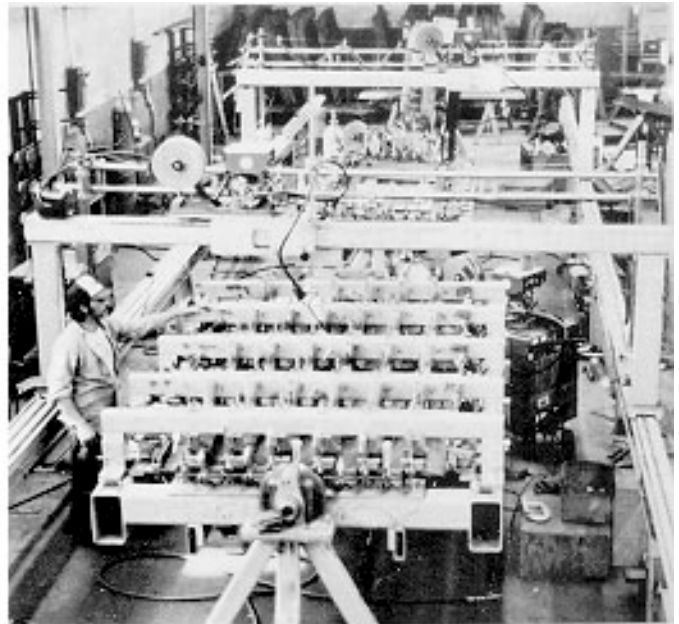


Application: Fabricate weldment from 50 separate pieces.

Process: MIG welding.

Equipment: Two MUG-O Welding Gantries.

Savings: Minimum distortion, good control of tight tolerances with reduced material handling, produced substantial savings.

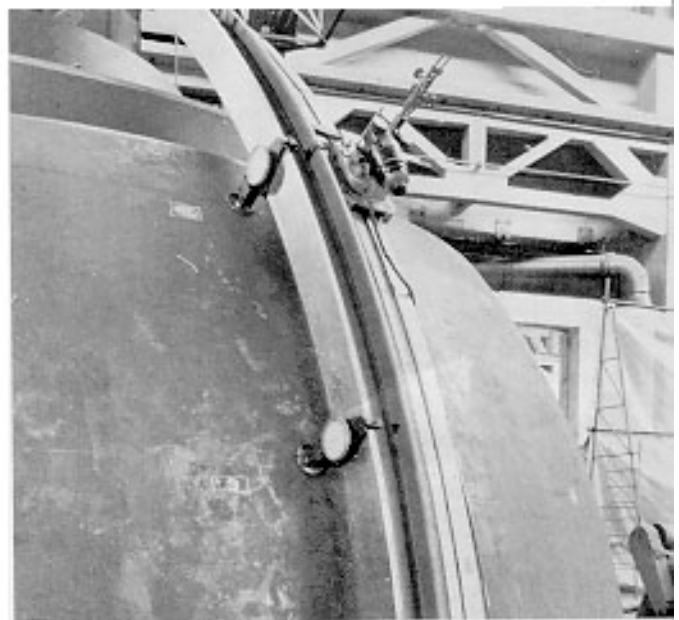
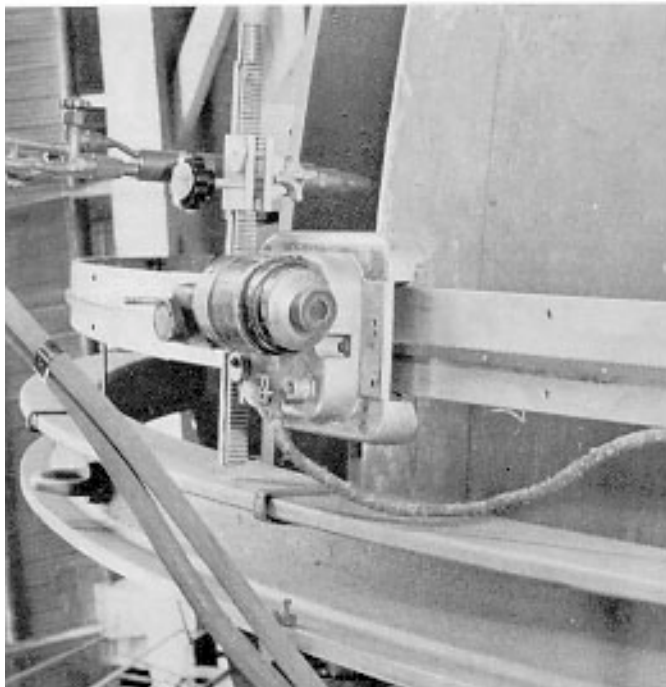
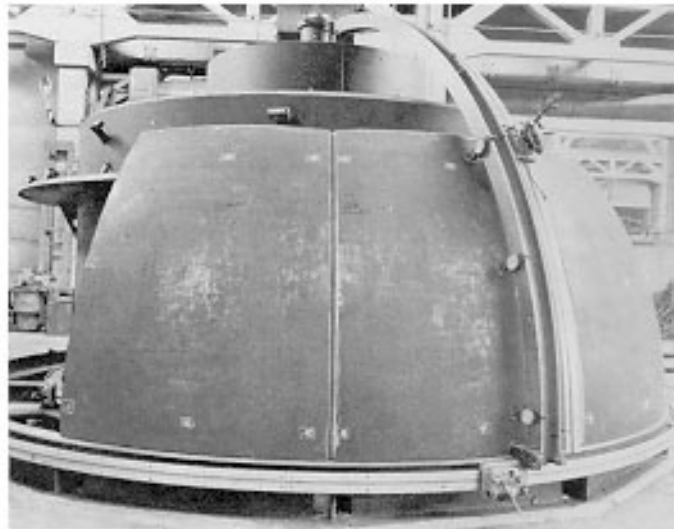


Application: Fabrication of submarine sections.

Process: MIG welding.

Equipment: BUG-O DC III and IV, Bent Rail mounted on customer's fixture.

Savings: Doubled production and improved product quality.

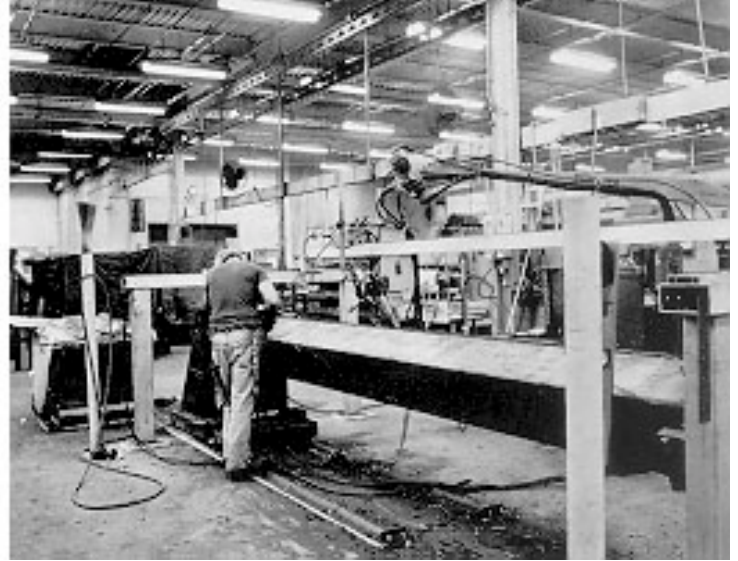
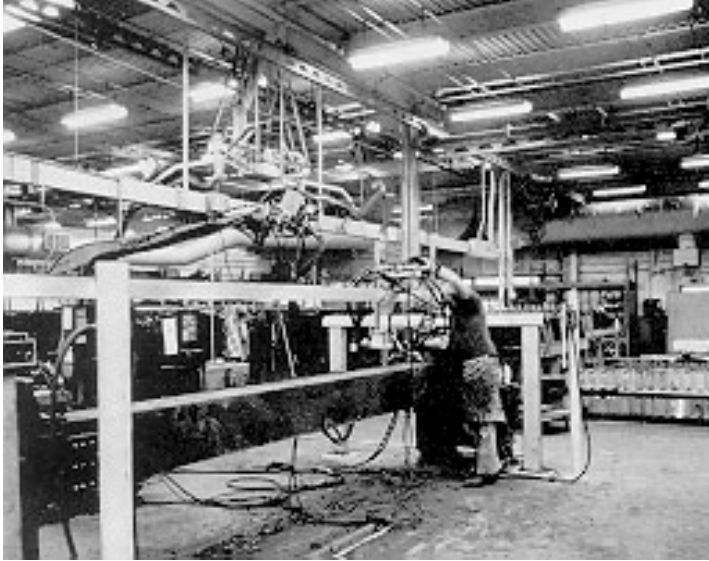


Application: Fabricating telescoping boom segments for large digging machines.

Process: Dual MIG welding.

Equipment: Bug-O DC Skip Welder, Rails, Carriages and other components mounted on fixture made by customer.

Savings: Distortion eliminated, close tolerances maintained and productivity increased 200%.

