DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

SHOP SET, ARTILLERY:

FIELD MAINTENANCE, SET N (4933-754-0704)

AND

TOOL KIT, ARTILLERY:

FIELD MAINTENANCE, SUPPLEMENTAL

NO. I (4933-754-0659):

INSTALLATION IN ONE 2-1/2-TON

SHOP VAN TRUCK M109 OR M220

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

This bulletin is current to 11 September 1970

1. General. *a.* The instructions contained in this bulletin are to be used as a guide for installation of Artillery Field Maintenance Shop Set N (4933-754-0704) and No. 1 Supplemental Artillery Field Maintenance Tool Kit (4933-754-0659) in one 2-1/2 ton 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 the shop set is included in SC 4933-95-CL-A12. A complete list of items included in the tool kit is included in SC 4933-95-CL-A1O.

d. Precautions should be observed when drilling holes through the body to insure that waterproof characteristics of the body are retained. All hardware extending through the floor of the shop van should have the 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.

e. Items not mentioned in this bulletin that are components of the set and kit may be stowed in the work tables or other convenient places in such a manner as to avoid damage in transit.

This bulletin supersedes TB ORD 444-20, 9 April 1963 including changes.

2. Installation of the Shop Equipment. *a.* The floor plan for the shop van with each item in its designated position is shown in figure 1. Curbside and roadside views are shown in figure 2 and 3 respectively. Steps in fabricating nitrogen tank support blocks are shown in figure 4.

b. Equipment to be mounted or to be secured for transit is listed in Table 1.

Table 1. ***Equipment to be Mounted and / or Secured for Transit***

FSN	Nomenclature	Qty	Fig no.	Item
4910-543-7771	TABLE, WORK, AUTOMOTIVE MAINTENANCE:	1	1, 3	A
5130-293-2488	GRINDER, ELECTRIC, PORTABLE, WITH STAND:	1	I, 3	B
4910-205-3046	TABLE, WORK, AUTOMOTIVE MAINTENANCE:	1	1, 2	C
5120-293-1439	VISE, MACHINISTS:	1	1, 2	D
4910-543-7772	TABLE, WORK, AUTOMOTIVE MAINTENANCE:	1	1, 2	E
5130-204-2718	DRILL, ELECTRIC, PORTABLE, WITH STAND:	1	1, 2	F
6115-889-1446	GENERATOR SET, GASOLINE ENGINE:	1	1, 3	G
6830-292-0131	NITROGEN, TECHNICAL:	1	1, 3	H
(Fabricated)	NITROGEN TANK SUPPORT BLOCK:	3	1, 3, 4	I
4933-712-2378	PUMP KIT, HYDRAULIC OIL, GUN RECOIL:	2	2	J

c. Materials required to fabricate webbing straps and nitrogen tank support blocks are listed in Table 2.

Table 2. ***Fabricating Material***

FSN	Material	Application
5340-850-8060	BUCKLE: strap, 1 in. webbing accommodated	For application to webbing for securing straps
NSNA	HARDWOOD: 4 x 4	For fabricating nitrogen tank support block (I)
8305-263-2477	WEBBING, TEXTILE: cotton, 1 in. w, 500 lb breaking str	For fabricating straps for securing generator set (G), nitrogen tank (H) and pump kit (J)

d. Hardware required for installation of equipment in shop van is 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
5306-225-9081	BOLT, MACHINE: hex-hd, 5 / 16-18UNC-2A x 1-1 / 4	8	Work tables (A), (C), and (E).
5305-225-8504	BOLT, MACHINE: hex-hd, 5 / 16-18UNC-2A x 2	10	Work tables (A), (C), and (E).
5306-177-5677	BOLT, MACHINE: hex-hd, 7 / 16-20UNF-3A x 5-1 / 2	2	Nitrogen tank support block, upper
5306-027-5803	BOLT, MACHINE: hex-hd, 7 / 16-20UNF-3A x 8	4	Nitrogen tank support block, lower
5306-058-0518	BOLT, SQUARE NECK: (carriage bolt) 5 / 16-18UNC-2A x 3-1 / 2	4	Grinder (B)
5306-702-2821	BOLT, SQUARE NECK: (carriage bolt) 1 / 2-13UNC-2A x 3-1 / 2	4	Vise (D)
5340-616-4660	LOOP, STRAP FASTENER: for 1 in. webbing	2	Nitrogen tank support block, upper

