*TB 9-4931-353-30

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

SHOP SET, INSTRUMENT AND FIRE CONTROL: FIELD MAINTENANCE, BASIC (4931-754-0740): INSTALLATION IN ONE 2-1/2-TON, 6 X 6 SHOP VAN TRUCK, M109 OR M220

Headquarters, Department of the Army, Washington, D. C.
20 October 1970

This bulletin is current to 18 September 1970.

1. General. *a.* Instructions contained in this bulletin are to be used as a guide for installation of Shop Set, Instrument and Fire Control, Field Maintenance, Basic, 4931-754-0740, in one 2-1 / 2-Ton, 6 x 6 Shop Van Truck, M109 or M220.

b. These instructions are to be followed as prescribed in most instances. However, slight variations to the installation may be made at the discretion of the Officer in charge.

c. A complete list of items contained in this set is included in SC 4931-95-CL-A07.

d. Personnel performing this installation should have a practical knowledge of electricity. Special care should be exercised to avoid damage to wire or electrical equipment.

e. Precautions should be observed when drilling holes through the body to insure the waterproof characteristics of the body are retained. All hardware extending through the floor of the van should have outer parts covered with undercoating similar to that used on the underside of vehicles. Care should be taken that holes drilled into the floor do not penetrate the frame or cross members of the vehicle.

f. Items not mentioned in this bulletin, that are components of the set, may be stowed in cabinets or secured in convenient places in such a manner as to avoid damage in transit.

2. Installation of Shop Set. *a.* The floor plan for the shop van with each item in its designated spot is shown in figure 1. Curbside and roadside views are shown in figures 2 and 3 respectively. Figure 4 shows view of fabricated Nitrogen Tank Support Block. Equipment to be mounted and item to be fabricated and mounted are listed in table 1.

*** This technical bulletin supersedes TB ORD 444-12, dtd 27 April 1955, including changes.**

Table 1. Equipment to be Mounted and Item to be Fabricated and Mounted

FSN	Item Name			Item ident.
	Equipment to be Mounted			
4910-543-7771	TABLE, WORK, AUTOMOTIVE MAINTENANCE :	2	1, 2 and 3	A
3444-243-2654	PRESS, ARBOR, HAND OPERATED :	1	1 and 2	B
7125-330-0130	CABINET, STORAGE :	*2	1 and 2	C
6830-292-0131	NITROGEN, TECHNICAL:	2	1 and 2	D
6115-889-1446	GENERATOR SET, GASOLINE ENGINE :	1	1 and 2	F
3413-221-8714	DRILLING MACHINE, UPRIGHT:	1	1 and 3	G
4910-543-7772	TABLE, WORK, AUTOMOTIVE MAINTENANCE :	1	1 and 3	H
7110-634-8596	STOOL, REVOLVING :	2	1 and 3	I
3415-517-7754	GRINDING MACHINE, UTILITY:	1	1 and 3	J
5120-293-1439	VISE, MACHINIST'S:	1	1 and 3	K
5130-204-2718	DRILL, ELECTRIC, PORTABLE : WITH STAND	1	1 and 3	L
	Item to be Fabricated and Mounted			
	NITROGEN TANK SUPPORT BLOCK: to accomodate cylinders	3	1, 2 and 4	E

*Two in Supply Catalog. TB 9-4931-353-30, only space for one in truck, turn in other cabinet as excess. Two used in semitrailer - TB 9-493l-354-30.

b. Table 2 contains materials required to fabricate webbing straps for securing items in transit and hardwood for nitrogen tank support blocks.

Table 2. Fabricating Material

FSN	Material	Application
5340-850-8060	BUCKLE: strap, 1 in. webbing accommodated	For application to webbing for securing straps.
.....	HARDWOOD: 4 x 4 x 36	For fabricating nitrogen tank support block E
8305-263-2477	WEBBING, TEXTILE: cotton, 1 in. w, 550 lb breaking strength	For fabricating straps for holding stool I, nitrogen tank D, generator set F.

c. Hardware required for installation of items in the shop van are listed in table 3. Hardware items will be drawn from stock or through the managing activity having supply responsibility.