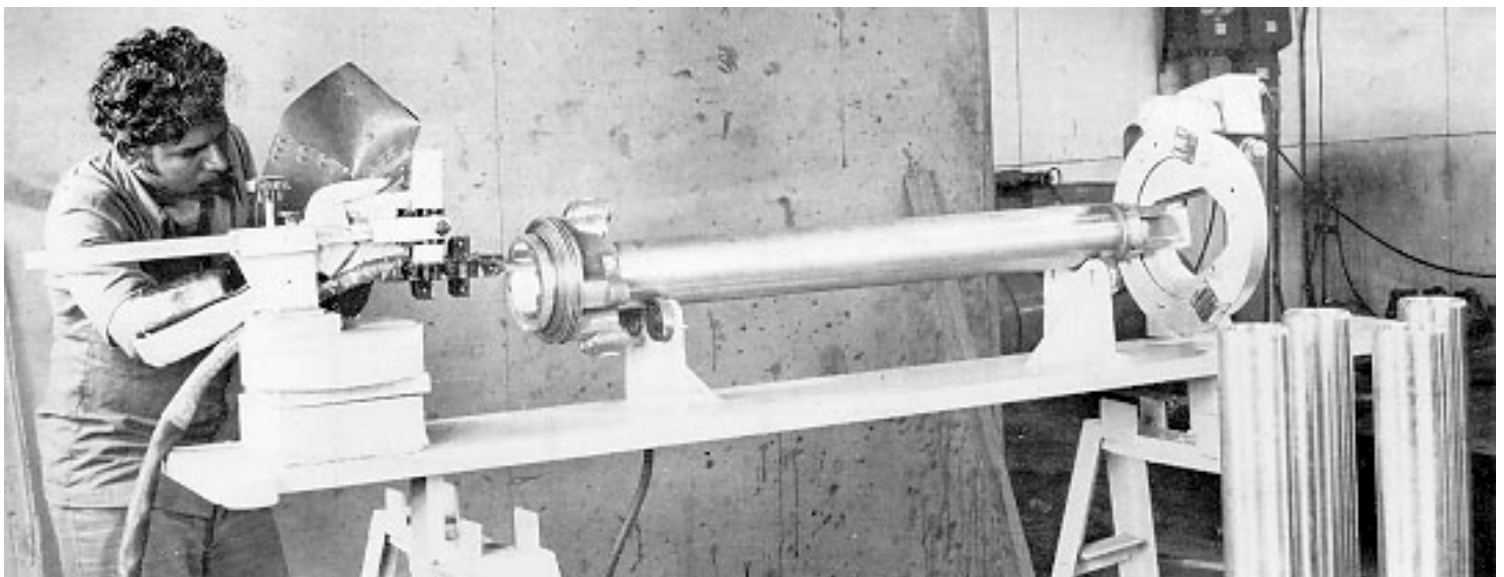


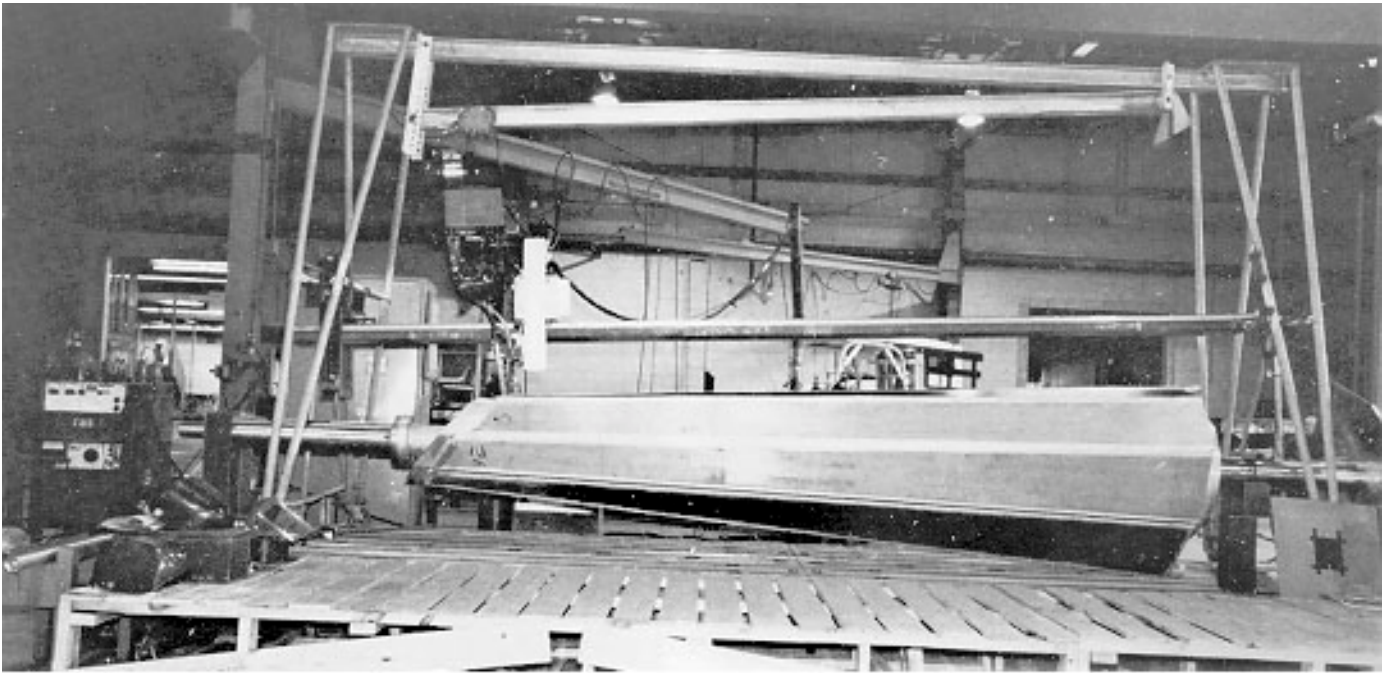
Application: Rotary welding of cylindrical heads.

Process: TIG welding.

Equipment: HOB-O, disassembled and fitted on customer's fixture.

Savings: Negligible distortion without defects, production increase saved \$24.00 per piece.





Application: Welding 8-sided truncated mandrel made of 1" (25 mm) aluminum.

Process: MIG welding.

Equipment: Bug-O Beam Bug and rail on customer's fixture.

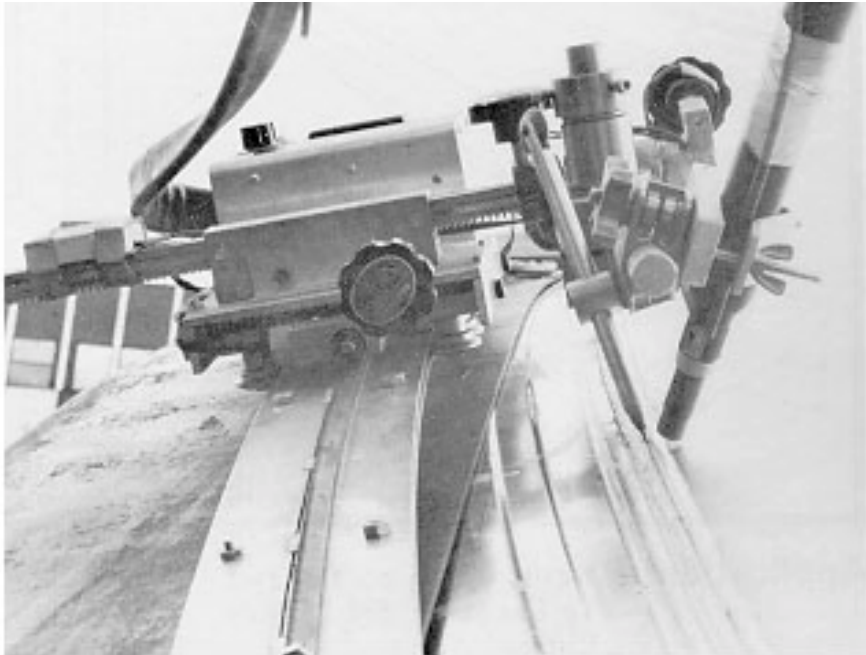
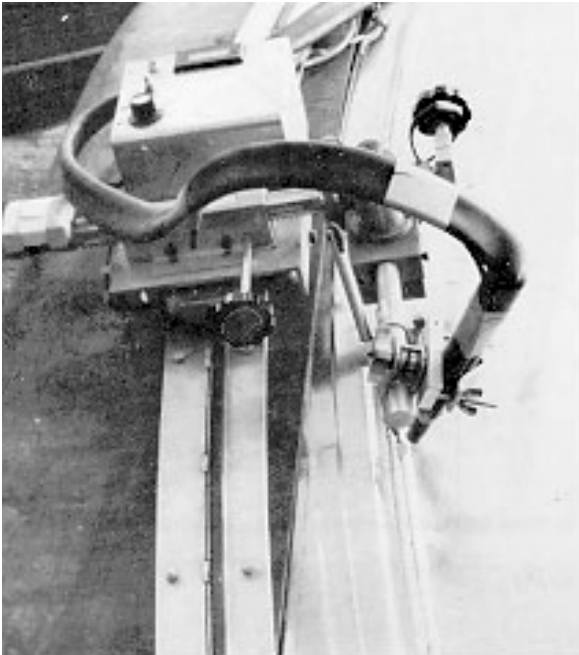
Savings: 32% reduction in welding time with accurate dimensions.

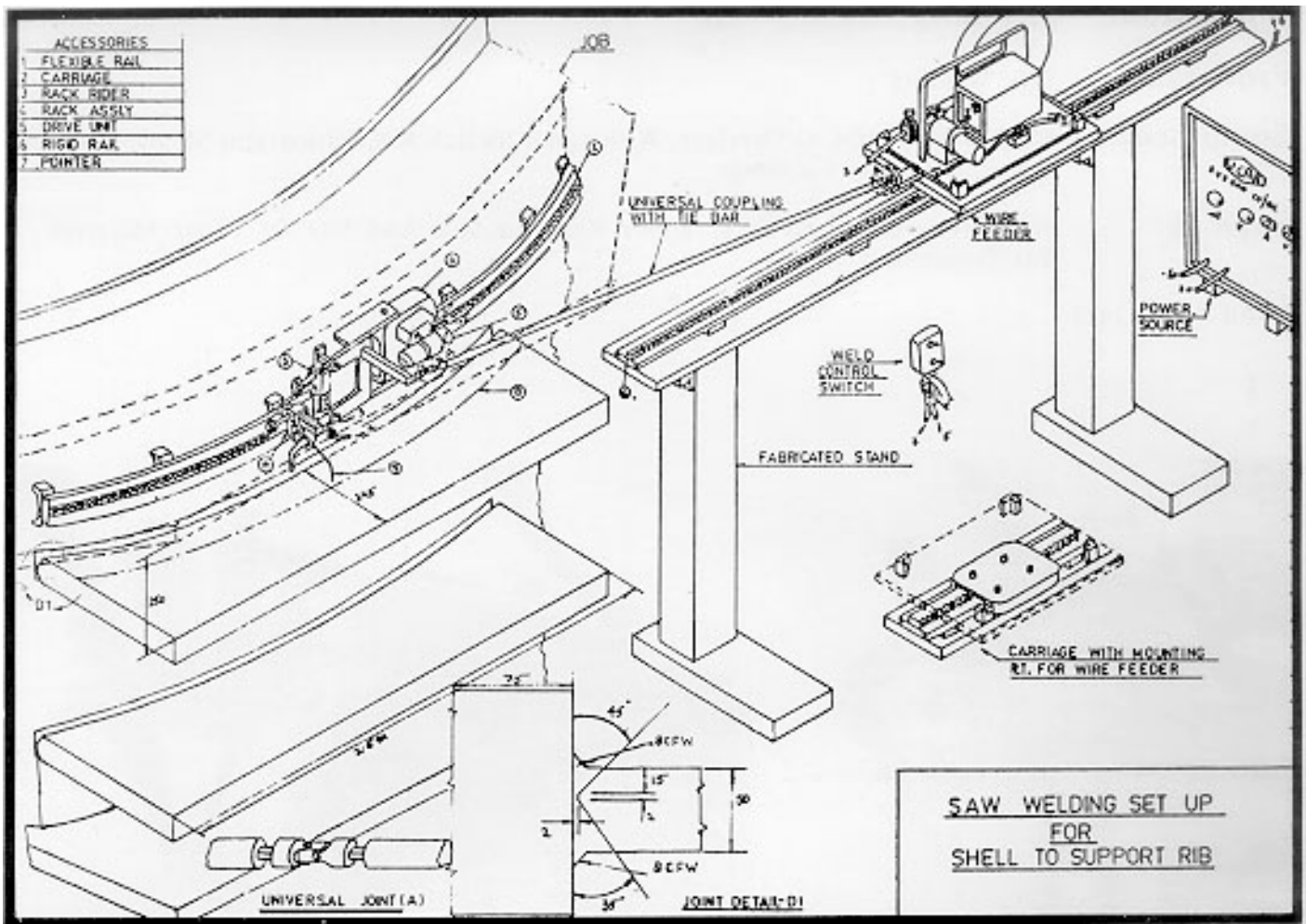
Application: Fabricating aluminum boats.

Process: TIG welding.

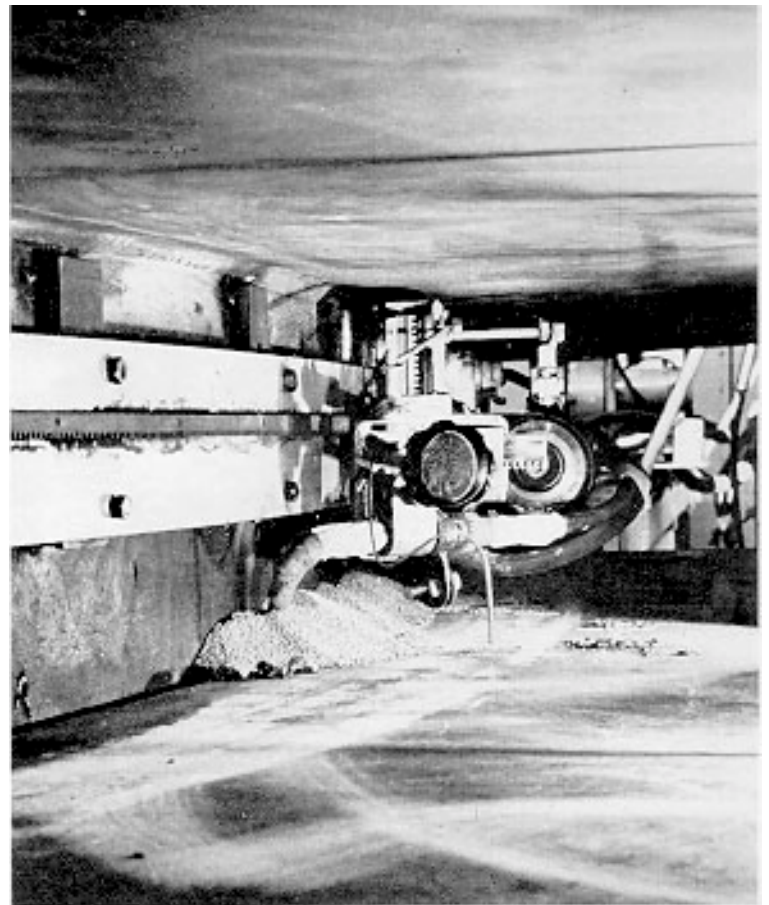
Equipment: Bug-O DCD ROL-O Carriage, with limit switch kit, panograph mounted on fixture made by customer.

