11. V-DRIVE INSTALLATION

In recent years two factors have had a great influence on power for outboard type hulls. One of these is the demand for greater speed and the other a requirement for engines with sufficient power for towing water skiers. In many cases the demand for additional power and speed has been met by the use of a higher horsepower outboard or by installing twin motors. A second solution has been the installation of an inboard engine with V-drive.

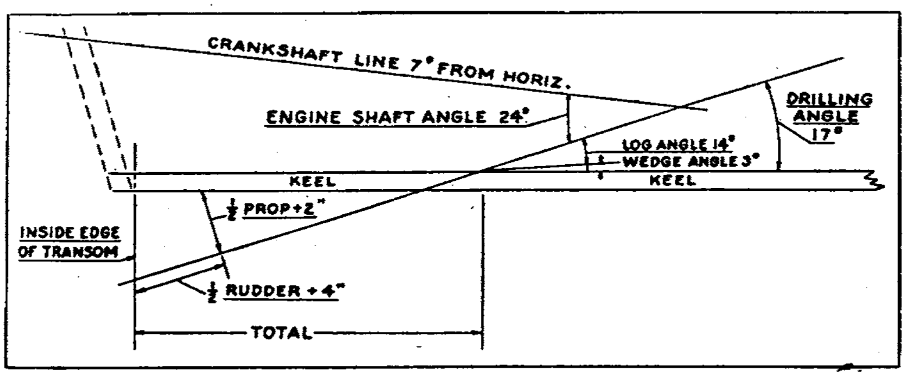


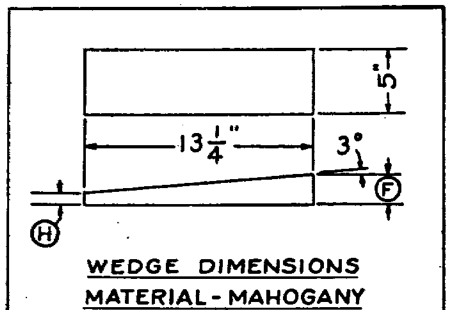
Fig. 12 Typical Shaft Location

These V-drive engines are designed to be mounted in the extreme stern of the boat. They are suitable for most outboard hulls 17' and over and are being used successfully in houseboat hulls up to 32' in length.

The installation of a V-drive engine differs from the installation of a conventional drive engine in that the engine is mounted aft and in the reverse position, with the flywheel toward the stern of the boat. The installation of a typical V-drive engine will be described here. The general principles and practices will serve for most V-drive engines although the angles and dimensions may vary.

Preparation for mounting the V-drive engine is like that for mounting conventional engines and the same steps are followed in each case. As before, the first step is the blocking up of the boat. In this case, the keel should be leveled from the transom to about six feet forward to aid in determining the shaft hole location and angle.

Location of the shaft hole and determining its angle are the next steps. Any of the methods described before will work. However, since the keel has been leveled and the distances involved are short, determination of the shaft angle by means of a simple, full-size sketch is the easiest (See Fig. 12). In making this sketch, two parallel lines are drawn approximately six feet long, with the distance between them equalling the thickness of the keel. A line is then drawn on the sketch, indicating the crankshaft center, at an angle to the keel equal to the recommended engine mounting angle (7° in Fig. 12). The prop shaft line is now drawn slanting down and through the keel at an angle to the crankshaft line equal to the engine shaft angle. This angle is obtained from the manufacturer's scale drawings or from actual measurement of the engine (24° in Fig. 12). A third line is then drawn from the point the shaft line intersects the top of the keel, at



KEEL THICKNESS	F	H
1½"	1⅜"	11/16"
1⅝"	1¼"	9/16"
1¾"	1⅛"	7/16"
1⅞"	1"	5/16"
2"	⅞"	3/16"

Fig. 13 Wedge Sizes

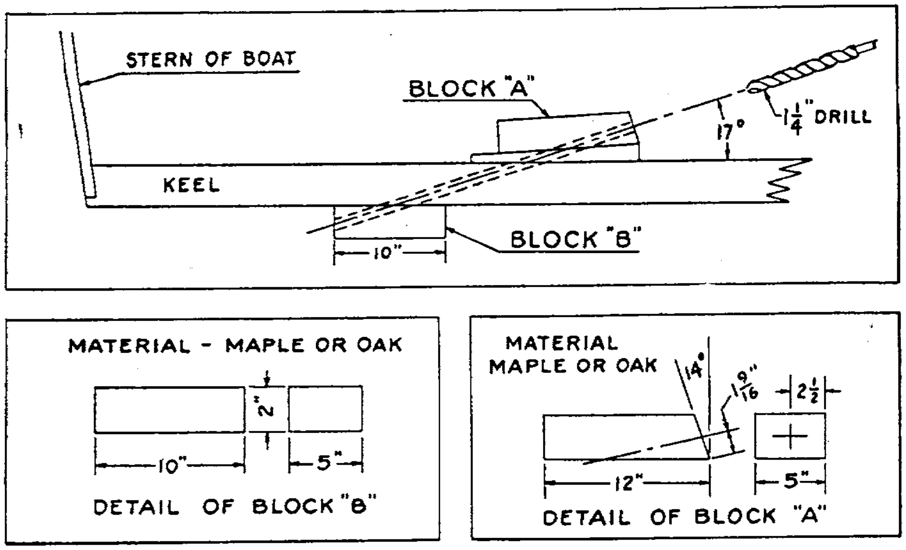


Fig. 14 Drill Block Details

an angle to the shaft line equal to the angle of the shaft log to be used (14° in Fig. 12). The angle this line makes with the keel then determines the angle of wedge needed (3° in Fig. 12).

The location of the shaft hole can now be determined. Its distance from the transom will be controlled by the dimensions of the rudder being used, clearance between the rudder and propeller, propeller diameter and propeller clearance to the bottom of the boat. Locate the after end of the propeller hub which will be at that point on the prop shaft where the right angle distance from the prop shaft center to the bottom of the keel is equal to half the prop diameter plus two inches. Mark a spot four inches plus half the width of the rudder toward the stern along the shaft line from the after end of the prop hub line. Draw a line from this point at right angles to the keel. This line now represents the inside of the transom. Measuring from this point to the spot where the shaft line passes through the keel will give the location of the shaft hole.

A wedge can now be cut to fit between the shaft log and keel as previously described. Fig. 13 gives

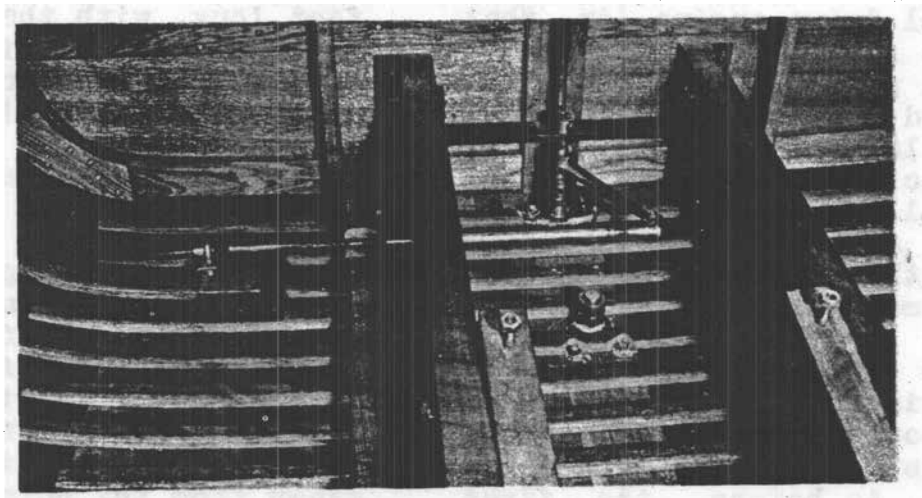


Fig. 15 Typical Bed, Stringer and Steering Set-up

dimensions of typical 3° wedges for varying keel thickness.