Table 3. Hardware

FSN	Nomenclature	Qty	Application
5306-177-5677	BOLT, MACHINE: S, hex-hd, 7/16-20 UNF-3A x 5-61/64	2	Nitrogen tank support block E, upper
5306-027-5803	BOLT, MACHINE: S, hex-hd, 7/16-2O UNF-3A x 8	4	Nitrogen tank support block E, lower
5306-225-8504	BOLT, MACHINE: S, hex-hd, cd-pltd, chromated, 5/16-18 UNC-2A x 2	22	Tables A and H, cabinet C
5306-012-6705	BOLT, SQUARE NECK: (carriage bolt) b-hd, S, 3/8-16 UNC-2A x 3	4	Drill L
5306-089-1422	BOLT, SQUARE NECK: (carriage bolt) b-hd, S, 3/8-16 UNC-2A x 4-1/2	3	Drilling machine G
5306-702-2821	BOLT, SQUARE NECK: (carriage bolt) b-hd, S, 1/2-13 UNC-2A x 3-1/2	4	Vise K
5306-059-1241	BOLT, SQUARE NECK: (carriage bolt, w/sq nut) b-hd, S, 5/16-18 UNC-2A x 3-1/2	4	Press B, grinding machine J
5340-616-4660	LOOP, STRAP FASTENER: for 1 in. webbing	4	Nitrogen tank support block E, upper
5310-021-9434	NUT, PLAIN, HEXAGON: S, cd-or zn-pltd, 1/2-13 NC-2B, 3/4 w, 9/16 thk	4	For 1/2 bolts
5310-880-7744	NUT, PLAIN, HEXAGON : S, cd-pltd, 5/16-18 UNC-2B, 1/2 w, 17/64 thk	22	For 5/16 bolts

Table 3. Hardware - Continued

FSN	Nomenclature	Qty	Application
5310-761-0654	NUT, PLAIN, HEXAGON: S, cd-pltd, 3 / 8-16 UNC-2B, 9 / 16 w, 21 / 64 thk	7	For 3 / 8 bolts
5310-741-5305	NUT, PLAIN, HEXAGON : S, cd-pltd, 7 / 16-2 OUNF-3B, 5 / 8 w, 21 / 64 thk	6	For 7 / 16 bolts
5305-013-0384	SCREW, WOOD: rd-hd, no. 10, 2-1 / 2 lg	8	Nitrogen tank support block E, upper (strap fastener loops)
5310-273-7729	WASHER, FLAT: S, rd, cd-pltd, 0.234 id, 0.625 od, 0.065 thk	8	For no. 10 screws
5310-262-3003	WASHER, FLAT: S, rd, cd-pltd, 0.343 id, 0.625 od, 0.062 thk	26	For 5 / 16 bolts
5310-080-6004	WASHER, FLAT: S, rd, cd-pltd, chromated, 0.406 id, 0.812 od, 0.065 thk	7	For 3 / 8 bolts
5310-809-5998	WASHER, FLAT: S, rd, cd-pltd, chromated, 0.500 id, 1.062 od, 0.074 thk	4	For 1 / 2 bolts
5310-760-2021	WASHER, FLAT: S, rd, zn-pltd, 0.500 id, 1.075 od, 0.063 thk	6	For 7 / 16 bolts
5310-209-0061	WASHER, FLAT: S, rect, cd-pltd, 7 / 16 id, 2 w, 4 lg, 1 / 8 thk	22	For 5 / 16 bolts
5310-905-5454	WASHER, LOCK: S, cd-pltd, 7 / 16 bolt size, 0.600 od, 0.018 thk	6	For 7 / 16 bolts
5310-167-0677	WASHER, LOCK: S, cd-pltd, 0.509 id, 0.877 od, 0.099 thk	4	For 1 / 2 bolts
5310-209-1191	WASHER, LOCK: S, cd-pltd, chromated, 0.312 id, 0.562 od, 0.067 thk	26	For 5 / 16 bolts
5310-637-9541	WASHER, LOCK: S, cd-pltd, chromated, 0.375 id, 0.688 od, 0.094 thk	7	For 3 / 8 bolts

d. Unused space in the shop van may be utilized for transporting and storing other tools, etc.