Savings: Production increased 60%, labor reduced 50% and use of filler material was eliminated.





- Application:** Welding support plates to large weldment with limited access.
- Process:** Sub Arc welding.
- Equipment:** Bug-O DCD ROL-O Carriage, trailer, rails and fittings mounted on customer's fixture.
- Savings:** 150 man-hours per joint or 1500 man-hours for the complete project.



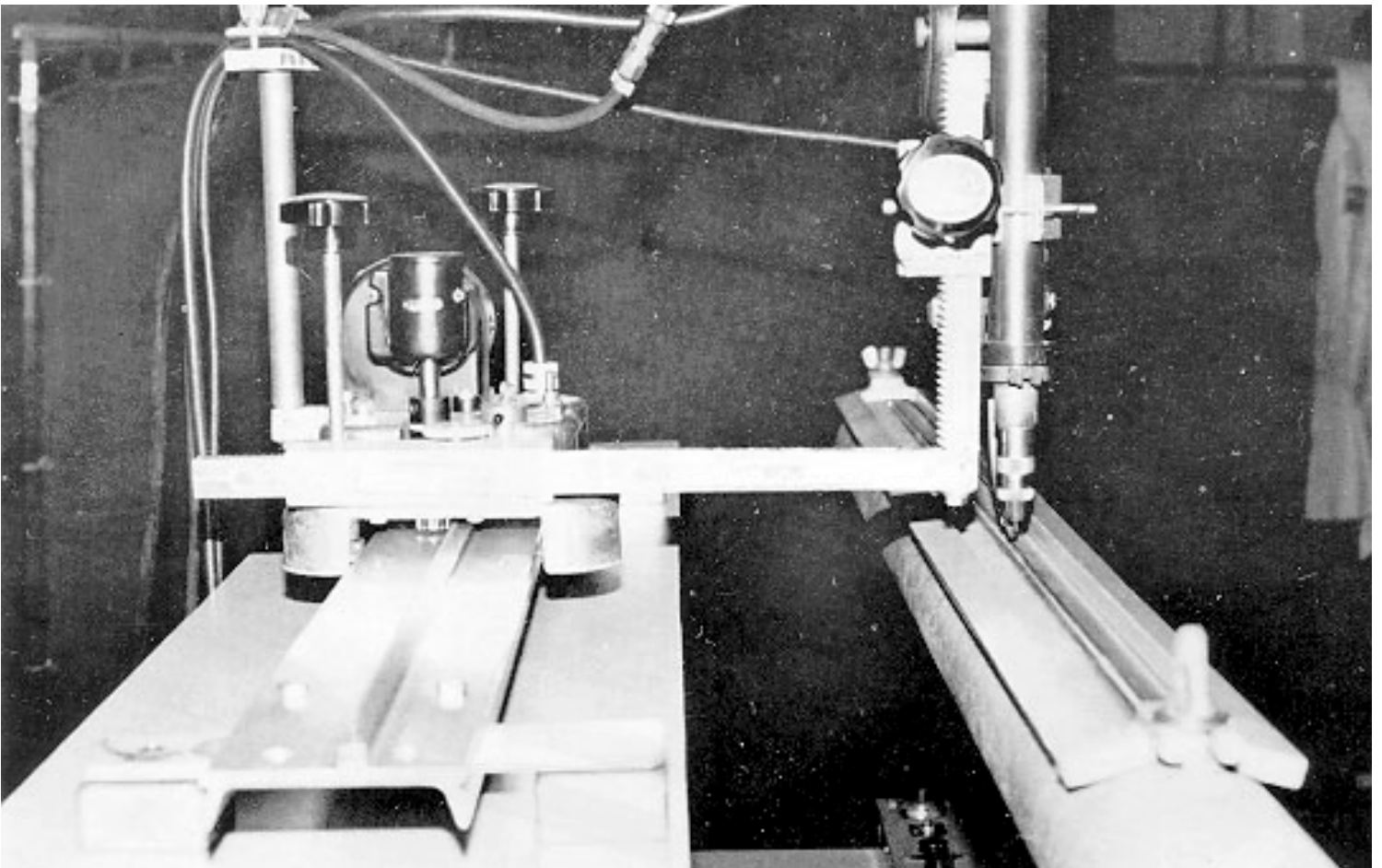


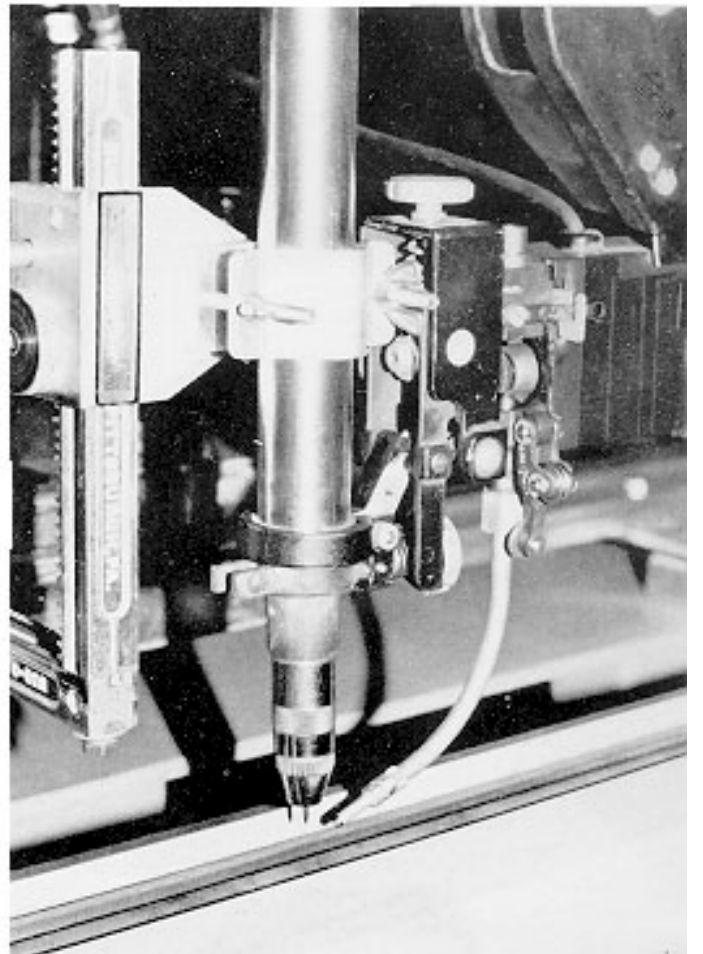
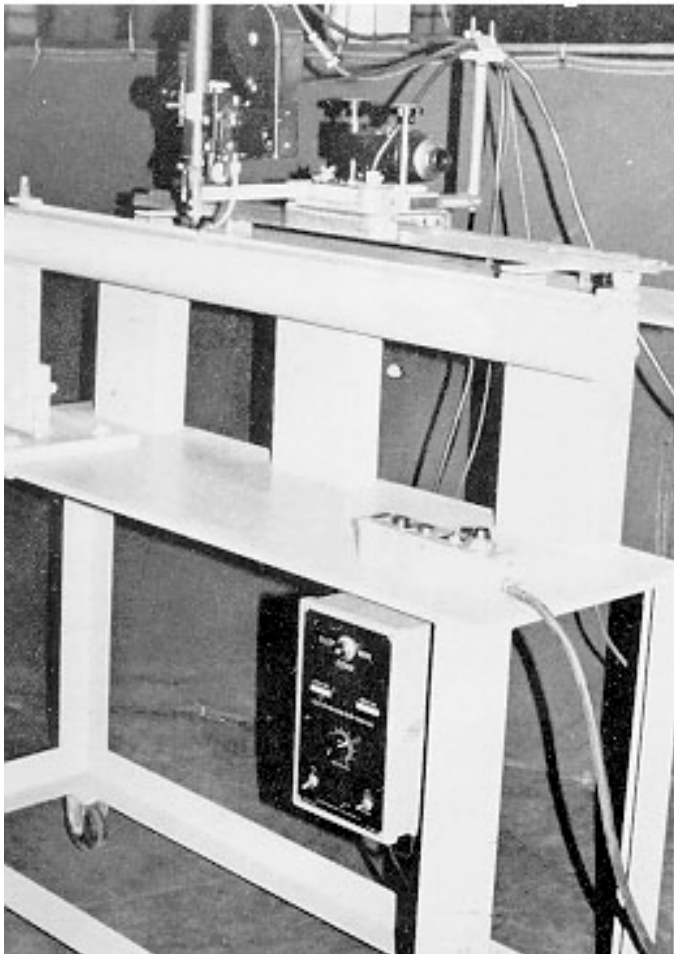
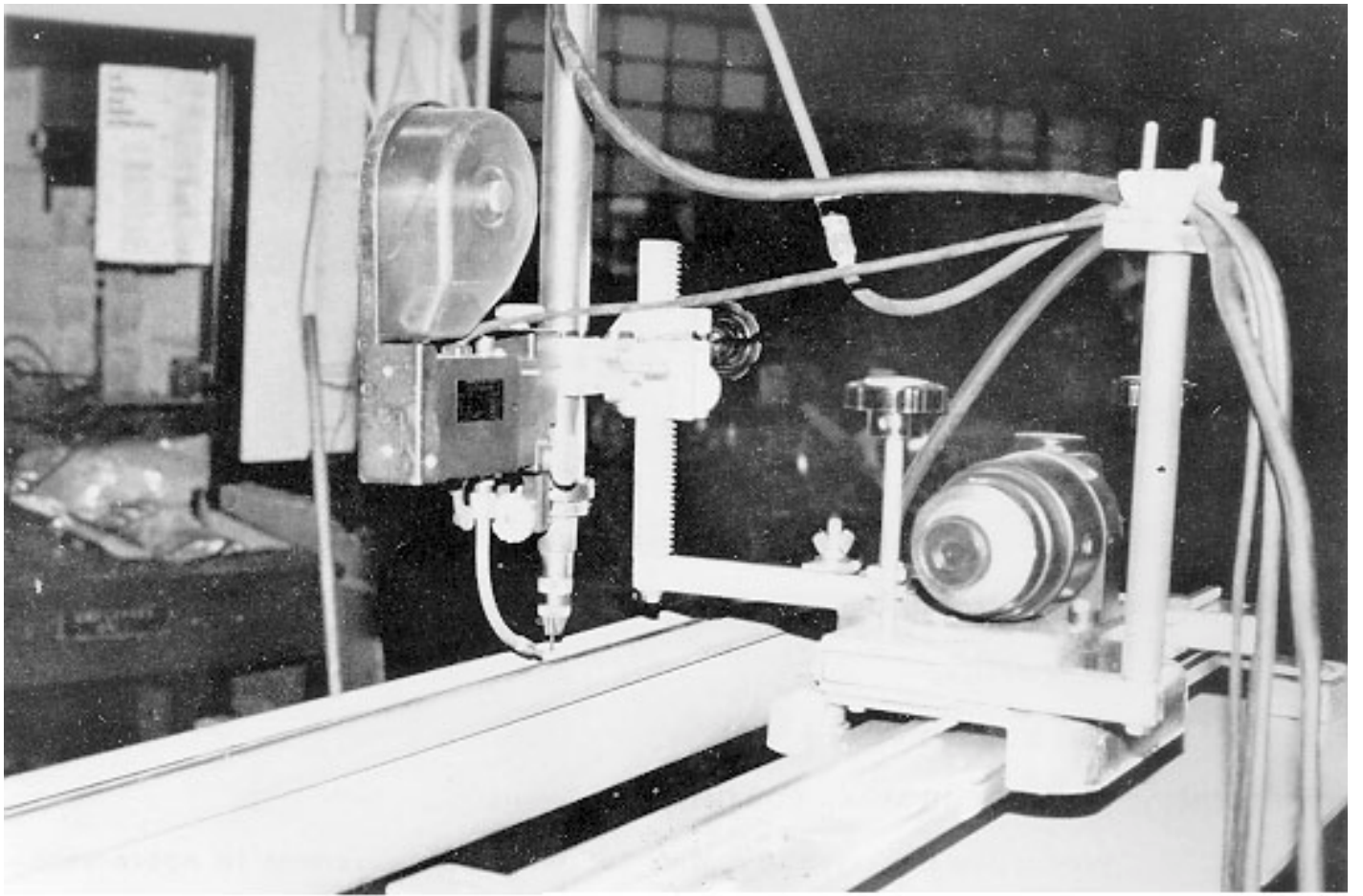
Application: Seam welding.