After installation of the wedge, preparations can be made for drilling the shaft hole. Fig.14 gives dimensions and angles for drilling blocks for installation requiring a shaft angle of 17°. Pre-drilled blocks are available in most cases, which will greatly simplify this step.

Following previous instructions, the shaft log, propeller shaft, strut and coupling may now be installed.

Engine stringers running at least two-thirds the length of the hull are now installed and fastened se- curely to the transom, and th rudder installed and braced to the stringers. A typical installatio is shown in Fig. 15.

The gas tank comes next. In most V-drive installations, the tank i installed between the engine and transom as shown in Fig. 16. The same safety features described fo conventional installation appl equally well in this case.

From this point, installation i the same as for conventional drive engines. The engine beds are constructed, engine blocked in plac

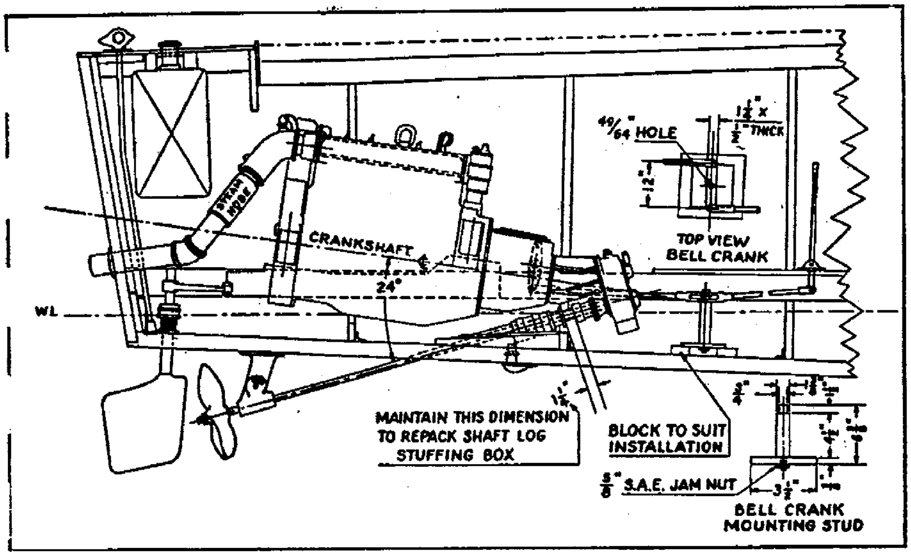


Fig.16 Typical V-Drive Layout

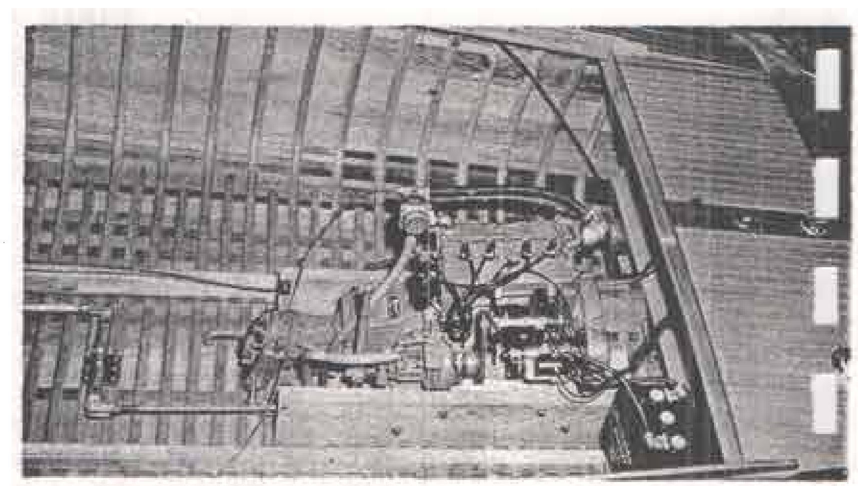


Fig. 17 Photo of Typical V-Drive Installation

temporarily, beds slid into place under the engine and clamped for marking of the mounting bolts. The engine is then removed, beds fastened in place and the engine installed and brought into proper alignment.

The installation of water intake scoop, fuel lines, oil lines, instrument panel, battery and exhaust can now be accomplished as described for conventional engines.

Shifting is controlled in a conventional manner by connecting the reverse gear lever on the engine with any commercially available remote shifting lever by means of a pipe or rod stock. Due to the fact that the V-drive engine is installed in the reverse position, the result of a direct connection will be that the remote lever will operate in reverse of the normal. That is, to go forward, it is necessary to pull back on the lever, and to reverse, the lever is pushed forward. This may confuse the experienced operator, but can be changed to the conventional method of forward on the lever to go ahead, and back to go astern by introducing a bell crank in the linkage. Figs. 16 and 17 show how this can be done, using a bell crank.

Because of installation at the extreme stern, the engine can be enclosed by building a seat over or in front of the engine with the seat back acting as the forward bulkhead of the engine box. However, care must be used in designing this seat to provide access for maintenance and adequate ventilation for operation and safety.

After installation is complete, the engine and shaft alignment should be rechecked and all controls operated to assure ease of operation, as in the case of conventional installations.

12. SPECIAL EQUIPMENT

Two types of instrument panels are available as special equipment. An instrument panel of the three-unit type is available and consists of an oil pressure gauge, ammeter, and ignition switch. This instrument panel is cadmium-plated and the instruments are constructed of brass. See Fig. 18. The five-unit panel consists of an ammeter, oil pressure gauge, heat indicator, tachometer head, and engine hour meter. See Fig. 19. Wiring diagrams for the three and five-unit panels are shown in Fig. 20 and Fig. 21.

Table 2
INSTALLATION DATA

Model Name	Max. Engine Angle	Compartment Ventilator Size, Min.	Exhaust Pipe Size	Cooling System Pipe Size In	Cooling System Pipe Size Out	Fuel Pump Intake Copper Tube Size
Blue Jacket Twin	12°	5 sq. in.	1-1/2"	1/2"	1/2"	5/16"
Atomic Four	14°	5 sq. in.	1-1/4"	3/8"	1/2"	5/16"
Utility Four	12°	5 sq. in.	1-1/4"	1/4"	1/2"	5/16"
Super-Four	12°	5 sq. in.	2"	3/8"	1/2"	5/16"
Unimite Four	14°	5 sq. in.	2"	3/8"	1/2"	5/16"
Arrow	12°	15 sq. in.	2-1/2"	3/4"	3/4"	3/8"
Bluefin	12°	15 sq. in.	2-1/2"	3/4"	3/4"	3/8"
Marlin	12°	20 sq. in.	2-1/2"	3/4"	3/4"	3/8"
Tarpon	12°	20 sq. in.	3"	3/4"	3/4"	3/8"
Knight	12°	20 sq. in.	3"	3/4"	3/4"	3/8"
Little King	16°	20 sq. in.	2-1/2"	2-3/4"	*	3/8"
Big King	16°	25 sq. in.	3"	2 - 1"	*	1/2"