Table 3. Hardware-Continued

FSN	Nomenclature	Qty	Application
5310-880-7744	NUT, PLAIN, HEXAGON: 5/16-18UNC-2B	22	Work tables (A), (C), and (E), grinder (B)
5310-975-2075	NUT, PLAIN, HEXAGON: 3/8-24UNF-2B	3	Drill and stand (F)
5310-741-5305	NUT, PLAIN, HEXAGON: 7/16-20UNF-3B	6	Nitrogen tank support block (I)
5310-834-8732	NUT, PLAIN, HEXAGON: 1/2-13UNC-2B	4	Vise (D)
5305-269-3244	SCREW, CAP, HEXAGON HEAD: 3/8-24UNF-2A x 2-1/2	3	Drill and stand (F)
5305-724-7236	SCREW, CAP, HEXAGON HEAD: 5/8-11UNC-2A x 3-1/4	6	Work tables (A), (C), and (E)
5305-013-0384	SCREW, WOOD: rd-hd, no. 10, 2-1/2 lg	4	Nitrogen tank support block, upper, strap fastener loops (I)
5310-273-7729	WASHER, FLAT: .234 id, for no. 10 screw	4	Nitrogen tank support block, upper, strap fastener loops (I)
5310-081-4219	WASHER, FLAT: 11/32 id, for 5/16 bolt size	22	Work tables (A), (C) and (E) grinder (B)
5310-167-0804	WASHER, FLAT: 25/64 id, for 3/8 bolt size	6	Drill and stand (F)
5310-760-2021	WASHER, FLAT: 1/2 id, for 7/16 bolt size	6	Nitrogen tank support blocks (I)
5310-809-5998	WASHER, FLAT: 17/32 id, for 1/2 bolt size	4	Vise (D)
5310-823-8803	WASHER, FLAT: 21/32 id, for 5/8 screw size	6	Work tables (A), (C), and (E)
5310-209-0061	WASHER, FLAT: rect, 7/16 in. hole dia	18	Work tables (A), (C), and (E)
5310-737-4728	WASHER, LOCK: int-ext-teeth, dished, 3/8 screw size	3	Drill and stand (F)
5310-407-9566	WASHER, LOCK: split, 5/16 bolt size	22	Work tables (A), (C), and (E), grinder (B)
5310-905-5454	WASHER, LOCK: split, 7/16 bolt size	6	Nitrogen tank support blocks (I)
5310-584-5272	WASHER, LOCK: split, 1/2 bolt size	4	Vise (D)
5310-045-5001	WASHER, LOCK: split, 5/8 screw size	6	Work tables (A), (C), and (E)

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

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 van each time the shop set is placed in operation.

3. Shop Van. *a.* Work Tables (Figs 1, 2, and 3)

(1) There are three work tables 4910-543-7771, 4910-205-3046 and 4910-543-7772 to be installed in the shop van. The tables in the sequence listed above, are designated A, C, and E.

(2) Place work table (A) flush against the front wall and left side of the van as shown in figure 1. Locate table (C) on the right side of the van in a similar manner. Mark and drill twelve 11/32-inch holes through the floor of the van aligned with the mounting holes in the table legs. Secure each table with two 5/16-18 x 1-1/4-inch hexagon-head machine bolts 5306-225-9081 (use for securing legs over wheel well plates), four 5/16-18 x 2-inch hexagon-head machine bolts 5305-225-8504, six 7/16-inch hole diameter rectangular flat washers 5310-209-0061 (place on underside of floor), six 11/32-inch inside diameter flat washers 5310-081-4219, six 5/16-inch split lockwashers 5310-407-9566 and six 5/16-18 hexagon plain nuts 5310-880-7744.