Process: Cold Wire TIG Welding.

Equipment: Bug-O DC-III mounted on customer's fixture.

Savings: Production increased 25% with substantial improvement in appearance, penetration and quality.



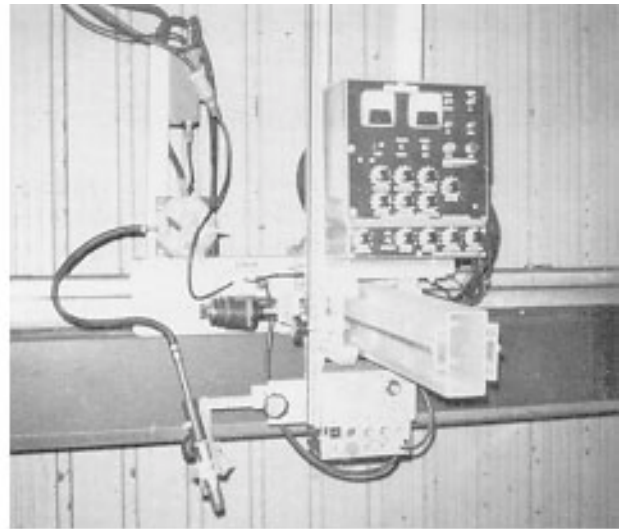


Application: Manufacture of pressure vessels.

Process: MIG Welding.

Equipment: Bug-O Yoke Carriage, Drive Unit, Speed Weaver, Vertifloat Carriages, Rails and Supports mounted on fixture built by customer.

Savings: Productivity increased more than 100% with great improvement in appearance and quality.

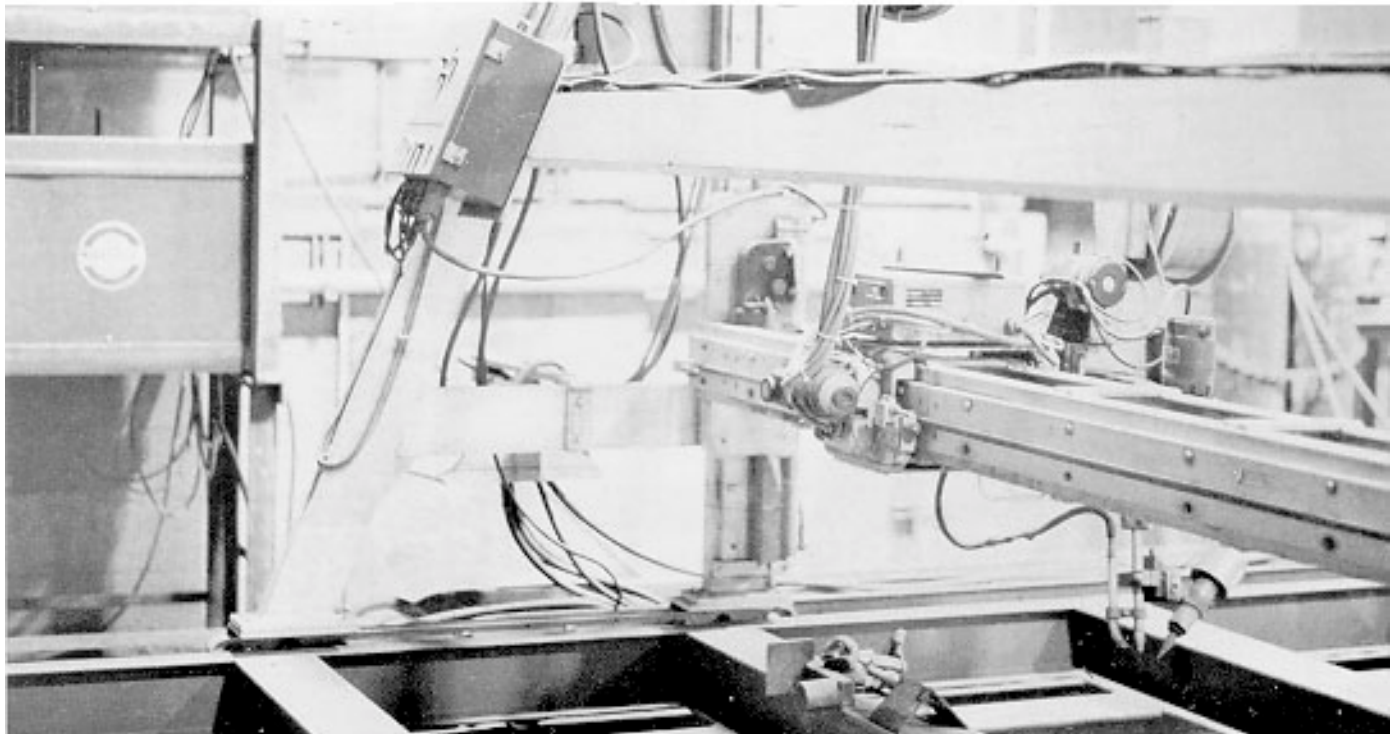
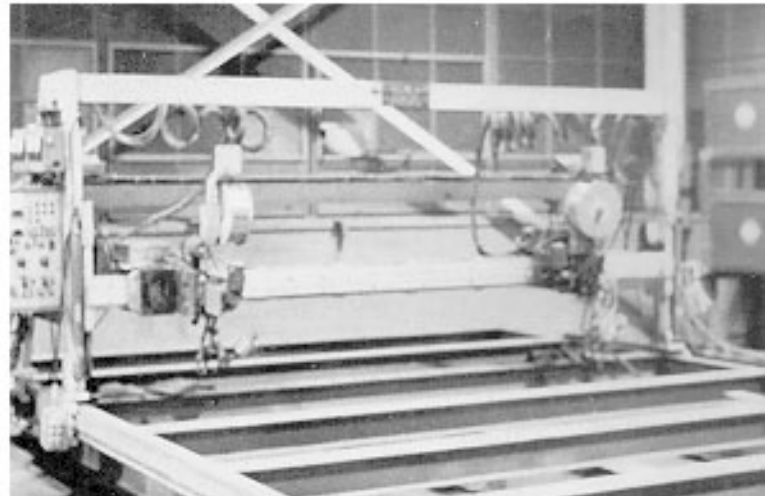


Application: Panel fabrication.

Process: Dual MIG Welding.

Equipment: MUG-O Welding Gantry mounted on customer's fixture.

Savings: Increased production and improved quality.

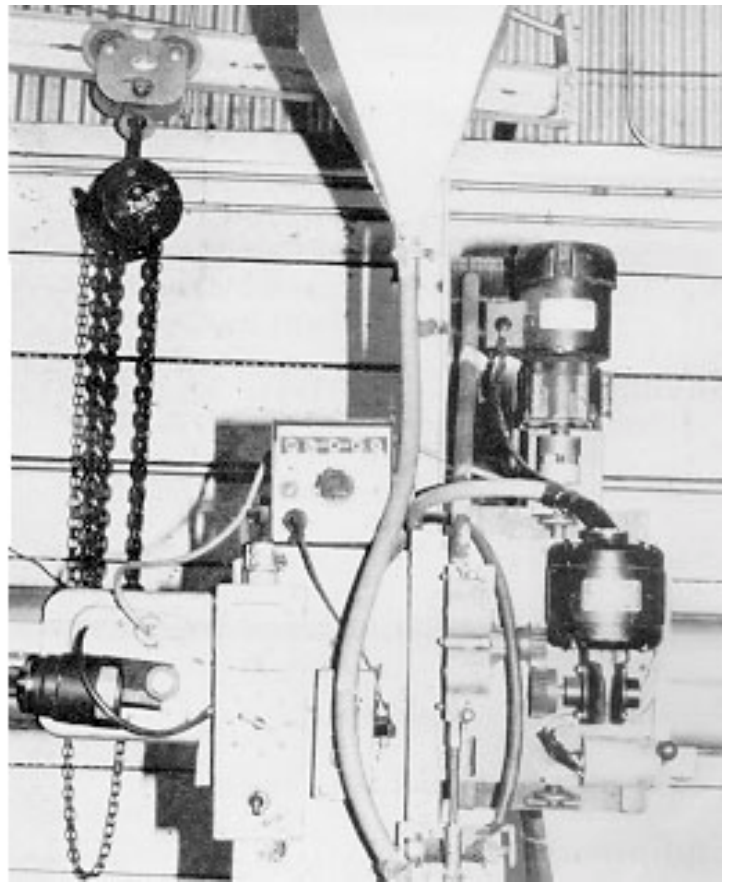
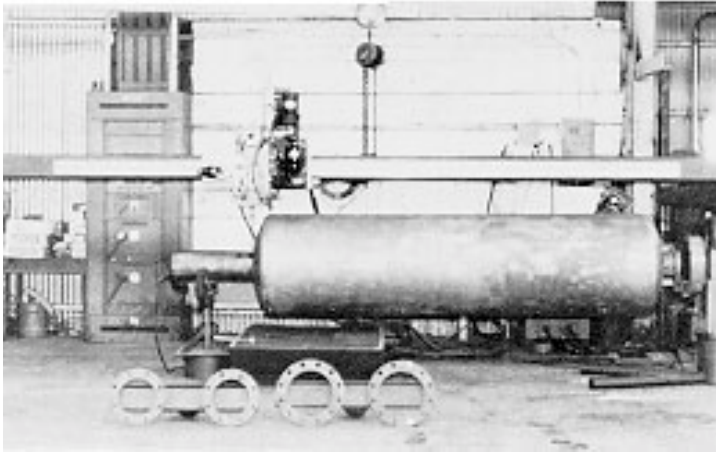


Application: Fabricating industrial mufflers.

Process: Sub Arc Welding.

Equipment: Bug-O Yoke Carriage and Drive Unit mounted on customer's fixture.

Savings: Production increased 40%.

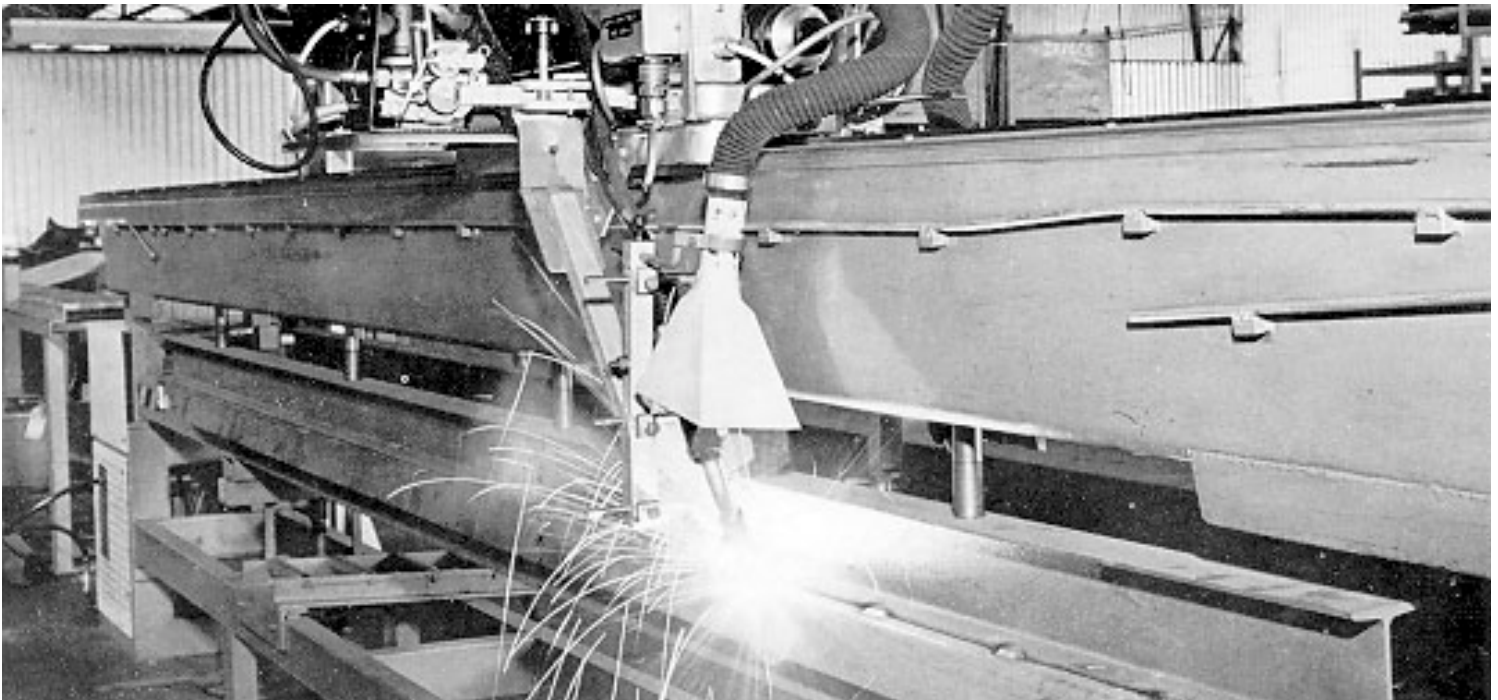


Application: Welding of Hydraulic Lift Platform Components.