*Cast in manifold

Fig.18 3-Unit Instrument Panel

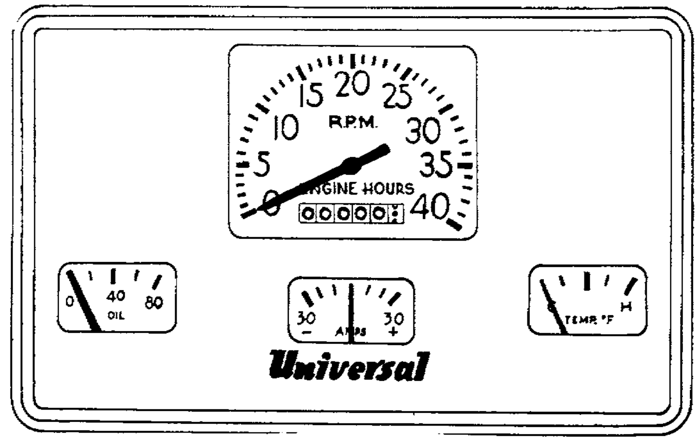


Fig. 19 5-Unit Instrument Panel

Table 3

ELECTRICAL SYSTEM WIRING SIZES

Use	Wire Gauge	Number Cable	Total Wire Length	Total Cable Length
Generator Circuits	12	---	6' or less	---
	10	---	6' to 10'	---
	8	---	10' to 15'	---
	6	---	15' to 25'	---
	5	---	25' to 50'	---
Starting Circuits		0	---	6' or less
		00	---	6' to 7½'
		000	---	7½' to 10'
Horn Circuits	10			
Lighting Circuits	10	Note: Maximum of four 21-cp lamps per circuit		
Ignition Circuits	12	Note: With one coil		
	10	Note: With two coils		
Electric Fuel Pump	12	Note: With one pump		
	10	Note: With two pumps		
Remote Control Switch	12			