(3) Place table (E) toward the rear of the van, flush against the right side, and abutted against table (C) as shown in figures 1 and 2. Mark and drill six 11/32-inch holes through the floor of the van aligned with the mounting holes in the table legs. Secure the table with four 5/16-18 x 1-1/4-inch hexagon-head machine bolts 5306-225-9081 (use for securing legs over wheel well plates), two 5/16-18 x 2-inch hexagon-head machine bolts 5305-225-8504, six 7/16-inch hole diameter rectangular flat washers 5310-209-0061 (place on underside of floor), six 11/32-inch inside diameter

flat washers 5310-081-4219, six 5/16-inch split lockwashers 5310-407-9566, and six 5/16-18 hexagon plain nuts 5310-880-7744.

(4) Secure each of the table tops to angle iron (factory installed in van) with two 5/8-11 x 3-1/4-inch hexagon-head capscrews 5305-724-7236, two 21/32-inch inside diameter flat washers 5310-823-8803, and two 5/8-inch split lockwashers 5310-045-5001 (nuts are factory installed in table top).

b. Portable Electrical Grinder (Figs 1 and 3). Place the portable electrical grinder 5130-293-2488 (designated B) on work table (A) and position the base of the grinder 10 inches from the right end and 2 inches from the front edge of the table top as shown in figure 1. Mark and drill four 11/32-inch holes through the table top aligned with mounting holes in the base of the grinder. Secure the grinder with four 5/16-18 x 3-1/2-inch square neck bolts 5306-058-0518, four 11/32-inch inside diameter flat washers 5310-081-4219; four 5/16-inch split lockwashers 5310-407-9566, and four 5/16-18 hexagon plain nuts 5310-880-7744.

c. Machinist's Vise (Figs. 1 and 2). Place the machinist vise 5120-293-1439 (designated D) on work table (C), and position the base of the stand 4 inches from the right end of the table top and flush with the front edge as shown in figure 1. Mark and drill four 9/16-inch holes in the base of the vise. Secure the vise with four 1/2-13 x 3-1/2-inch square neck bolts 5306-702-2821, four 17/32-inch inside diameter flat washers 5310-809-5998, four 1/2-inch split lockwashers 5310-584-5272, and four 1/2-13 hexagon plain nuts 5310-834-8732.

d. Portable Electric Drill and Stand (Figs 1 and 2). Place the drill and stand 5130-204-2718 (designated F) on work table (E), and position the base of the stand 10 inches from the right end of the table top and 1 inch from the front edge as shown in figure 1. Mark and drill three 7/6-inch holes through the table top aligned with the mounting holes in the base of the stand. Secure the drill and stand with three 3/8-24 x 2-1/2-inch hexagon-head cap screw 5305-26.9-3244, six 25/ 64-inch inside diameter flat washers 5310-167-0804, three 3 / 8-inch split lockwashers 5310-737-4728, and three 3 / 8-24 hexagon plain nuts 5310-975-2075.

e. Generator Set (Figs. 1 and 3). Place the generator set 6115-889-1446 on the floor of the van, two inches from the left side of van and flush against table (A) as shown in figures 1 and 3. Secure the generator to the table legs with webbing straps which are to be fabricated using webbing 8305-263-2477 and a buckle 5340-850-8060.

CAUTION: The generator set is secured in the shop van for transportation purposes only and is to be removed from the van before operation.

f. Nitrogen Tank Support Block (figs. 1, 3 and 4)

(1) Fabricate three 24 inch long support blocks (designated I) as shown in figure 4. The blocks are to be placed on the left side of the van 8 inches from the rear wall.

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

(3) Two blocks are to be positioned on the floor, one flush with the wall and one directly in front of the other so that nitrogen tank will fit snugly between them. Mark and drill, two inches from each end of blocks, 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 lockwashers 5310-905-5454, and two 7/16-20 hexagon plain nuts 5310-741-5305.

