McLAUGHLIN BORING SYSTEMS
MIGHTYMOLE

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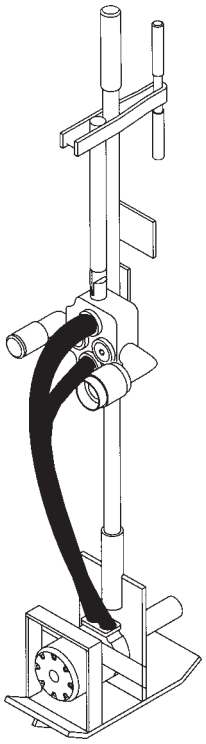
OPERATOR'S MANUAL

CONTAINS:

COMPONENTS

MODEL M427
MOLEING MACHINE
PART NO. M427000

Manual Part No.: E250030



Machine Serial #_____

Purchased &
Serviced Thru: _____

Purchase Date: _____

Revision Date: 12.2002

TABLE OF CONTENTS
M427

MACHINE SAFETY AND OPERATION
M427

Hazard Alert Decals

BE AWARE OF SAFETY INFORMATION: This is the safety-alert sign. This symbol is placed in the manual and on your machine to alert you to potential bodily injury or death.

SIGNAL WORDS

The safety-alert icon is used with the following signal words: DANGER, WARNING and CAUTION. When you see these words in the manual or on decals on your machine, carefully read and follow all instructions. Watch for these words and learn their meanings.

DANGER - Imminent hazard which, if not avoided, will result in death or serious injury.

WARNING - Potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION - Potentially hazardous situation which, if not avoided, may result in minor personal injury or property damage.

READ YOUR OPERATOR'S MANUAL: This machine is designed to produce holes up to 2" by screw comaction in the advance direction, and up to 3 1/2" by screw compaction in the retract direction. It requires both an experienced operator and helper. **NEVER WORK ALONE. READ AND UNDERSTAND OPERATION MANUAL PROVIDED.**

Specific Hazard Alert Decals

UNDERGROUND UTILITIES: Before starting work contact the local "one call" service in advance to mark all underground utilities. Make sure all underground utilities have been properly located, paying attention to any questionable areas in the immediate digging or boring area. Expose any utilities by non-destructive means before working.

Inadvertent contact with buried utilities may cause death or serious injury. Contact with electric lines can cause electrocution. Contact with gas lines can cause explosion or fire.

Know where and what type of utilities are in the area and how deep they are located.

MACHINE SAFETY AND OPERATION
M427

ENTANGLEMENT HAZARD: The normal use of this machine requires rotating parts, in the form of the drill string, cutting head and reamer, to be exposed in front of the machine.

The machine is to be shut down whenever work is required on the drill string, or any rotating parts. This machine is **NEVER** to be operated with personnel near the drill string, except for the initial start of the MOLEING HEAD.

Never stand on or stradle the drill string, and avoid gloves and loose clothing on the job.

Inadvertent contact with drill rod, cutting head and/or reamer will cause death or serious injury.

Always use a rod guide when positioning drill rods during operation.

When removing cutting head, operator must shut down machine - then attend the removal of cutting head on exit side.

MACHINE UPSET: In order to "screw" the MOLEING HEAD into the ground, the machine must resist the torque applied to the rods by the engine. Under normal use the machine is stable, but if the head catches on an obstruction in the ground and the rotation stops suddenly, the machine can upset to the left. All MIGHTY MOLES are equipped with a safety device in the form of an **OPERATOR PRESENCE CONTROL** that will stop the action of the machine when released. The Operator Presence Control (OPC) is located on the left hand grip of the M1800.

The drill rods are designed with a limited measure of flexibiltiy to allow insertion into the ground with the machine at a different elevation than the tunnel. If an excessive amount of rod is exposed behind the pit, and if the operator tries to aid the machine by pushing it, the rods may "whip." McLaughlin Manufacturing Co. expressly limits the number of exposed rods behind the entrance pit to 2, during either insertion of the rods or removal of the rods.