e. Ground all electrically powered machinery and power tools to the chassis of the shop van as a safety precaution against electrical shock to the operator.

f. One ground rod with cable assembly is included in the shop set for each shop van. Drive the ground rod into the ground and secure the cable assembly to the chassis of the shop van each time the shop set is placed in operation.

3. Shop Van. *a.* Automotive Maintenance Work Table (A) 4910-543-7771 and (H) 4910-543-7772 (Figs. 1, 2 and 3).

(1) There are three work tables to be installed in the shop van truck. Two work tables, 4910-543-7771, are designated as A, and one work table, 4910-543-7772, is designated as H.

(2) Place one automotive maintenance work table (A) against the right wall, and other against the left wall of van. They are located flush with the front of the van as shown in figure 1. Mark and drill twelve 11 / 32-inch holes through the floor of the van. Secure work tables with twelve 5 / 16-18 x 2-inch hexagon-head machine bolts 5306-225-8504, twelve 7 / 16-inch inside diameter rectangular flat washers 5310-209-0061, twelve 11 / 32-inch inside diameter flat washers 5310-262-3003, twelve 5 / 16-inch split lock washers 5310-209-1191, and twelve 5 / 16-18 hexagon plain nuts 5310-880-7744.

(3) Place automotive maintenance work table (H) flush with work table (A) on roadside as shown in figure 1. Mark and drill six 11 / 32-inch holes through floor of the van. Secure work table with six 5 / 16-18 x 2-inch hexagon-head machine bolts 5306-225-8504, six 7 / 16-inch inside diameter rectangular flat washers 5310-209-0061, six 11 / 32-inch inside diameter flat washers 5310-262-3003, six 5 / 16-inch split lock washers 5310-209-1191, and six 5 / 16-18 hexagon plain nuts 5310-880-7744.

b. Storage cabinet 7125-330-0130 (Figs. 1 and 2). Place the storage cabinet (C) flush with work table (A) on curbside as shown in figure 1. Mark and drill four 11 / 32-inch holes through floor of the van. Secure cabinet with four 5 / 16-18 x 2-inch hexagon-head machine bolts 5306-225-8504, four 7 / 16-inch inside diameter rectangular flat washers 5310-209-0061, four 11 / 32-inch inside diameter flat washers 5310-262-3003, four 5 / 16-inch split lock washers 5310-209-1191, and four 5 / 16-18 hexagon plain nuts 5310-880-7744.

c. Hand Operated Arbor Press 3444-243-2654 (Figs. 1 and 2). Place the hand operated arbor press (B) on work table (A), 7-inches from the right end and 2-inches from the front edge of the table top, as shown in figure 1. Mark and drill two 11 / 32-inch holes through the table top. Secure the press with two 5 / 16-18 x 3-1 / 2-inch square-neck carriage bolts, w / sq nuts 5306-059-1241, two 11 / 32-inch inside diameter flat washers 5310-262-3003, and two 5 / 16-inch split lock washers 5310-209-1191.

d. Technical Nitrogen (D) 6830-292-0131 (Figs. 1 and 2). Secure the nitrogen tank to upper block with webbing strap. Fabricate strap using webbing 8305-263-2477 and a buckle 5340-850-8060. Position four strap fastener loops 5340-616-4660, 7-inches and 17-inches from each end of block. Secure with eight no. 10 2-1 / 2-inch round head wood screws 5305-013-0384 and eight 0.234-inch inside diameter flat washers 5310-273-7729. Loop webbing strap through fastener loops and buckle as required to hold tank firmly in position as shown in figure 2.

e. Nitrogen Tank Support Block (Figs. 1, 2 and 4).