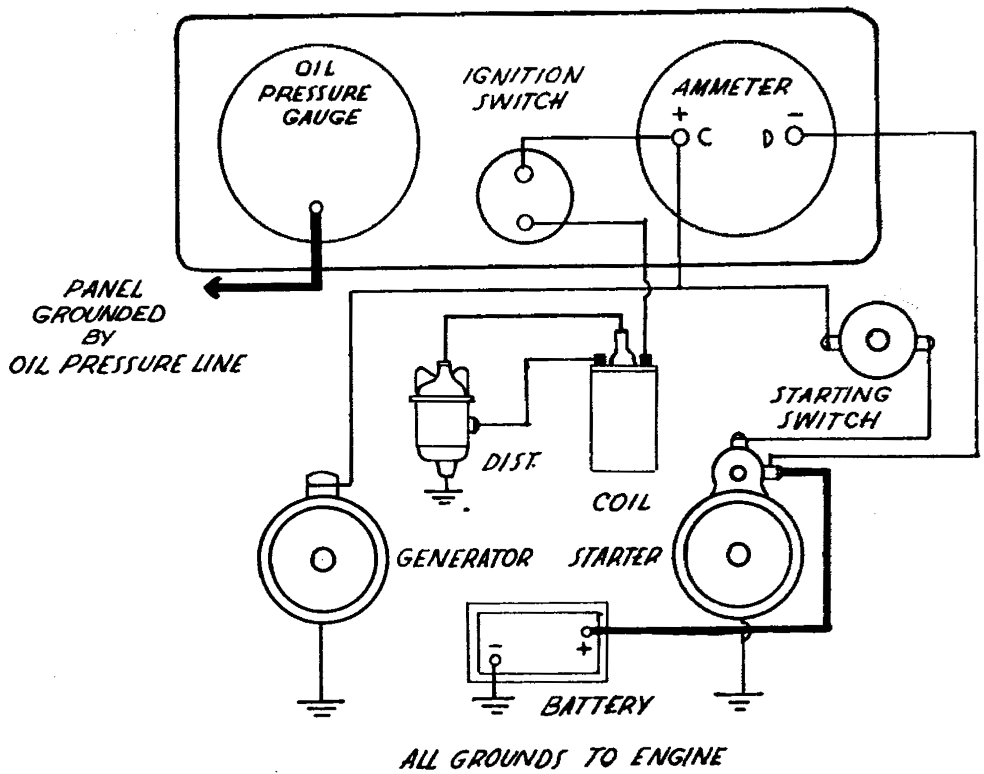


Fig. 20 Wiring Diagram - 3-Unit Panel

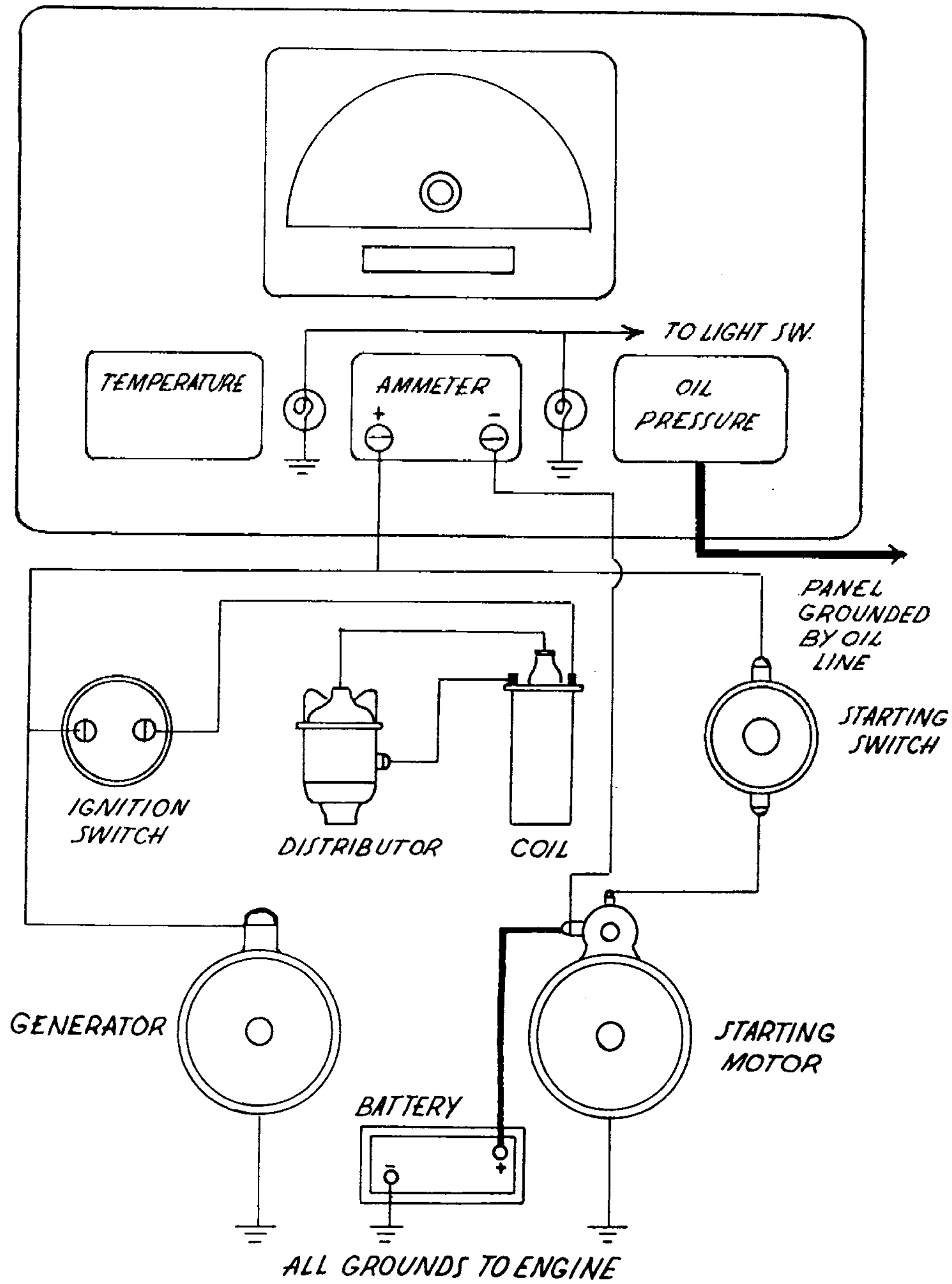
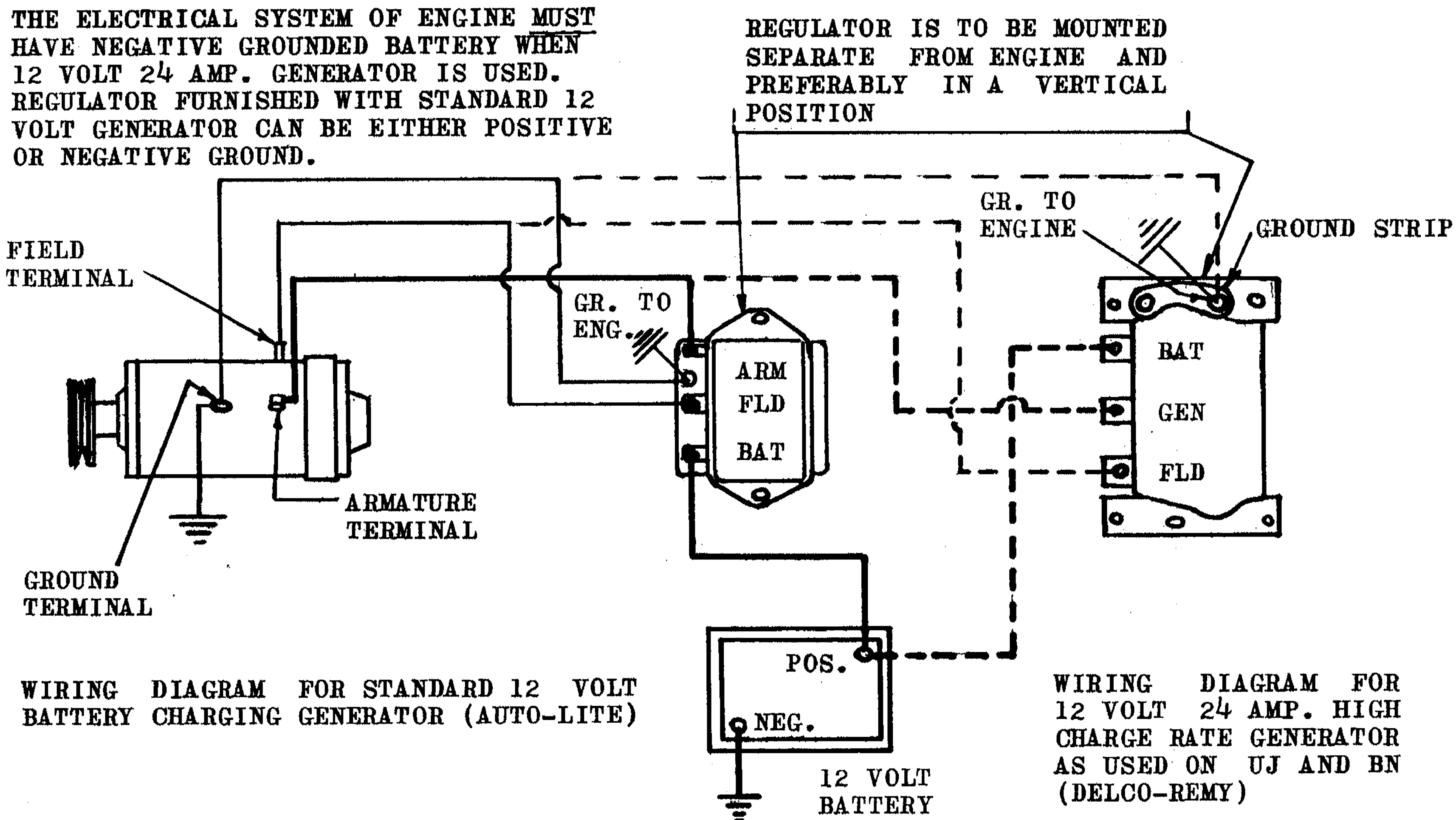


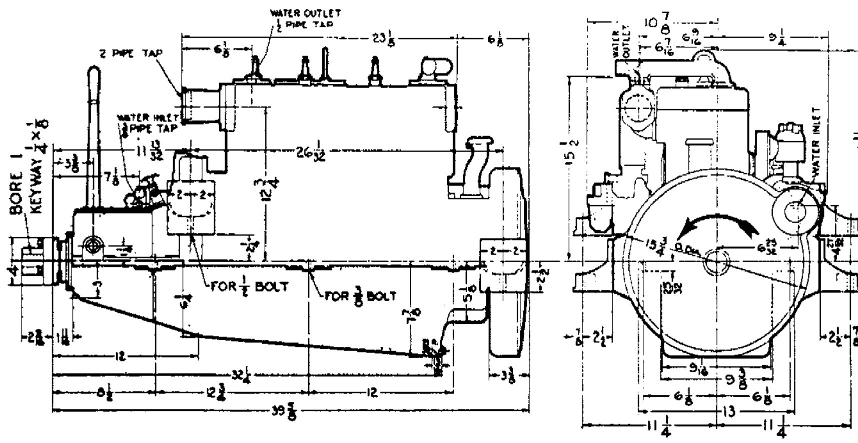
Fig. 21 Wiring Diagram - 5-Unit Panel



REPOLARIZING GENERATOR

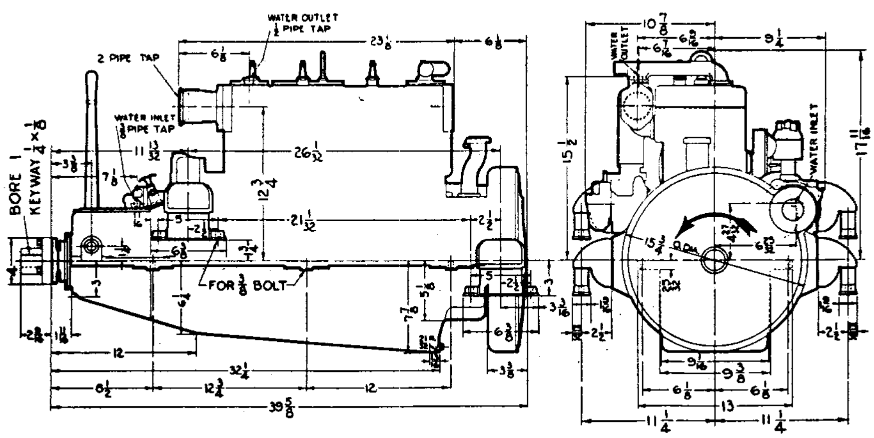
After reconnecting leads and before starting the engine, momentarily connect a jumper lead between the "BAT" terminal of the regulator and the "A" terminal of the generator. This allows a momentary surge of current to flow through the generator, correctly polarizing it. Reversed polarity may result in vibrating, arcing and burning of the cutout relay contact points.