(4) Secure nitrogen tank (designated H) to upper block with webbing strap. Fabricate strap using webbing 8305-263-2477 and a buckle 5340-850-8060. Position and secure two strap fastener loops 5340-616-4660 at opposite ends of block with two no. 10-2-1/2 inch round head wood screws 5305-013-0384 and two .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 3.

g. Pump Kits (Fig. 2). Place the two pump kits 4933-712-2378 (designated J) on the lower shelf of work table (E) as shown in figure 2. Secure the kits to the shelves with fabricated webbing straps as required.

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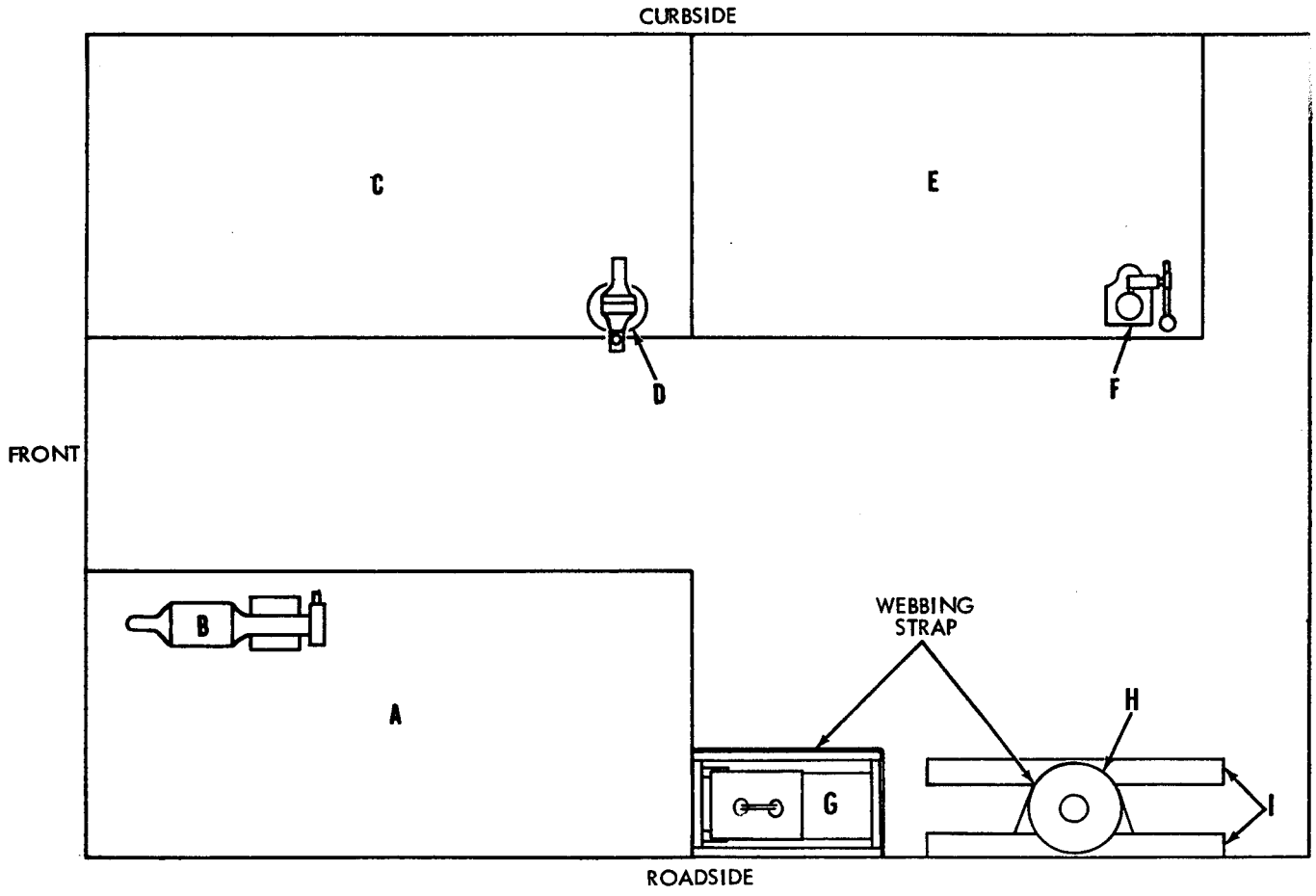
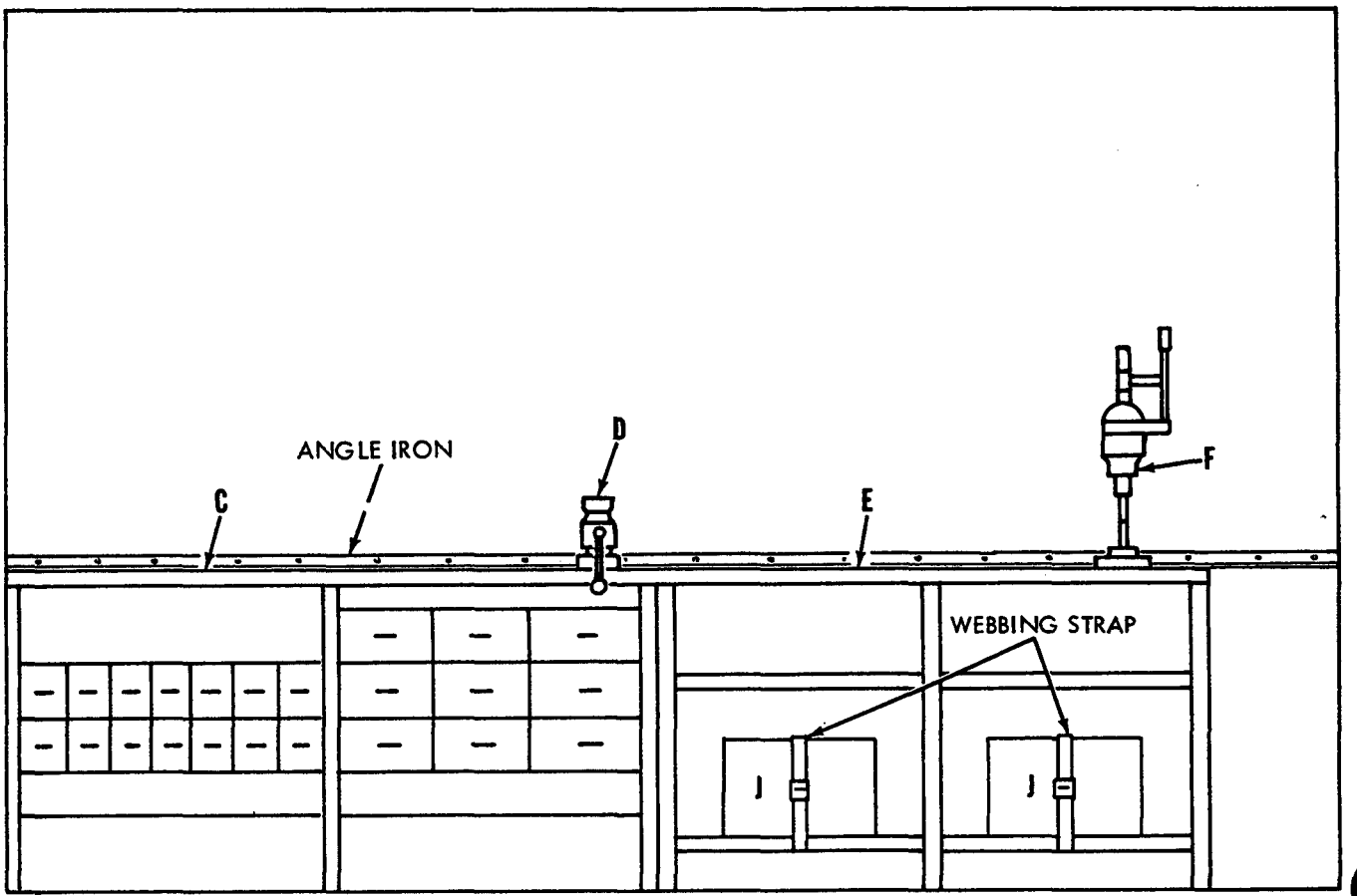