(1) Fabricate three 36-inch long support blocks (E) as shown in figure 4. Place blocks flush with cabinet (C) on the curbside of the van as shown in figure 1.

(2) Place one block 35-1 / 2-inches above the floor (directly beneath angle iron). Mark and drill approximately two inches from each end of block, two 1 / 2-inch holes through block (aligned with holes in angle iron). Secure with two 7 / 16-20 x 5-61 / 64-inch hexagon-head machine bolts 5306-177-5677, two 1 / 2-inch inside diameter flat washers 5310-760-2021, two 7 / 16-inch split lock washers 5310-905-5454, and two 7 / 16-20 hexagon plain nuts 5310-741-5305.

(3) Two blocks are to be positioned on the floor. Place one block flush with the wall, under and parallel with 3.e.2 above. Place other block directly in front where cut-out portion will hold nitrogen tank snugly between blocks. Mark and drill two inches from each end of blocks, four 1 / 2-inch holes through blocks and floor of van. Secure each block with two 7 / 16-20 x 8-inch hexagon-head machine bolts 5306-027-5803, two 1 / 2-inch inside diameter flat washers 5310-760-2021, two 7 / 16-inch split lock washers 5310-905-5454, and two 7 / 16-20 hexagon plain nuts 5310-741-5305.

f. Gasoline Engine Generator Set 6115-889-1446 (Figs. 1 and 2). Place the gasoline engine generator set (F) on the van floor 4-1 / 2-inches from the front wall of the van and in front of table (A) on the curbside as shown in figure 1. Secure the generator to the table legs with webbing straps. Use webbing 8305-263-2477 and buckle 5340-850-8060, to fabricate webbing straps.

CAUTION: The generator set is secured in the van for transportation purposes only, and must be removed from the van before being placed in operation.

g. Upright Drilling Machine 3413-221-8714 (Figs. 1 and 3). Place the upright drilling machine (G) on work table (H), 2-1 / 4-inches from the left end and flush with the front edge of the table top, as shown in figure 1. Mark and drill three 7 / 16-inch holes through the table top. Secure the drilling machine with three 3 / 8-16 x 4-1 / 2-inch square-neck carriage bolts 5306-089-1422, three 13 / 32-inch inside diameter flat washers 5310-080-6004, three 3 / 8-inch split lock washers 5310-637-9541, and three 3 / 8-16 hexagon plain nuts 5310-761-0654.

h. Revolving Stool 7110-634-8596 (Figs. 1 and 3). Each stool (I) will be secured to a table with webbing strap as shown in figure 3. Use webbing 8305-263-2477 and buckle 5340-850-8060, to fabricate webbing straps.

i. Utility Grinding Machine 3415-517-7754 (Figs. 1 and 3). Place the utility grinding machine (J) on work table (H), 7-1 / 2-inches from the right end and 2-inches from the front edge of the table top, as shown in figure 1. Mark and drill two 11 / 32-inch holes through the table top. Secure the grinding machine with two 5 / 16-18 x 3-1 / 2-inch square-neck carriage bolts, w / sq nuts 5306-059-1241, two 11 / 32-inch inside diameter flat washers 5310-262-3003, and two 5 / 16-inch split lock washers 5310-209-1191.

j. Machinist's Vise 5120-293-1439 (Figs. 1 and 3). Place the machinist's vise (K) on work table (A), 5-inches from the left end and flush with the front edge of the table top, as shown in figure 1. Mark and drill three 9 / 16-inch holes through the table top. Secure the vise with three 1 / 2-13 x 3-1 / 2-inch square-neck carriage bolts 5306-702-2821, three 1 / 2-inch inside diameter flat washers 5310-809-5998, three 1 / 2-inch split lock washers 5310-167-0677, and three 1 / 2-13 hexagon plain nuts 5310-021-9434.