Fig. 22 Wiring Diagram - Std. 12 Volt and 12 Volt 24 Amp.



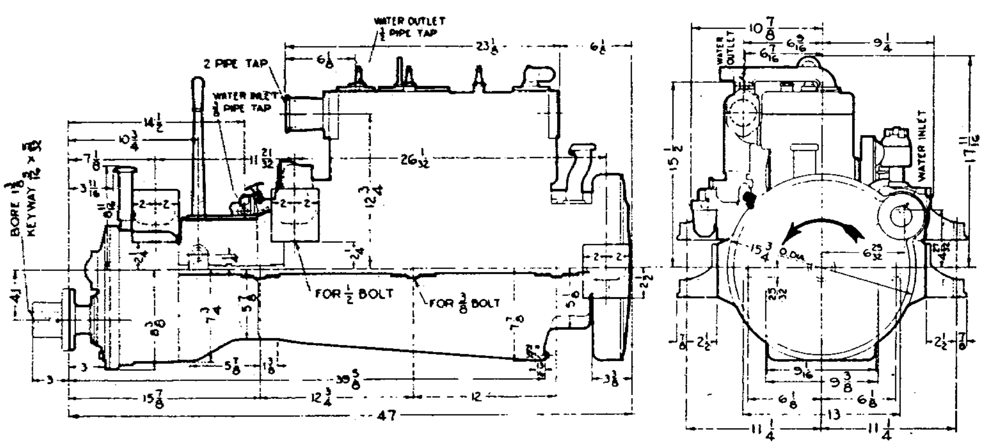
DIRECT DRIVE
RIGID MOUNTINGS

Fig. 29



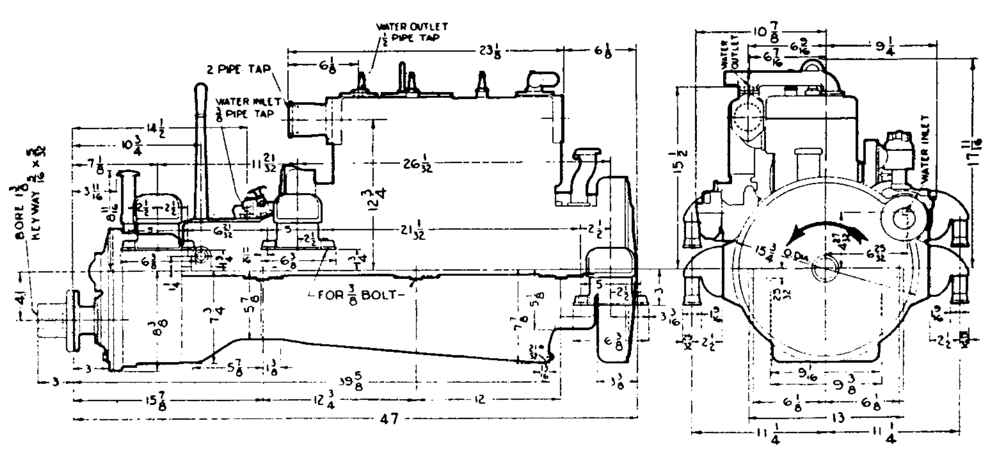
DIRECT DRIVE
RUBBER MOUNTINGS

Fig. 30



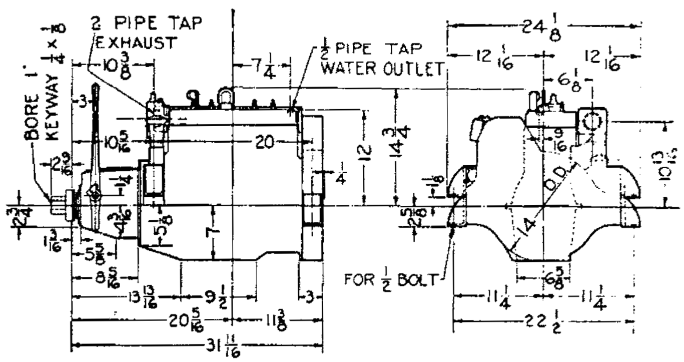
REDUCTION DRIVE
RIGID MOUNTINGS

Fig. 31



REDUCTION DRIVE
RUBBER MOUNTINGS

Fig. 32

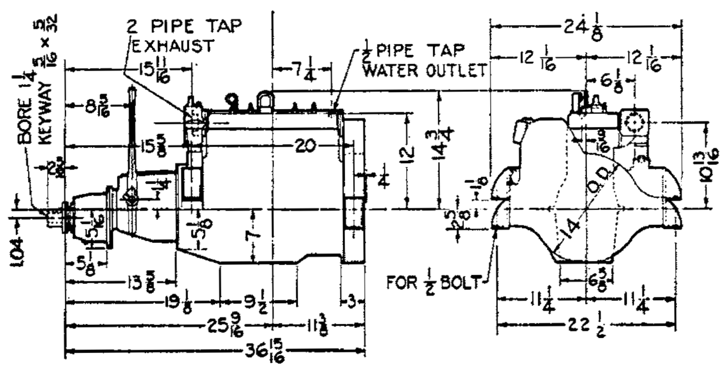


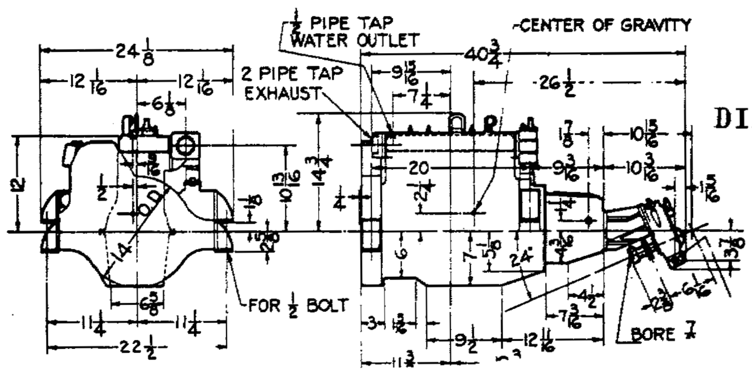
DIRECT DRIVE
RUBBER MOUNTINGS

Fig. 33

2:1 REDUCTION DRIVE
RUBBER MOUNTINGS

Fig. 34

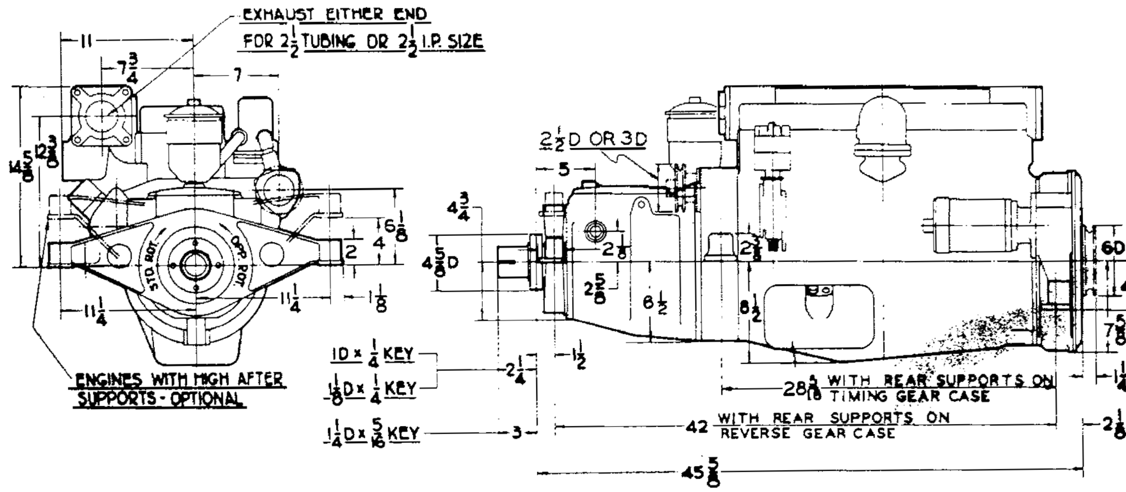




AQUA-PAK V-DRIVE
DIRECT DRIVE & ALL REDUCTION RATIOS
RUBBER MOUNTINGS

Fig. 35

Fig. 36



STA-NU-TRAL GEAR - DIRECT DRIVE

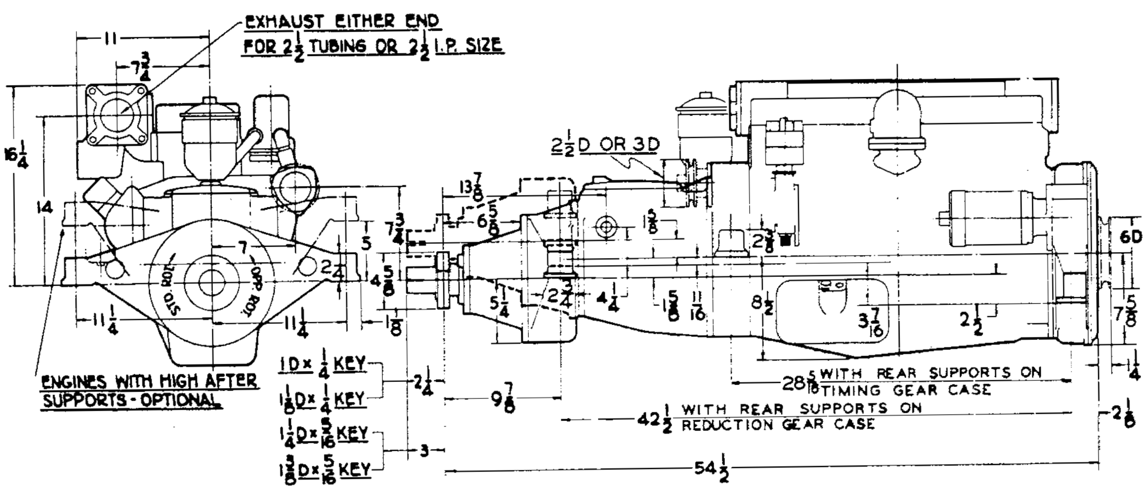
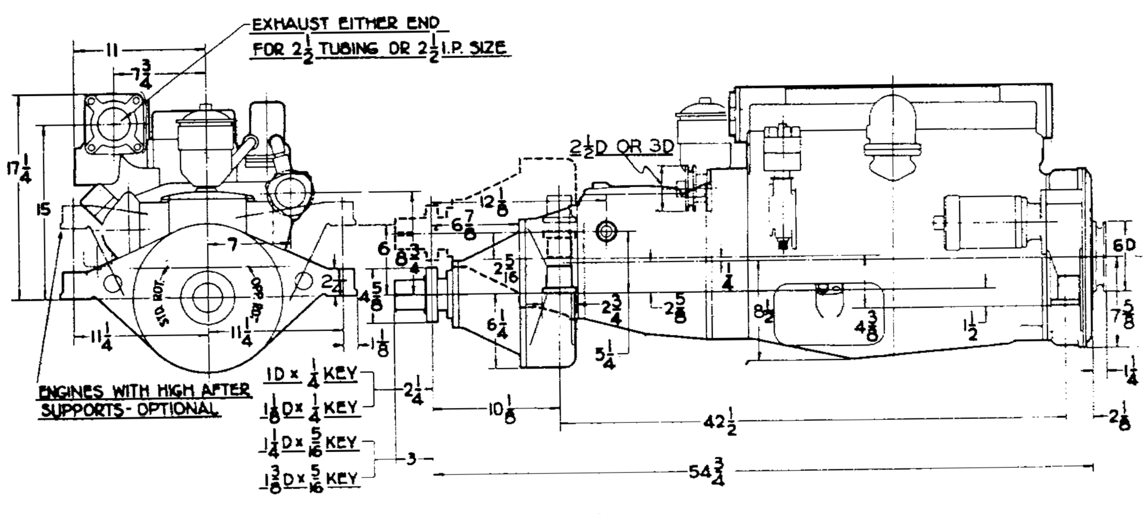