Process: Flux Cored Arc Welding.

Equipment: Bug-O DC IV, Trailer mounted on fixture built by customer.

Savings: Production time reduced with 50% savings in manpower, without distortion.

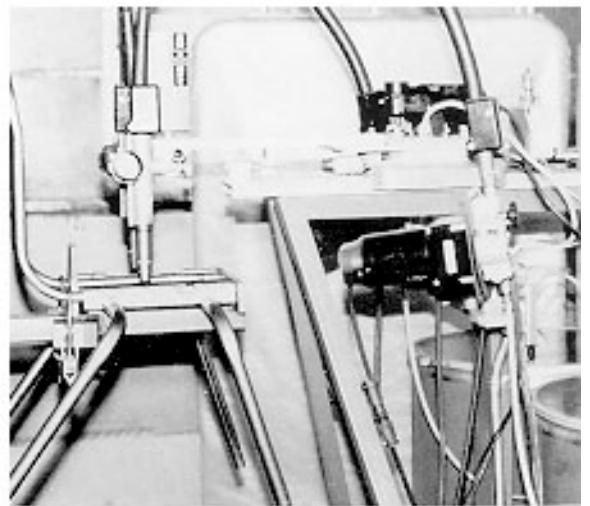
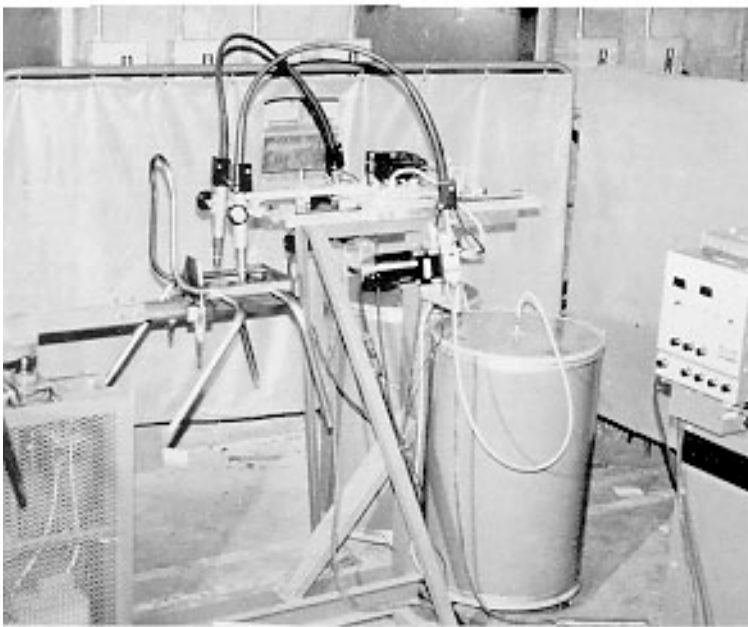
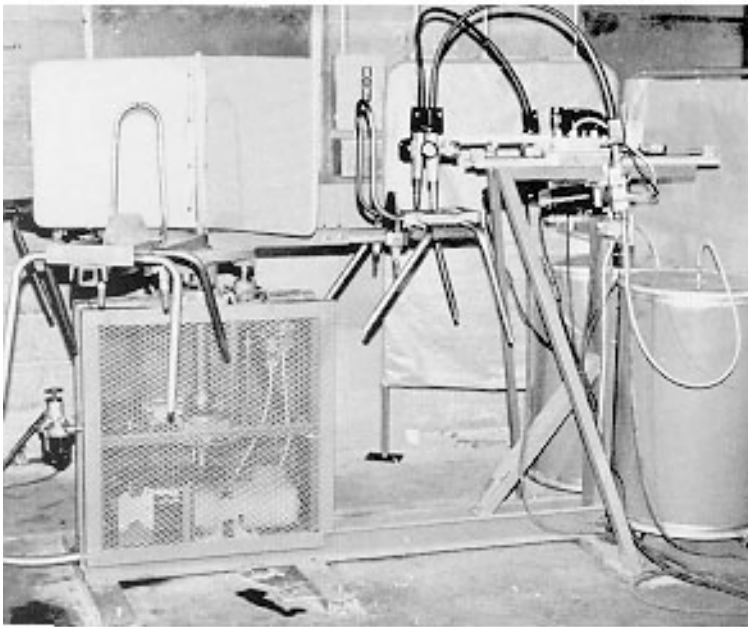


Application: Automating the fabrication of tubular steel chair frames.

Process: MIG Welding.

Equipment: Bug-O Skip Welder.

Savings: Eliminated skilled operators, improved quality and appearance, production increased four times, annual savings \$16,159.00

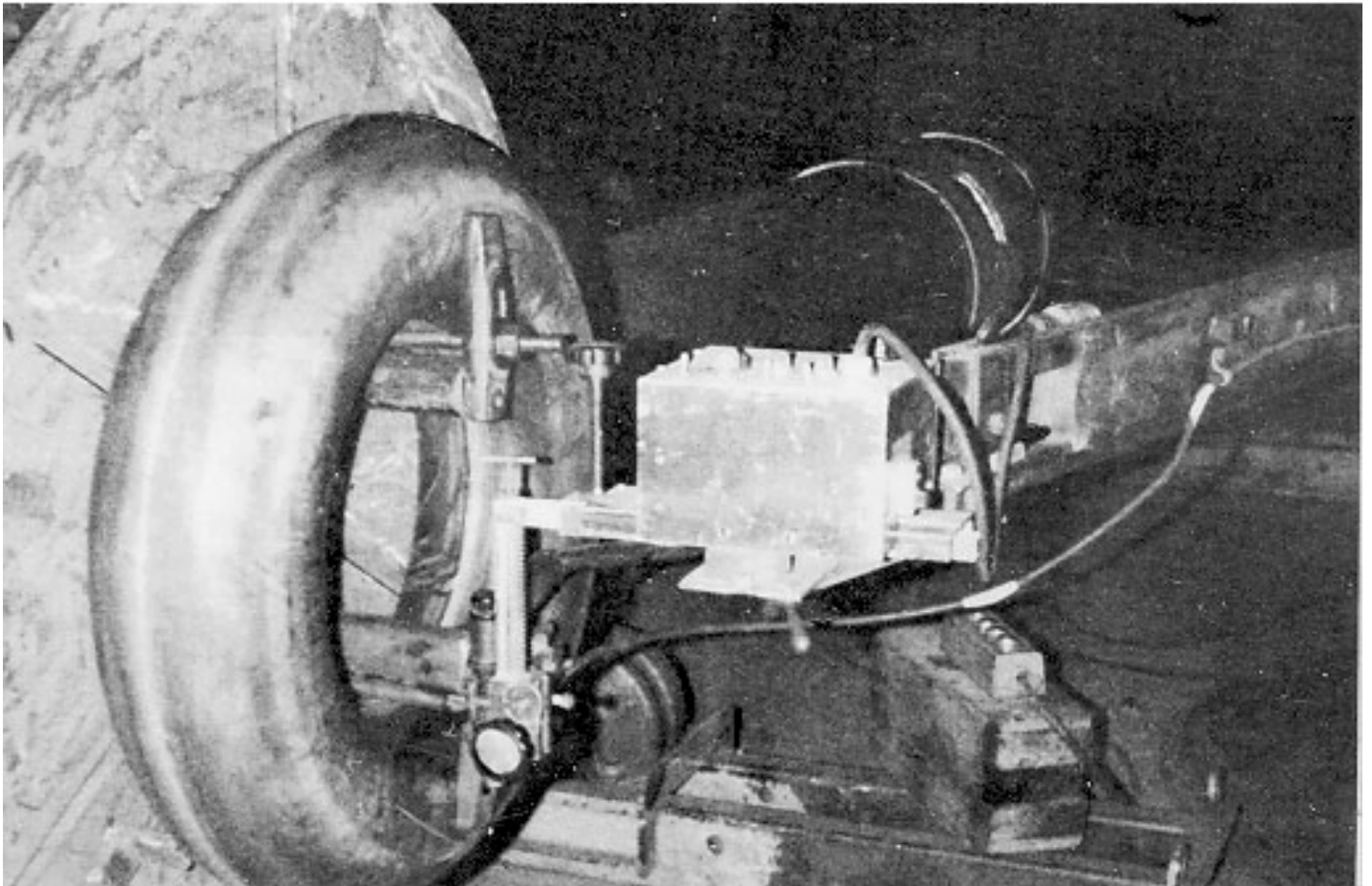
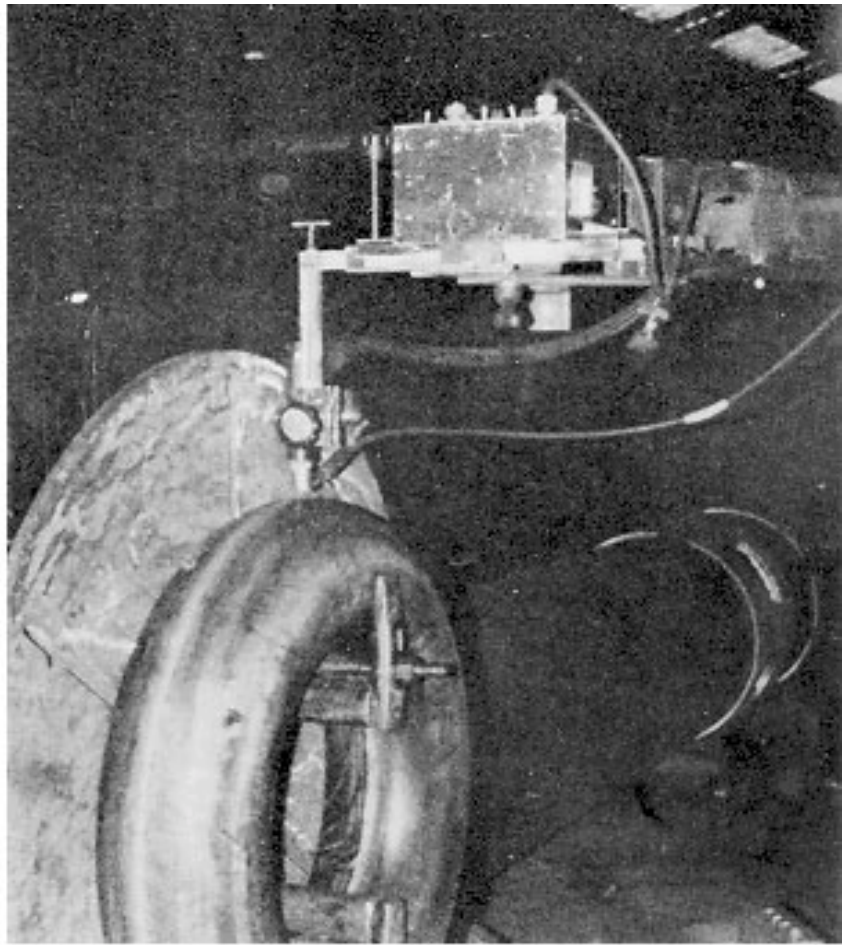


Application: Fabrication of return bins for heat treating furnances.