NOTE: Four each of the above hardware items are listed to meet the requirements of models having four mounting holes.

k. Portable Electric Drill (with stand) 5130-204-2718 (Figs. 1 and 3). Place the portable electric drill (with stand) (L) on work table (A) 4-inches from the right end and flush with the front edge of the table top, as shown in figure 1. Mark and drill four 7 / 16-inch holes through the table top. Secure the drill with four 3 / 8-16 x 3-inch square-neck carriage bolts 5306-012-6705, four 13 / 32-inch inside diameter flat washers 5310-080-6004, four 3 / 8-inch split lock washers 5310-637-9541, and four 3 / 8-16 hexagon plain nuts 5310-761-0654.

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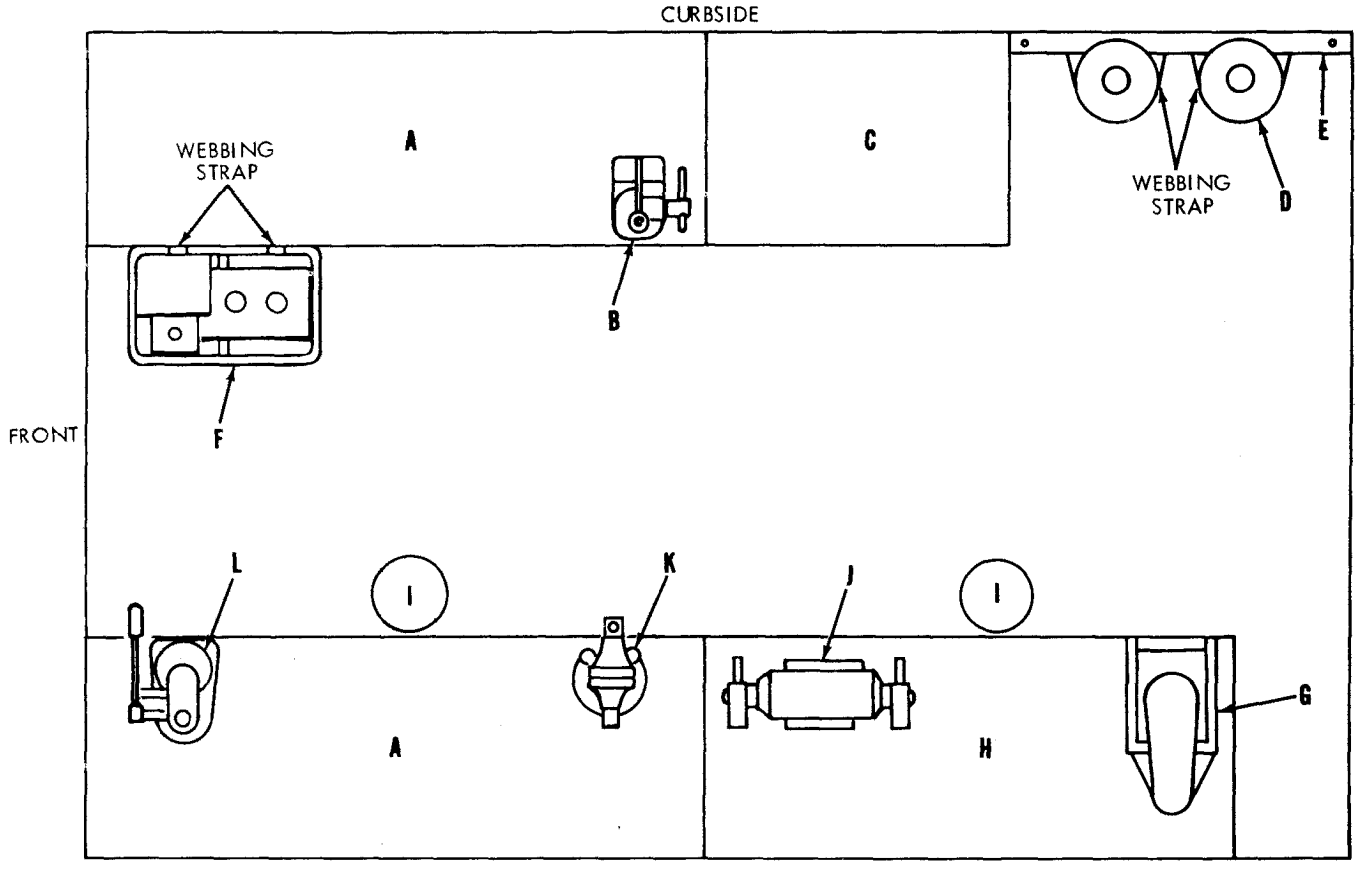
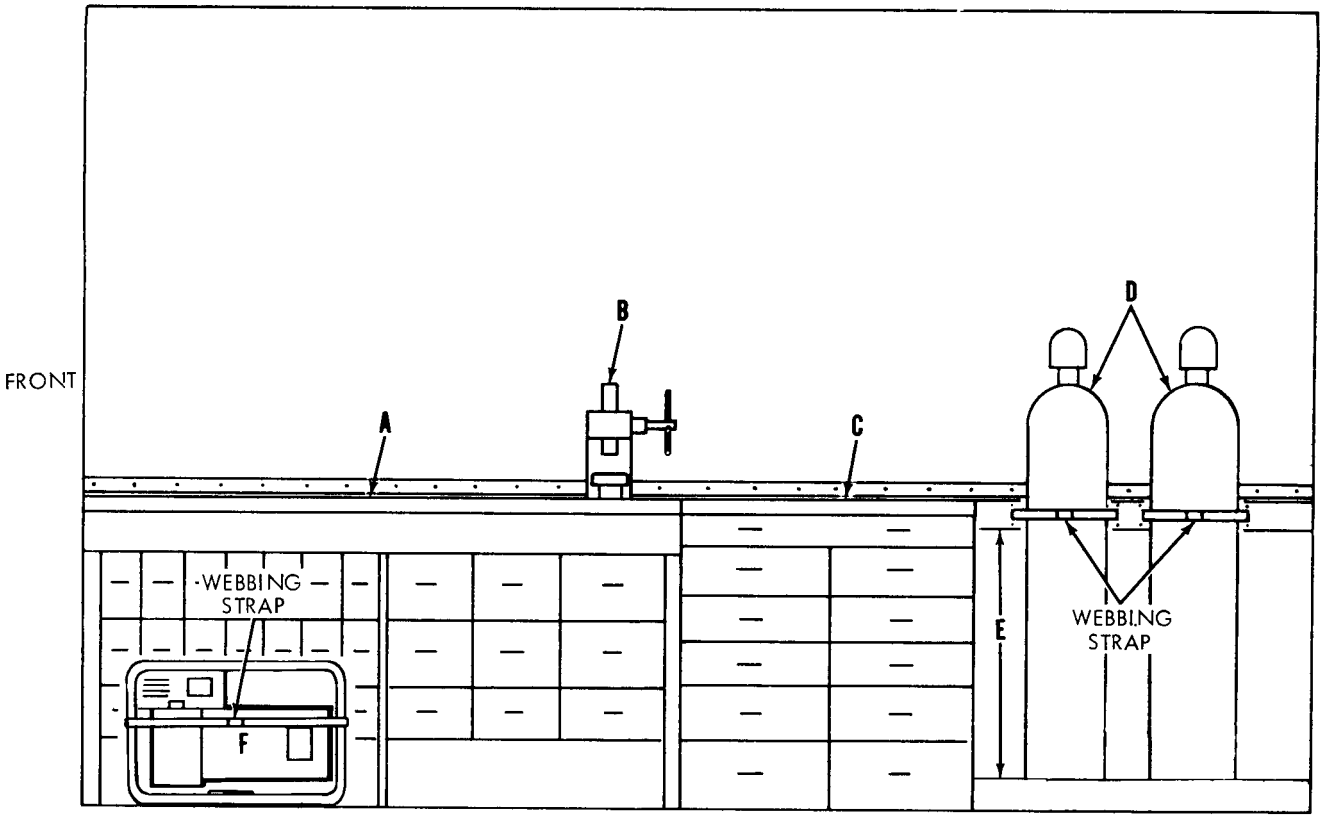