Machine upset will cause death or serious injury

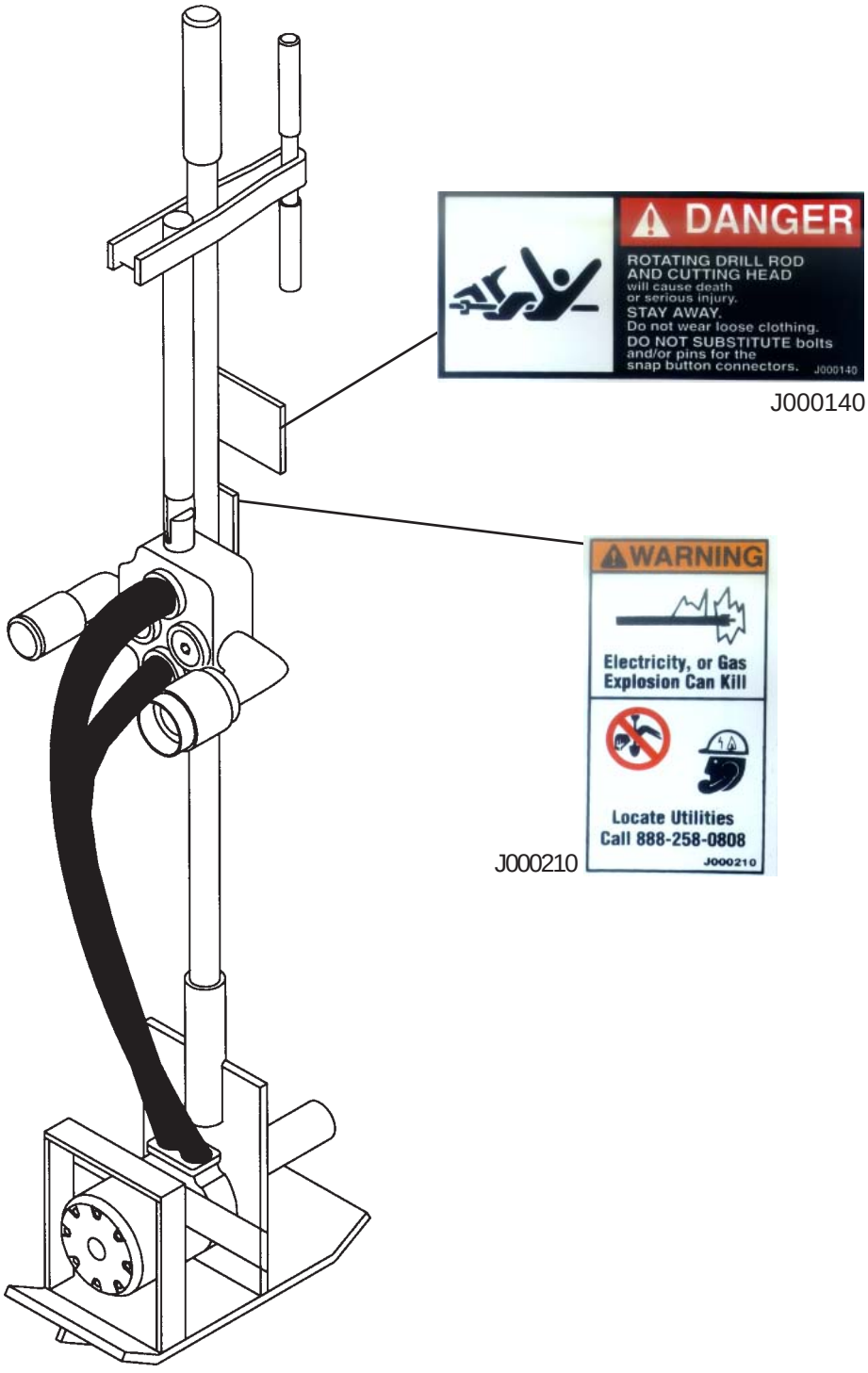
Inadvertent contact with underground obstacles may cause the machine to roll over. Operate only from designated operator position, see diagram on page 1.3.1.