Process: MIG Welding.

Equipment: Bug-O Speed Weaver II mounted on customer's fixture.

Savings: Costs reduced 60%, grinding and repair eliminated.

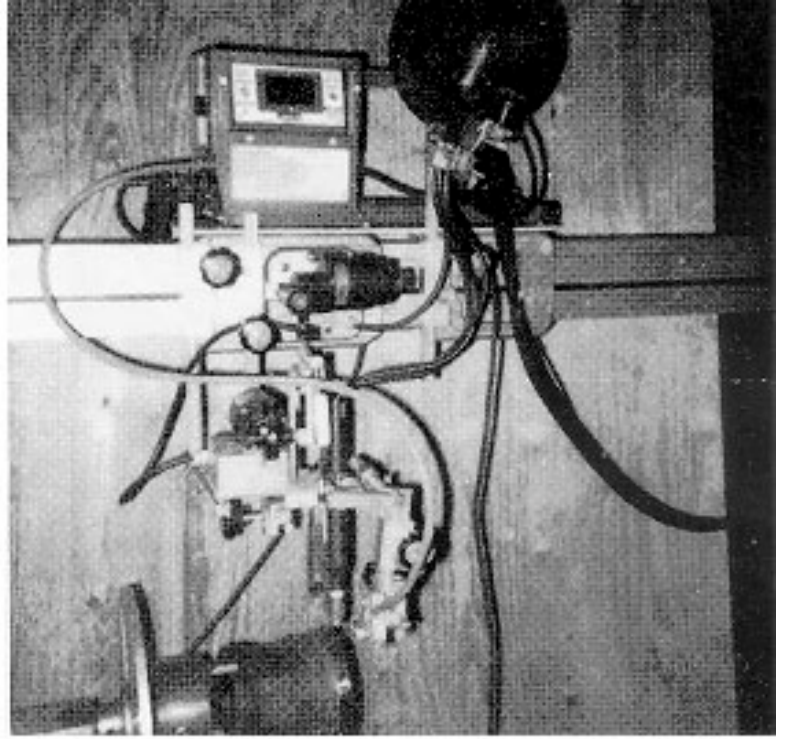
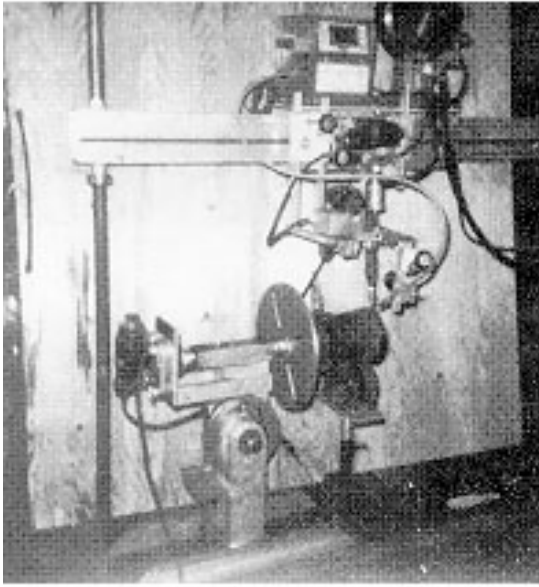


Application: Rebuilding shafts.

Process: TIG Welding with cold wire feed.

Equipment: Bug-O Heavy Duty Welding Kit and miscellaneous parts mounted on customer's fixture.

Savings: Production time reduced 50%.

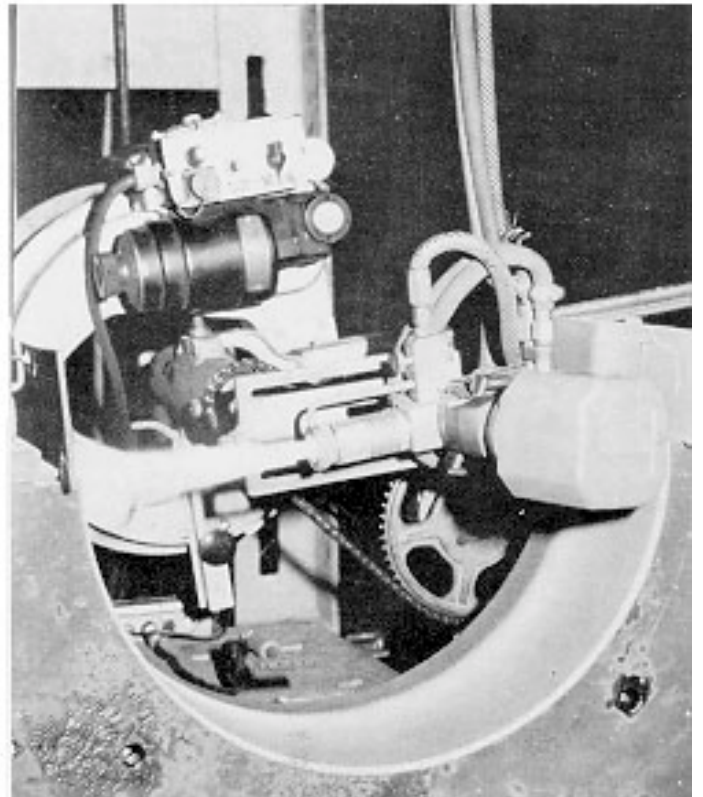


Application: Rebuilding Bearing Housings.

Process: Thermal Spraying.

Equipment: HOB-O with equipment mounted by customer.

Savings: \$100,000.00 per year.

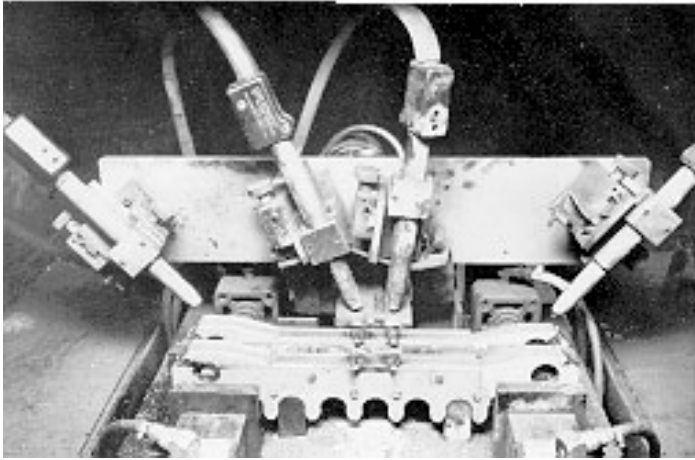
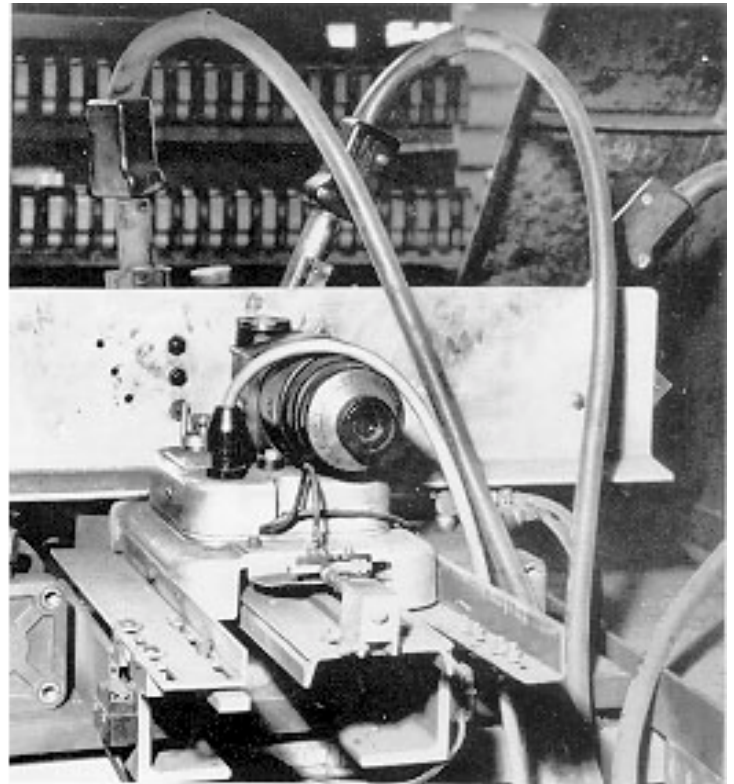


Application: Mechanizing four semiautomatic welding guns.

Process: MIG Welding.

Equipment: Bug-O DC IV with Limit Switch Kit and customer's fixture.

Savings: Production increased 300%.

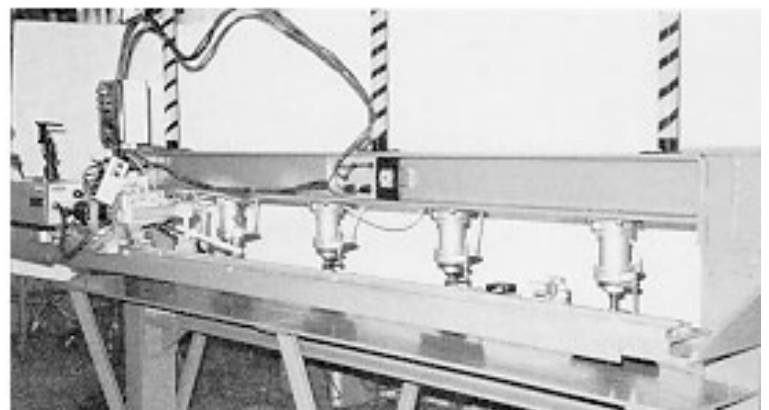
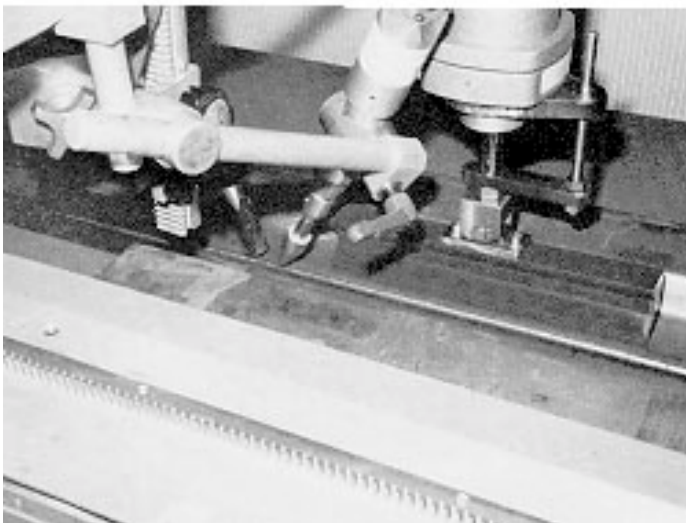
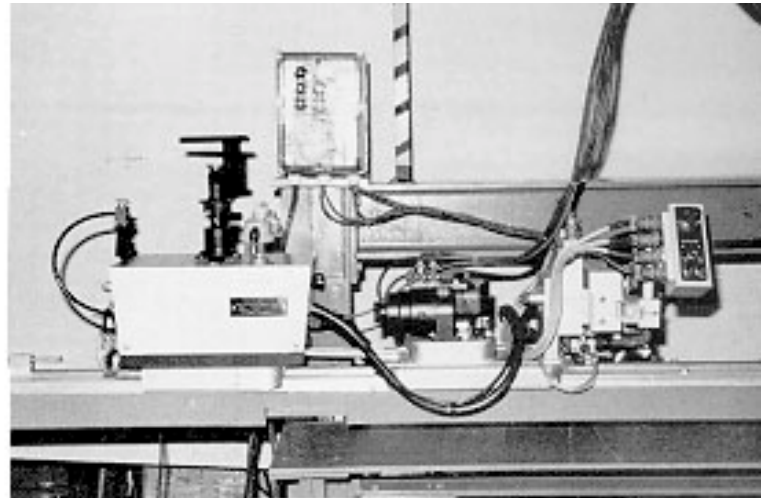


Application: Fabrication of highway truck bodies.

Process: MIG Welding.

Equipment: Bug-O DC IV, Trailer, Rails, mounted on customer's fixture.

Savings: Welding time reduced 75% per truck.