A - TABLE, WORK, AUTOMOTIVE MAINTENANCE - 4910-543-7771
B - PRESS, ARBOR, HAND OPERATED - 3444-243-2654
C - CABINET, STORAGE - 7125-330-0130
D - NITROGEN, TECHNICAL - 6830-292-0131
E - NITROGEN TANK SUPPORT BLOCK (SEE FIGURE 4)
F - GENERATOR SET, GASOLINE ENGINE - 6115-889-1446
G - DRILLING MACHINE, UPRIGHT - 3413-221-8714
H - TABLE, WORK, AUTOMOTIVE MAINTENANCE - 4910-543-7772
I - STOOL, REVOLVING - 7110-634-8596
J - GRINDING MACHINE, UTILITY - 3415-517-7754
K - VISE, MACHINIST'S - 5120-293-1439
L - DRILL, ELECTRIC, PORTABLE: WITH STAND - 5130-204-2718

WE 38416

Figure 1. Floor plan.

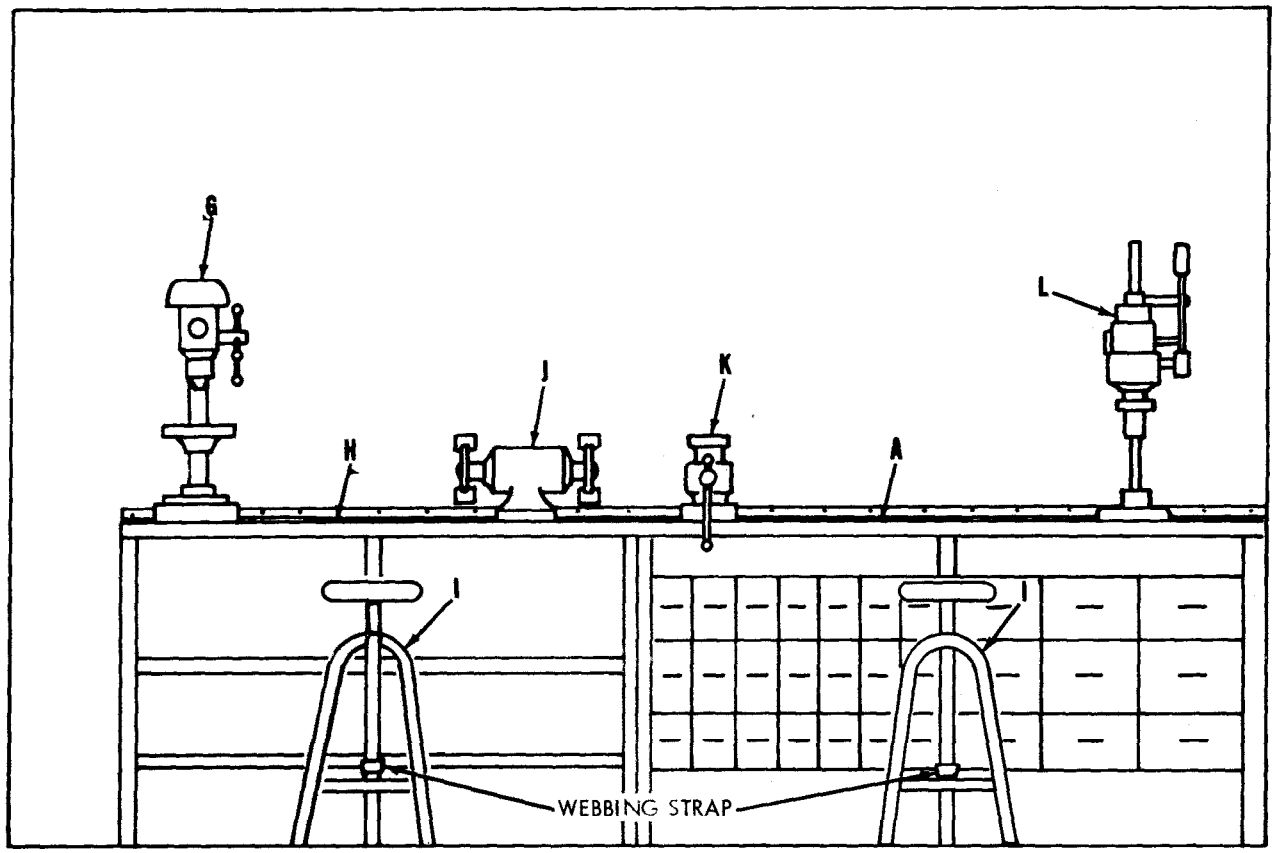


CURBSIDE VIEW