DO NOT disable Operator Presence Control.

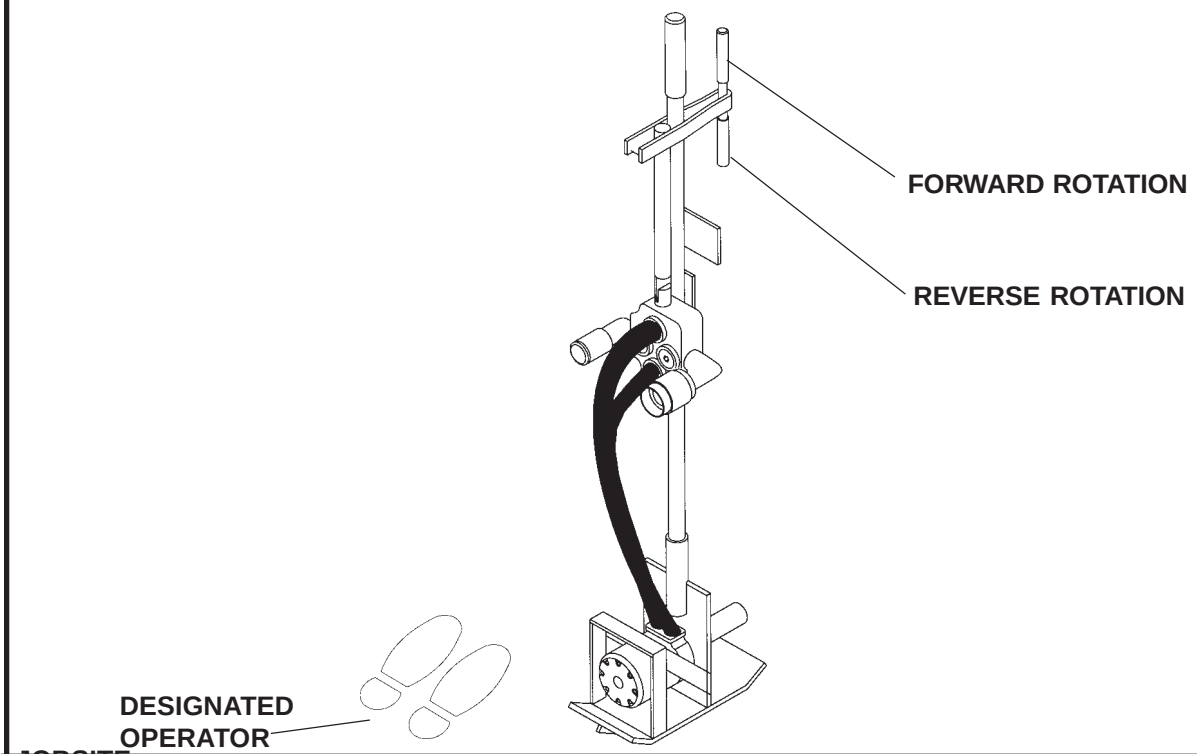
AVOID DEATH OR SERIOUS INJURY

Refer to warning decals on the machine for safety instructions and to the Accident Prevention page of this manual for safety instructions and safe operating procedures.

Hazard Alert Decal Placement



MACHINE SAFETY AND OPERATION
M427



Before the entrance trench is constructed, contact the local “one call” service and all other underground plant owners to determine the location of existing services in the path of the proposed bore. DO NOT start excavating or boring until the area has been marked and cleared.

Working excavations more than 4 feet deep, must be constructed in accordance with Federal and local regulations. This is the responsibility of the contractor. McLaughlin Mfg. Co. recommends that the contractor be familiar with the requirements of (OSHA) regulations.