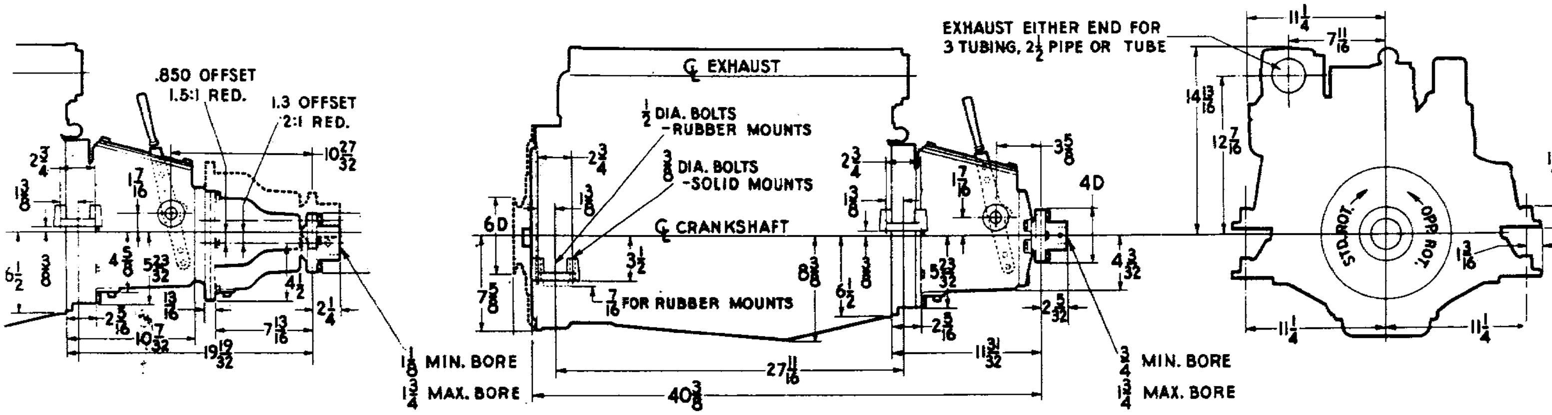
Fig. 37

STA-NU-TRAL GEAR - 1.88:1 REDUCTION RATIO

Fig. 38



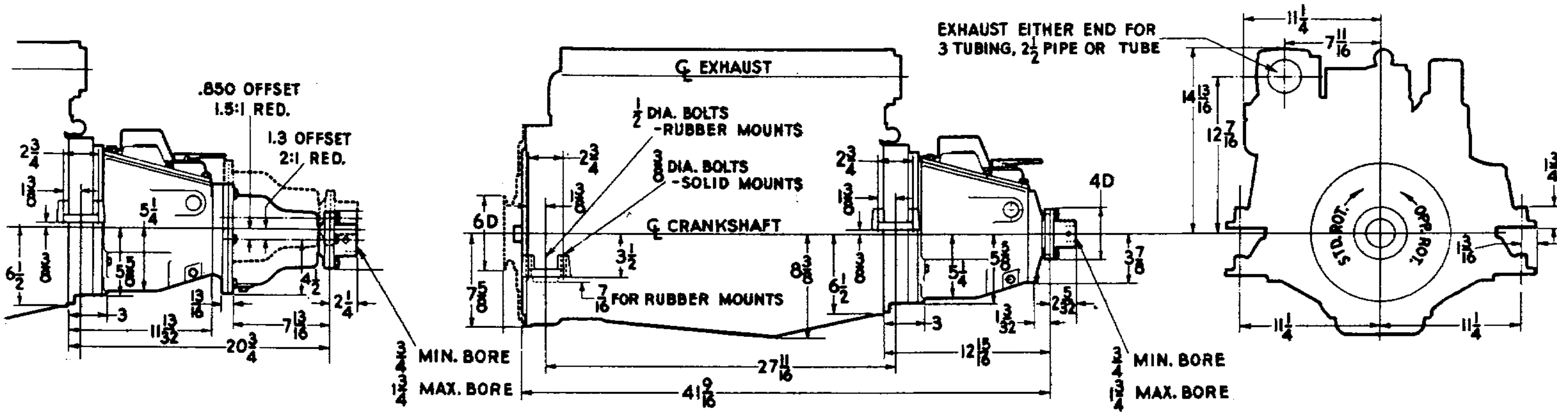
STA-NU-TRAL GEAR - 2.44:1 REDUCTION RATIO



1.5:1 & 2:1

DIRECT DRIVE
MANUAL REVERSING GEAR

Fig. 39



1.5:1 & 2:1

DIRECT DRIVE
HYDRAULIC REVERSING GEAR

Fig. 40

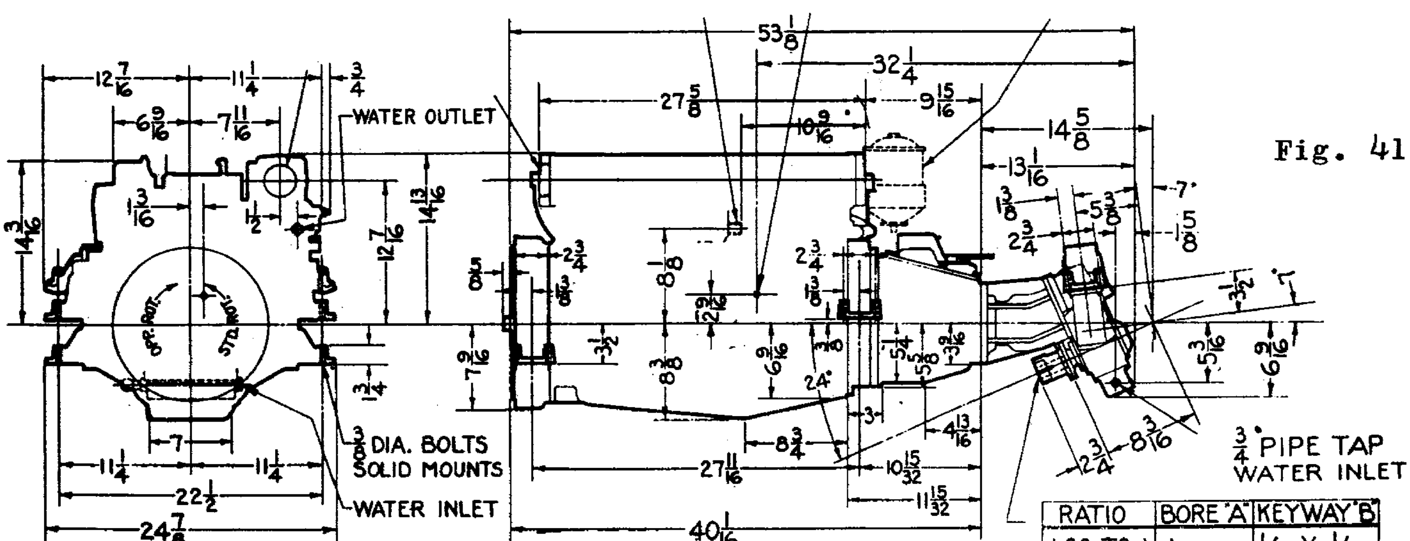
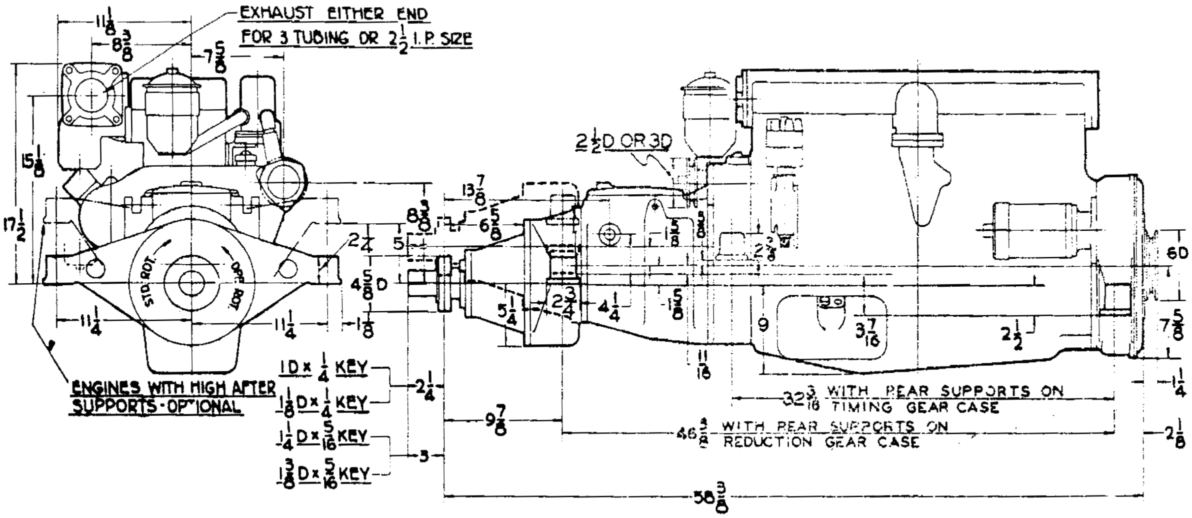


Fig. 41

RATIO	BORE 'A'	KEYWAY 'B'
1.00 TO 1	1	1/4 X 1/8
1.46 TO 1	1 1/4	5/16 X 5/32
2.05 TO 1	1 1/4	5/16 X 5/32
3.00 TO 1	1 1/2	3/8 X 3/16