A - TABLE, WORK, AUTOMOTIVE MAINTENANCE
B - PRESS, ARBOR, HAND OPERATED
C - CABINET, STORAGE
D - NITROGEN, TECHNICAL
E - NITROGEN TANK SUPPORT BLOCK (SEE FIGURE 4)
F - GENERATOR SET, GASOLINE ENGINE

WE 38417

Figure 2. Curbside view.



ROADSIDE VIEW

A - TABLE, WORK, AUTOMOTIVE MAINTENANCE
G - DRILLING MACHINE, UPRIGHT
H - TABLE, WORK, AUTOMOTIVE MAINTENANCE
I - STOOL, REVOLVING
J - GRINDING MACHINE, UTILITY
K - VISE, MACHINIST'S
L - DRILL, ELECTRIC, PORTABLE: WITH STAND

WE 38418

Figure 3. Roadside view.

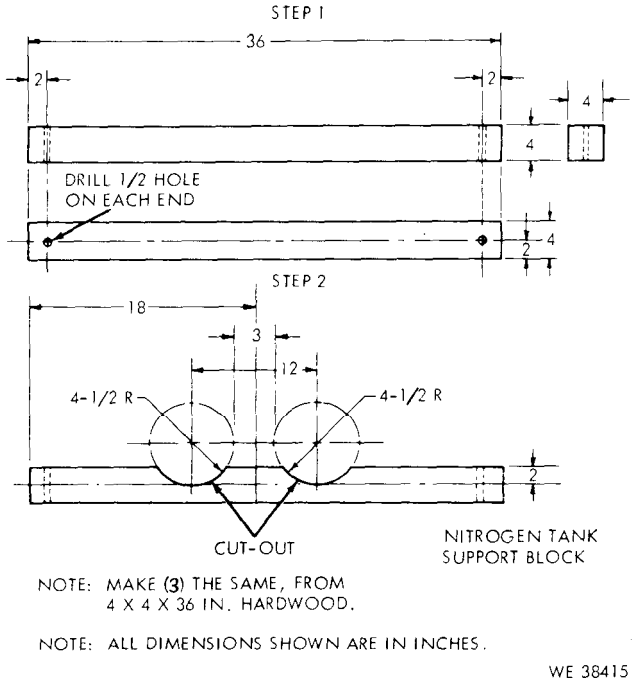


Figure 4. Fabrication instructions.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 009045-000