The working area at the site must be closed to all personnel not directly associated with the job. McLaughlin Mfg. Co. recommends that the exposed rotating rod be GUARDED BY A SAFE DISTANCE. **ALL PERSONNEL NOT DIRECTLY ASSOCIATED WITH THE JOB SHOULD BE KEPT AT LEAST 10 FEET (3m) BACK FROM THE EXPOSED ROTATING ROD.**

PIT SIZE

M-427 Cart

An entrance trench will be required that is at least 4” (10 cm) wide and 15’ (4.5m) long. Standard drill rod M1556 - 7/8 (2.2 cm) dia requires an entrance pit length that is at least 6 times the depth of the entry point. (See Fig. 1)

Heavy duty rod M1575-1” (2.5 cm dia.) requires an entrance pit that is at least 10 times the depth of the entry point.

OPERATION

The rotation is controlled by the control valve. The control valve is spring centered to neutral. There is no forward or reverse rotation without engaging the control valve. Releasing the control valve will cause rotation to STOP.

The drill rod rotation speed is controlled by the control valve. The direction of the rotation is selected by the valve handle. (FORWARD - NEUTRAL - REVERSE).

The ADVANCE of the drill rod and machine is caused by the “screw” action of the MOLE or REAMER selected for use. When MOLEING, the machine will ADVANCE when the transmission is in FORWARD, and RETRACT when the transmission is in REVERSE. When REAMING, the opposite action occurs and the machine will RETRACT when the transmission is in FORWARD and ADVANCE when the transmission is in REVERSE.

MACHINE SAFETY AND OPERATION
M427

When operating this machine, always be aware of any slight tipping of the machine, or engine “lugging”. Whenever these condition occur, be ready to release the Operatpr Presence Control immediately.

Select the moleing head to be used, and couple it to the lead section of rod. Couple additional rods as necessary to the lead section so that at least one full rod is on the ground behind the entrance trench. **NO MORE THAN 2 EXPOSED RODS, BEHIND THE ENTRANCE TRENCH, ARE TO BE COUPLED TO THE MOLEING MACHINE AT ANY TIME.**

ROD CONNECTION
McLaughlin drill rods use a snap button connector for assembly. This provides a secure, flush connection that will pass through the compacted hole without interference. **DO NOT SUBSTITUTE PINS OR BOLTS FOR McLAUGHLIN SPRING-LOADED BUTTONS.**

STARTING THE MOLE
A Helper and an Operator are required to safely operate McLaughlin Moleing Units. The Helper is required to hold the rods in starting position with the ROD GUIDE TOOL. (See Fig.2)

McLaughlin Mfg. Co. prohibits the use of hands or any other tool other than the ROD GUIDE TOOl (provided) for starting the rods or aligning the MOLEING HEAD.

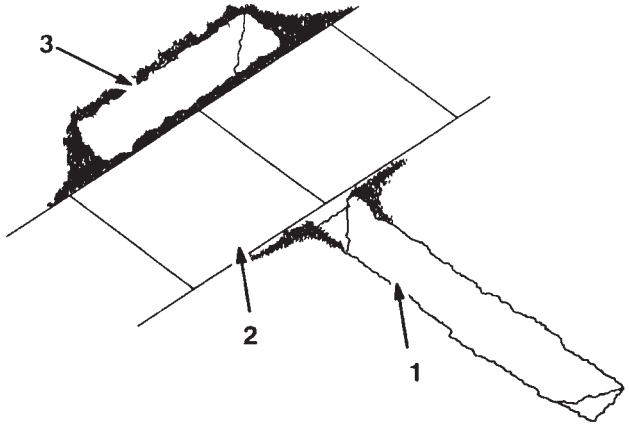
The position for the Helper is on top of the bank, on the right side of the trench with the tool just behind the moleing head. **AT NO TIME, SHALL PERSONNEL, BE IN THE ENTRANCE TRENCH WHEN THE MACHINE IS IN OPERATION.**

The Operator is ALWAYS in attendance at the machine and the Helper is responsible for the direction of the bore, and attaching the tools and the service to be installed. As soon as the MOLEING HEAD has entered the face, the machine is to be shut down, and the rod guide removed.

At this point, the grade of the rods should be checked with a LEVELING TOOL to assure that the bore has been started within specifications. If the LEVELING TOOL indicates that the first rod is not within grade tolerance, the rod should be withdrawn and restarted.