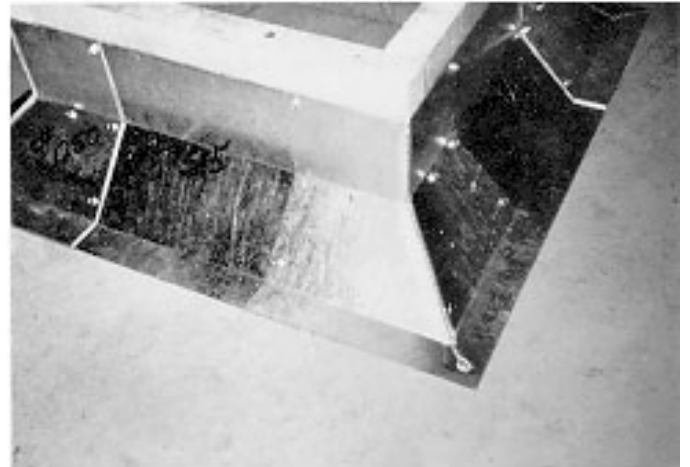
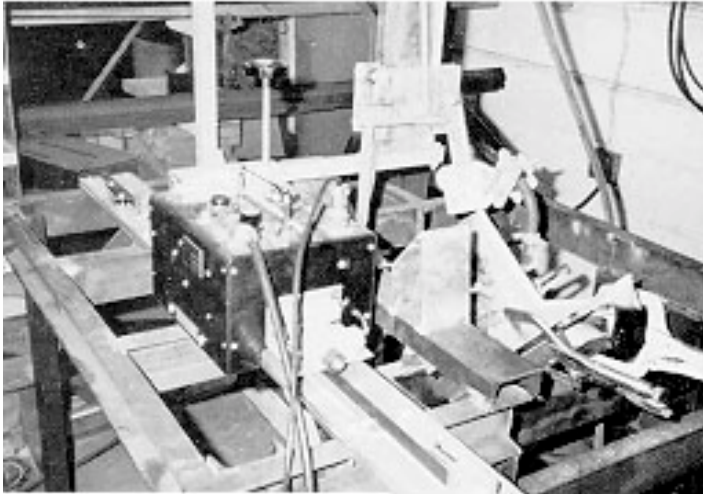
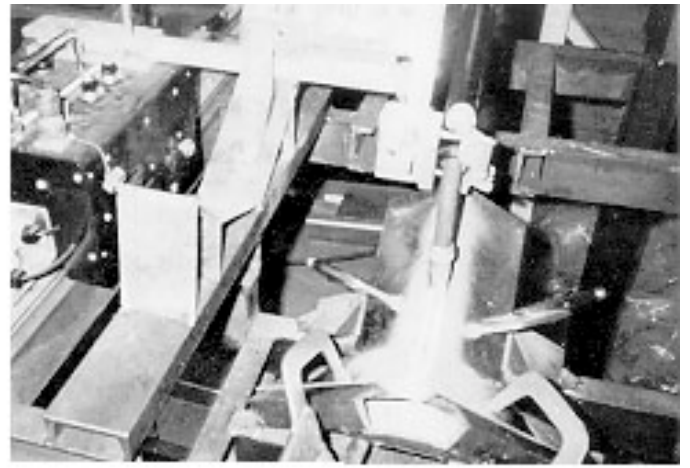


Application: Welding roof curb corners.

Process: MIG Welding.

Equipment: Bug-O DC Skip Welder.

Savings: Production increased 50%, quality improved 100%, worker fatigue greatly reduced.

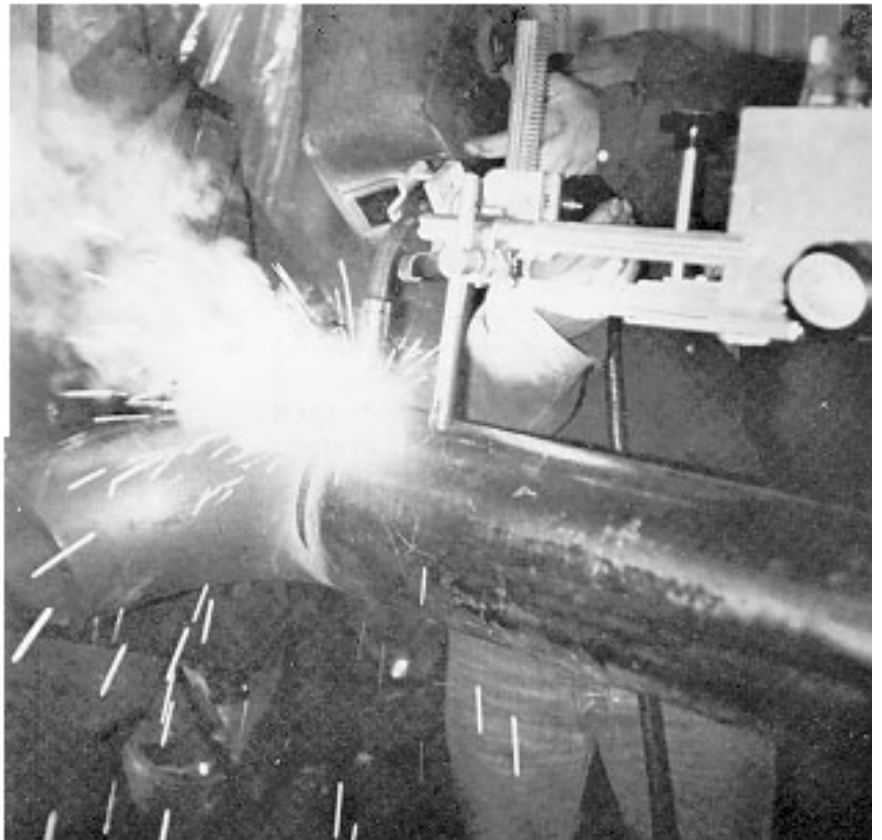


Application: Pipe Welding.

Process: Flux cored arc welding (two torches used).

Equipment: Bug-O Speed Weaver II mounted on customer's fixture.

Savings: Production increased 125%.

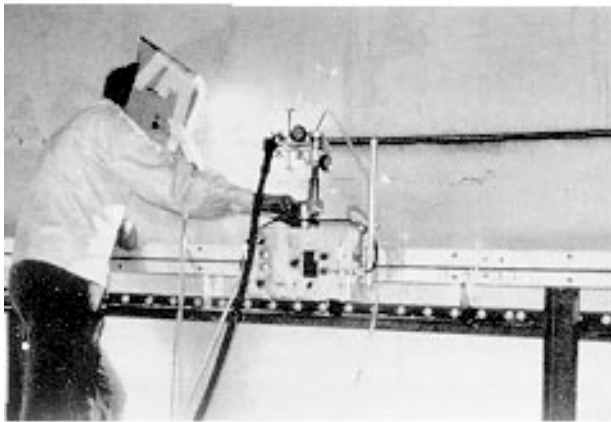
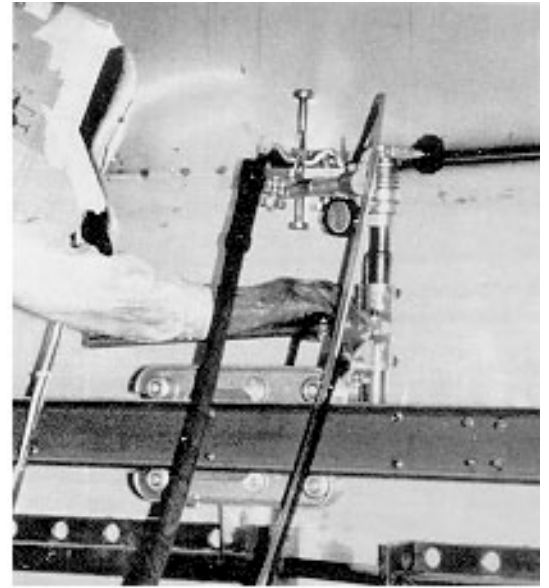


Application: Building wire storage tanks.

Process: MIG Welding.

Equipment: Bug-O DC IV, Bug-O-Matic and Bent Rail mounted on customer's fixture.

Savings: Welding speed increased 2 1/2 times with substantial improvement in quality and appearance.



Application: Building up and hardfacing gyratory crusher concaves.

Process: MIG Welding.

Equipment: Bug-O CIR-5505 with slow-speed drive unit mounted on customer's fixture.

Savings: Uniform heat input, controlled metallurgy and 20 lbs. (9.1 kg) per hour deposition without operator fatigue.

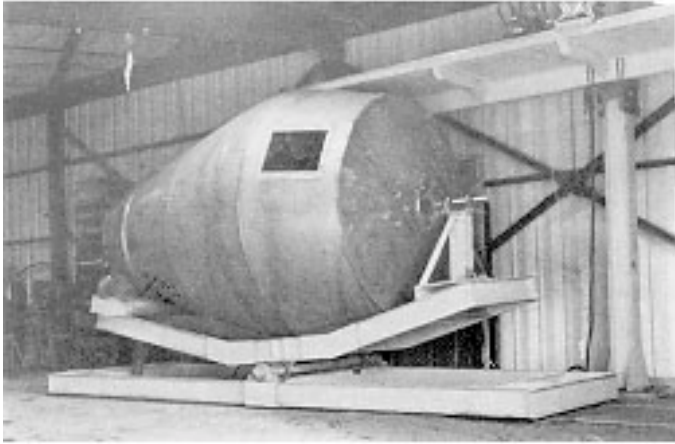
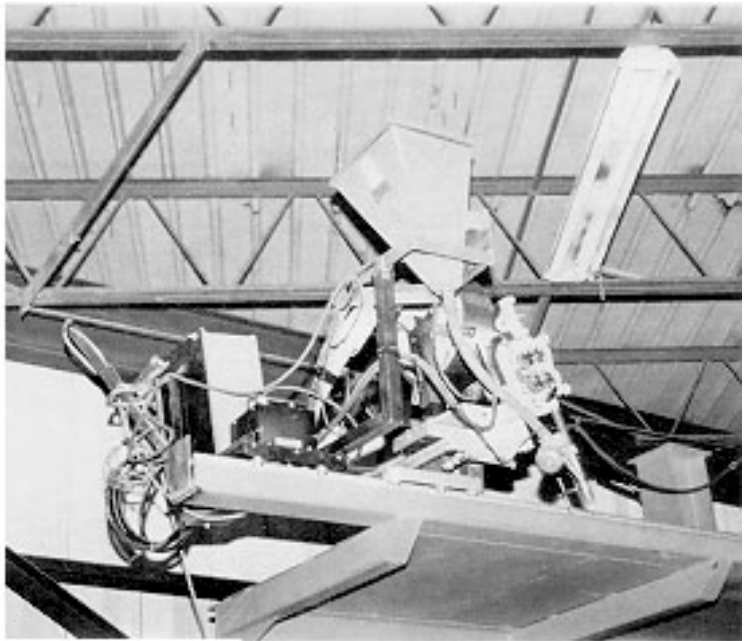


Application: Fabricating concrete mixer tanks.

Process: Sub Arc Welding.

Equipment: Bug-O DC DC Heavy Duty Welding Kit.

Savings: Production increased 60%, quality and appearance improved 100%.

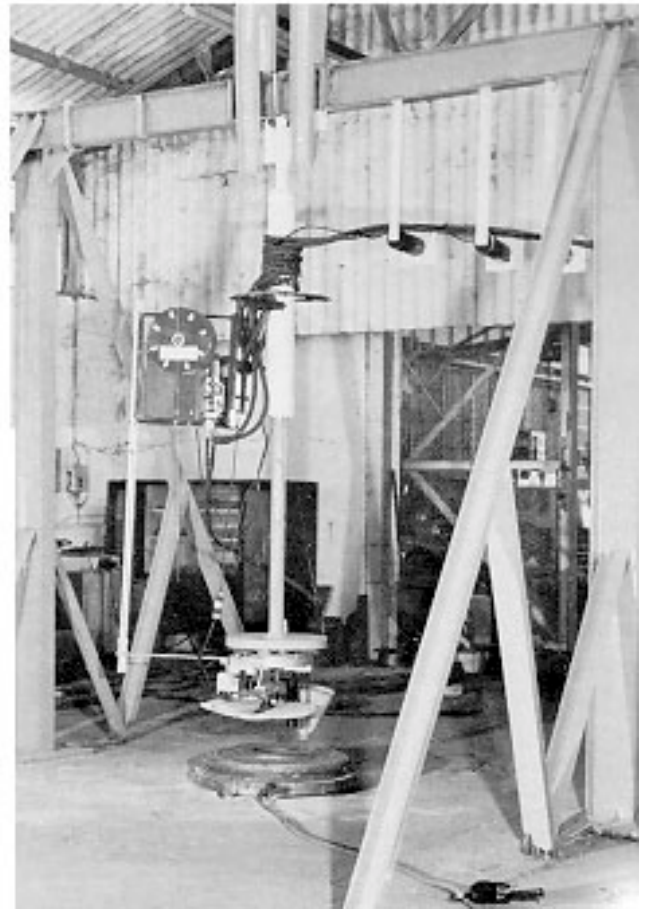


Application: Fabrication of flanges from weld metal.