A - TABLE, WORK, AUTOMOTIVE MAINTENANCE - 4910-543-7771
B - GRINDER, ELECTRIC, PORTABLE, WITH STAND - 5130-293-2488
C - TABLE, WORK, AUTOMOTIVE MAINTENANCE - 4910-205-3046
D - VISE, MACHINISTS - 5120-293-1439
E - TABLE, WORK, AUTOMOTIVE MAINTENANCE - 4910-543-7772
F - DRILL, ELECTRIC, PORTABLE, WITH STAND - 5130-204-2718
G - GENERATOR SET, GASOLINE ENGINE - 6115-889-1446
H - NITROGEN, TECHNICAL - 6830-292-0131
I - NITROGEN TANK SUPPORT BLOCK (SEE FIGURE 4)

WE 38408

Figure 1. Floor plan.

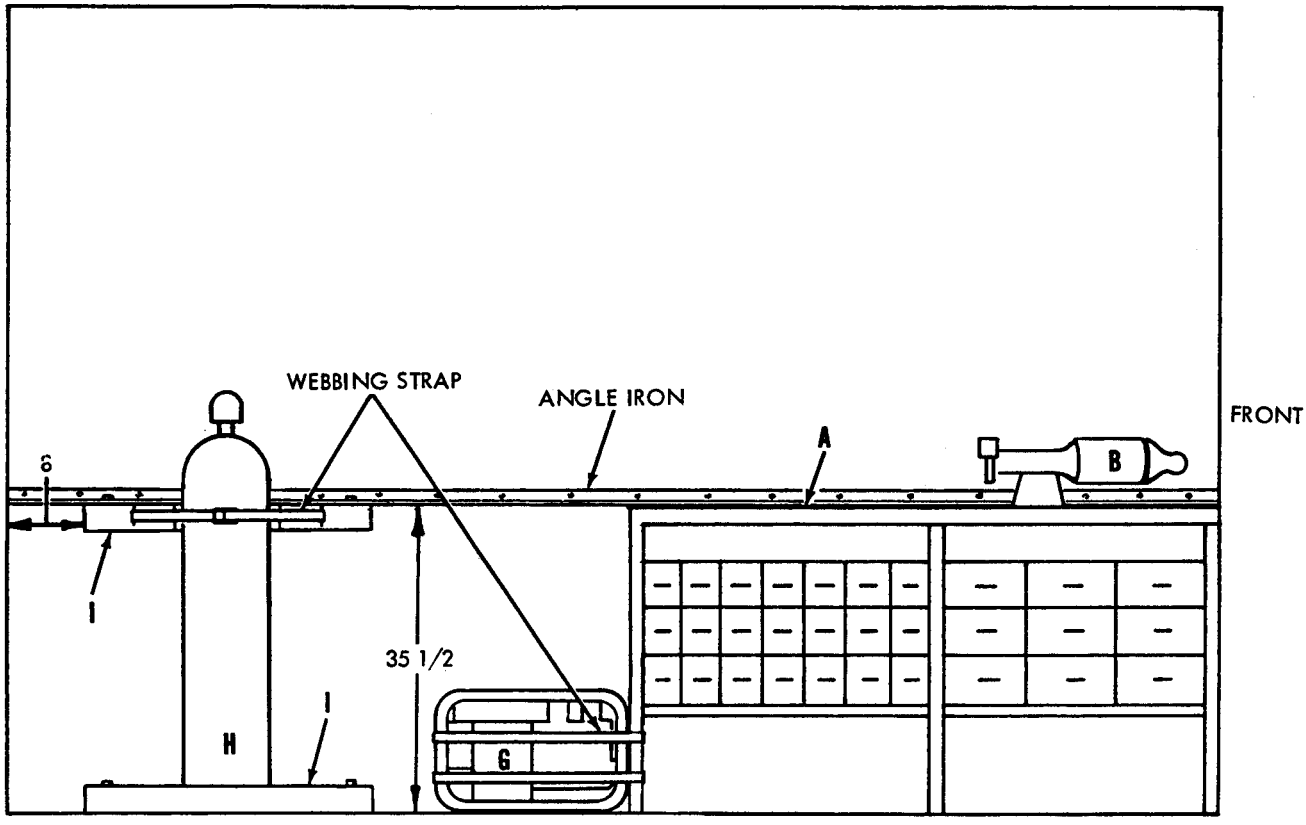


CURBSIDE VIEW

C - TABLE, WORK, AUTOMOTIVE MAINTENANCE
D - VISE, MACHINISTS
E - TABLE, WORK, AUTOMOTIVE MAINTENANCE