V-DRIVE - HYDRAULIC GEAR - ALL RATIOS

Fig. 42



STA-NU-TRAL REVERSE GEAR, 1.88:1 REDUCTION GEAR

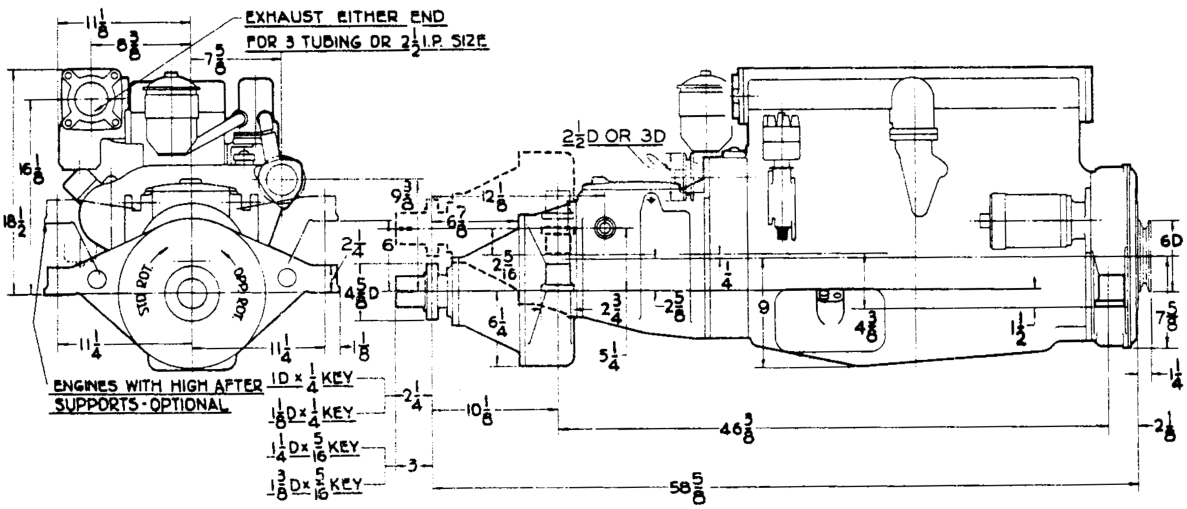
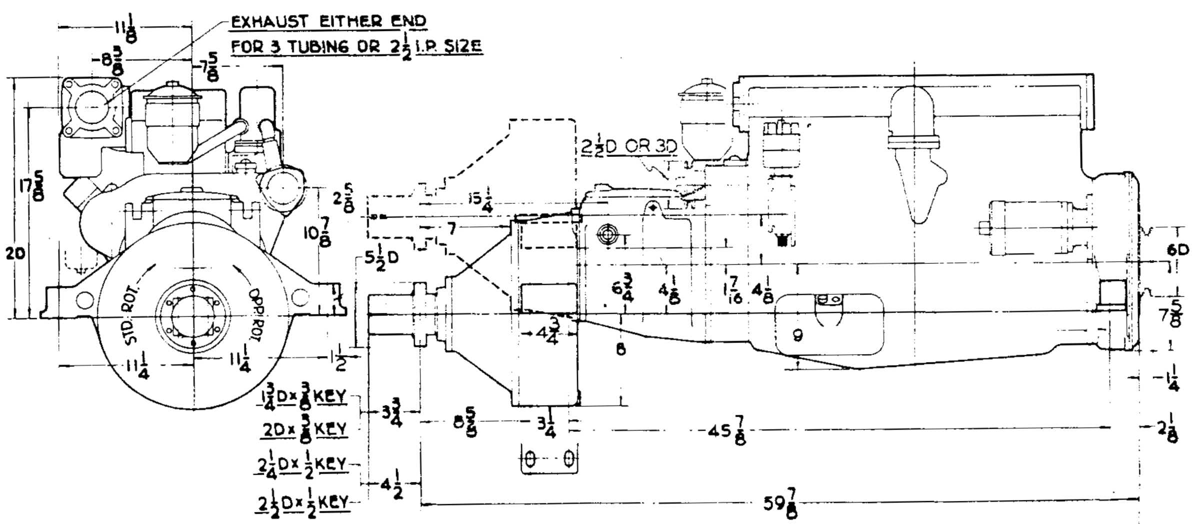


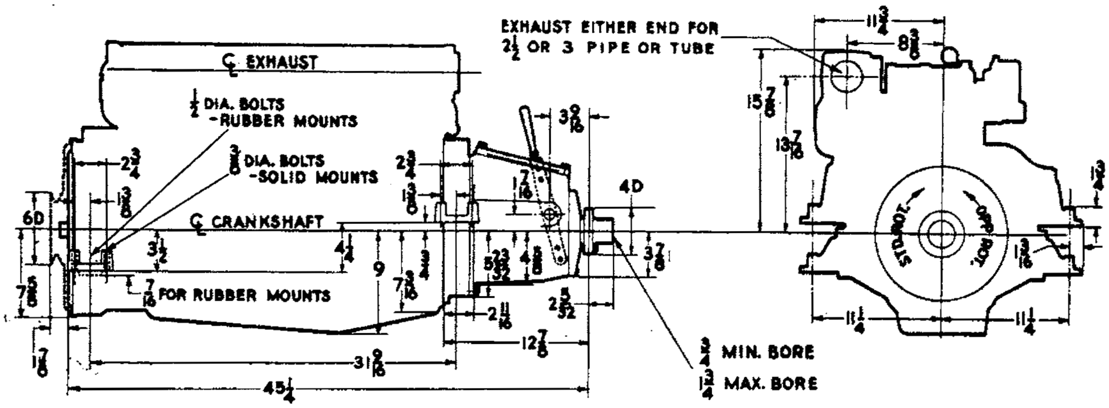
Fig. 43

STA-NU-TRAL REVERSE GEAR, 2.44:1 REDUCTION GEAR

Fig. 44

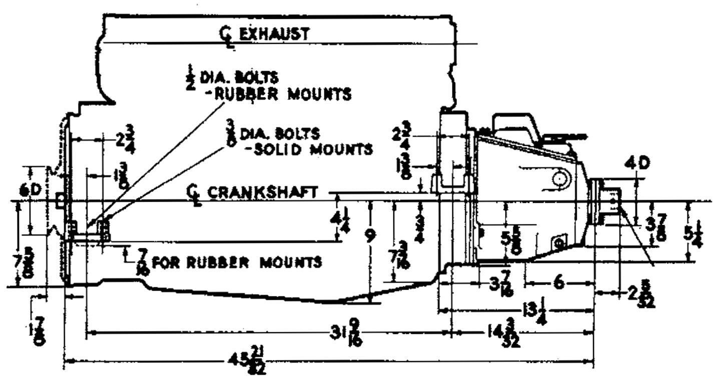


STA-NU-TRAL REVERSE GEAR, 3.32:1 REDUCTION GEAR

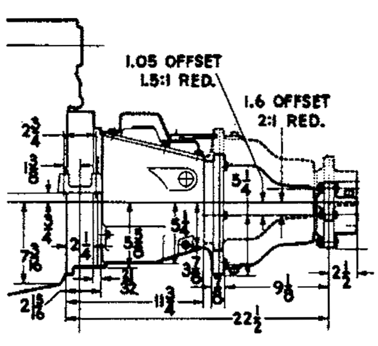


Direct Drive

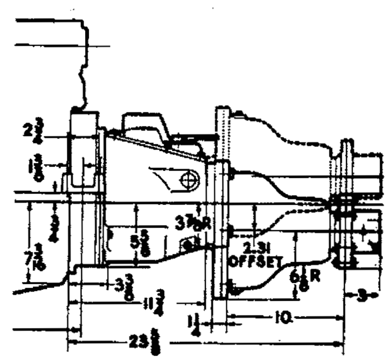
Fig. 45 MANUAL REVERSING GEAR



Direct Drive



1.5:1 & 2:1



2.5:1

Fig. 46 HYDRAULIC REVERSING GEAR