Process: Sub Arc Welding.

Equipment: HOB-O mounted on customer's fixture.

Savings: Enabled customer to meet delivery schedule.

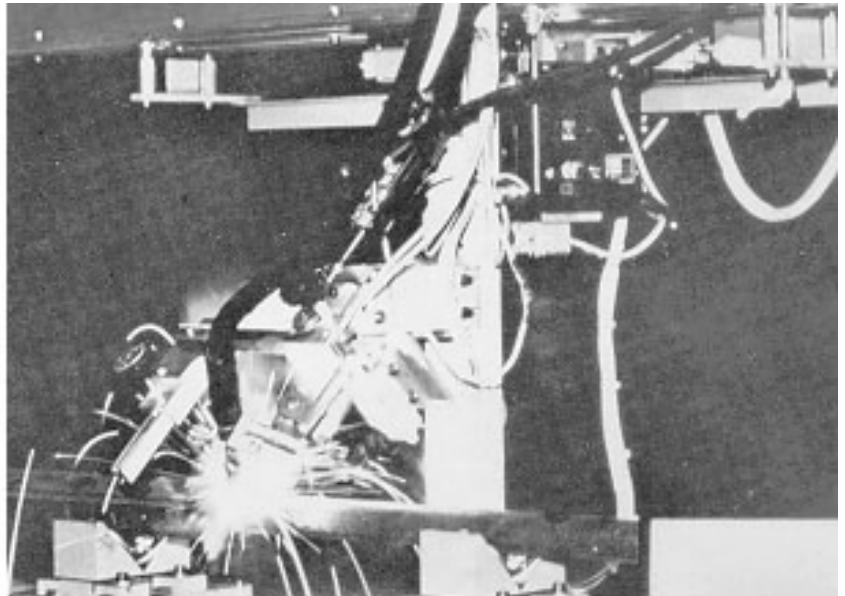


Application: Manufacturing steel light posts.

Process: MIG Welding.

Equipment: Beam Bug modified by customer on special fixture.

Savings: Welding time reduced 80%.



Application: Fabrication of "H" Beams.

Process: Flux Cored Arc Welding.

Equipment: Bug-O DC IV with trailer carriage and special torch mounting components.

Savings: Operating factor increased 150%, production increased 242% with minimum distortion.





Applications

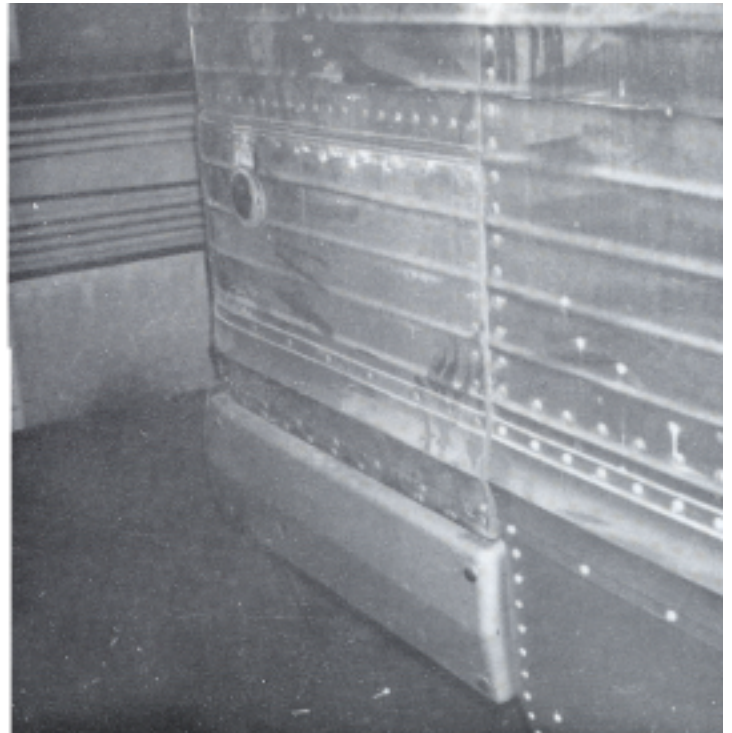
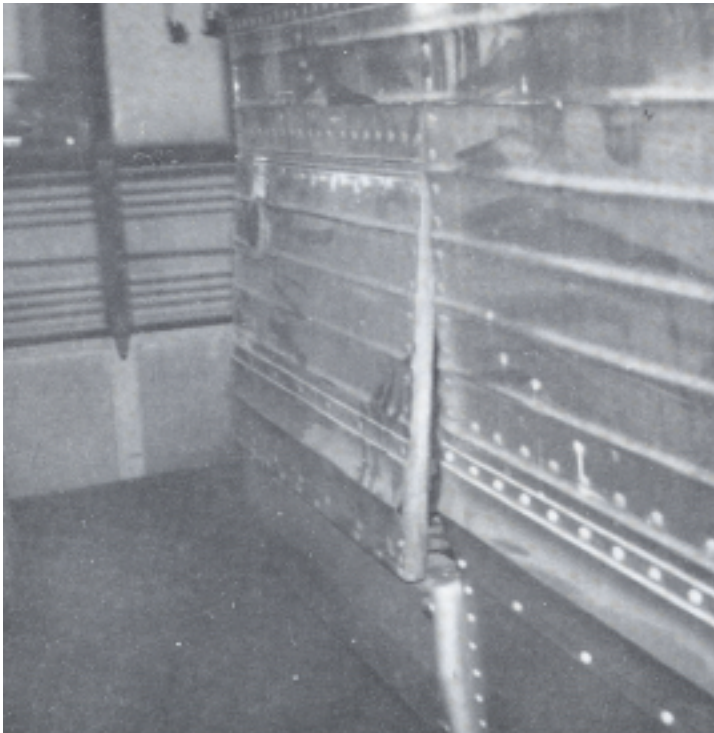
Inspection / Miscellaneous

Application: Replace mechanical latches on bus transmissions and radiator doors.

Process: Magnets used in place of mechanical latches.

Equipment: Bug-O ARM-2244 magnets and fasteners.

Savings: Magnets provided a maintenance-free solution.

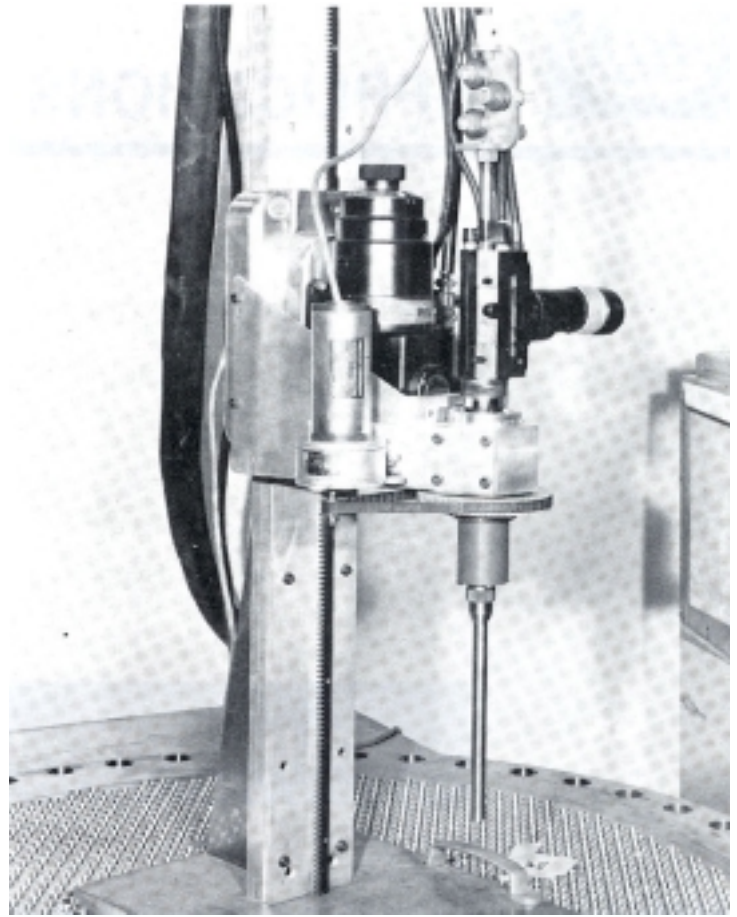


Application: Repair of mislocated holes on heat exchanger tube sheets.

Process: MIG Welding.

Equipment: Bug-O DC III and rail. Welding gun mounted by customer.

Savings: Precise control of weld location and quality.

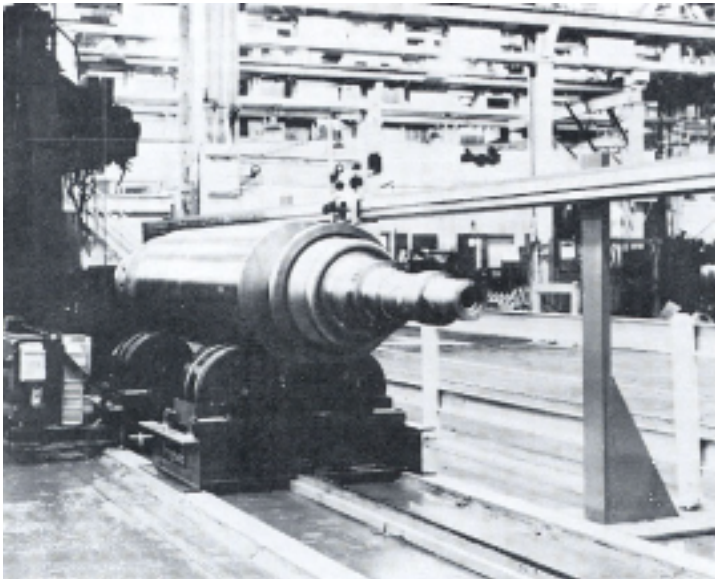


Application: Non-destructive inspection of large shafts.

Process: Ultrasonic inspection.

Equipment: Bug-O General Welding Kit, customer's fixture and turning rolls.

Savings: Eliminated bottleneck and reduced costs.

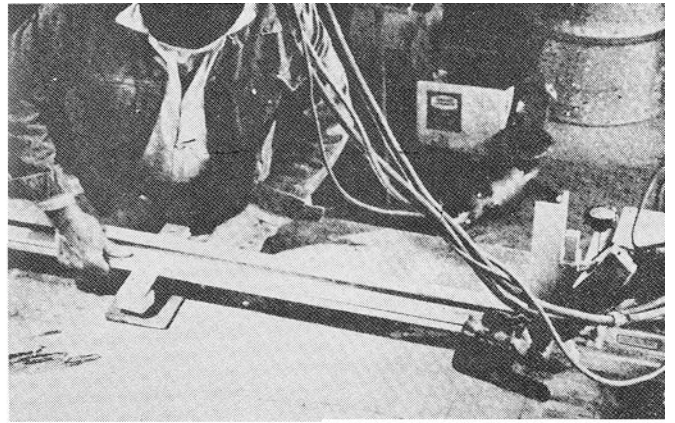


Application: Artistic rendering.

Process: MIG Welding.

Equipment: Bug-O General Welding Kit.

Savings: Enabled artist to use precision control for rendering in a short time.



Application: Grit blasting panels.

Process: Grit blasting.

Equipment: Bug-O Speed Weaver II mounted on customer's fixture.

Savings: 50% reduction in man hours per panel.