F - DRILL, ELECTRIC, PORTABLE, WITH STAND
J - PUMP KIT, HYDRAULIC OIL, GUN RECOIL

WE 38409

Figure 2. Curbside view.



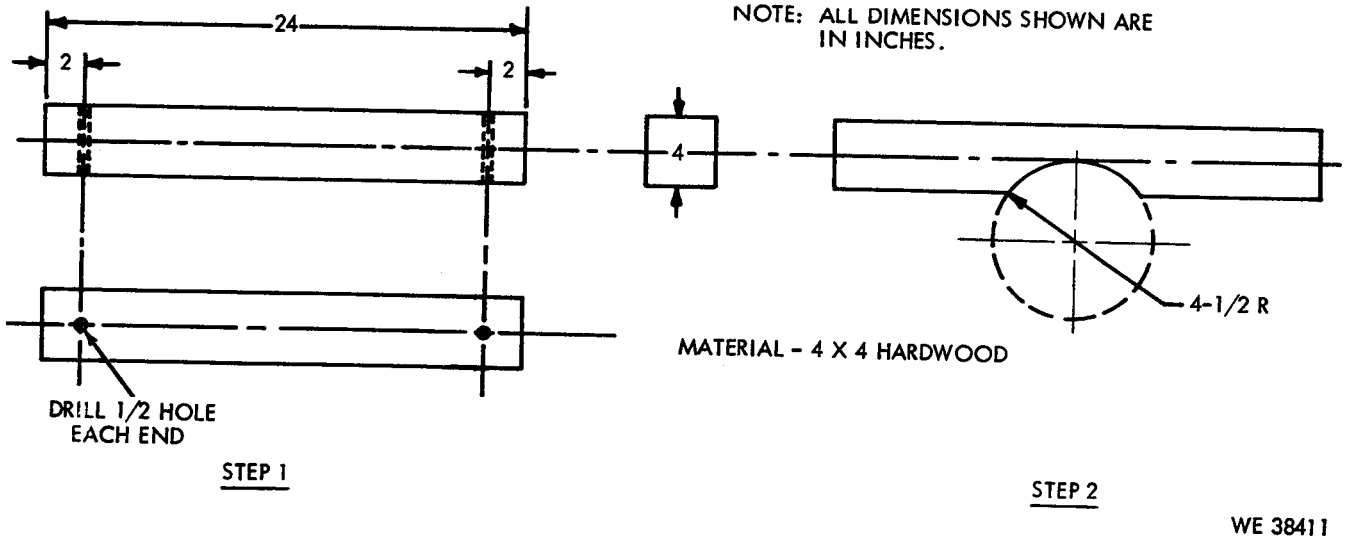
ROADSIDE VIEW

A - TABLE, WORK, AUTOMOTIVE MAINTENANCE
B - GRINDER, ELECTRIC PORTABLE, WITH STAND
G - GENERATOR SET, GASOLINE ENGINE
H - NITROGEN, TECHNICAL
I - NITROGEN TANK SUPPORT BLOCK (SEE FIGURE 4)

NOTE: ALL DIMENSIONS SHOWN ARE IN INCHES

WE 38410

Figure 3. Roadside view.



WE 38411

Figure 4. Nitrogen tank support block.

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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

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