Clear the area and start the machine. Use FORWARD rotation and the drill stem will advance itself into the face by the “screw” action of the MOLEING HEAD. When using the Mighty Mole for IN-LINE BORES water services 48” to 60” (1.2m to 1.5m) below the surface, allow the machine to advance until approximately 6” (15.2 cm) of the rod protrudes from the face.

Fig. 1



1. Entrance trench
2. Sidewalk
3. Exit trench

Stop advancing, shut down the machine, uncouple the rod at the chuck using the UNCOUPLER, and move the machine back to install another rod section. Continue to install rods until the exit trench area has been reached.

When using the Mighty Mole for SURFACE BORES below the surface, allow the machine to advance until it has reached the rear of the entrance trench. Stop advance, shut down the machine, uncouple the rod at the chuck using the UNCOUPLER and move the machine back to install another rod section. Continue to install rods until the exit trench area has been reached.

Stop advancing, shut down the machine, uncouple the rod at the chuck using the UNCOUPLER, and move the machine back to install another rod section. Continue to install rods until the exit trench area has been reached.

Fig. 2

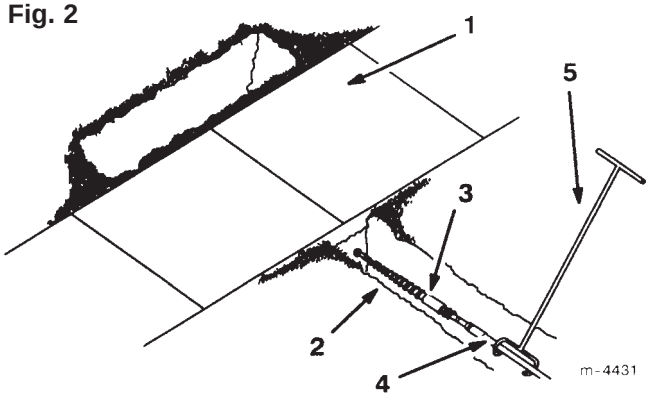


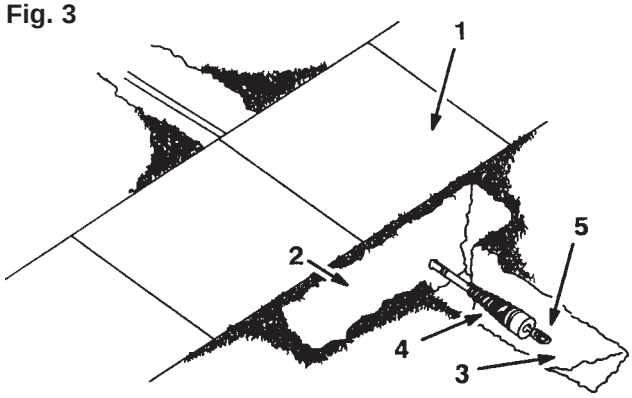
Figure 4

1. Sidewalk or driveway
2. Entrance trench
3. Boring bit
4. Rod
5. Rod guide tool

When using the Mighty Mole for SURFACE BORES below the surface, allow the machine to advance until it has reached the rear of the entrance trench. (See Fig.2)

Stop advance, shut down the machine, uncouple the rod at the chuck using the UNCOUPLER and move the machine back to install another rod section. Continue to install rods until the exit trench area has been reached.

Fig. 3



1. Sidewalk or driveway
2. Exit trench
3. Shovel dug area around bit
4. Reamer
5. Swivel

REAMING OPERATION

Shut down the machine then, with both the Operator and Helper, open the exit trench, locate and uncouple the MOLEING HEAD. Couple a REAMER to the end of the exposed rod and attach the service to be installed to the swivel on the REAMER.

The Helper must not guide or touch the service being installed. The Helper must stay 10' from the service being installed. Failure of the swivel or unforeseen ground friction may make the service rotate and become an entanglement hazard. The Helper should notify the operator by radio if this happens.

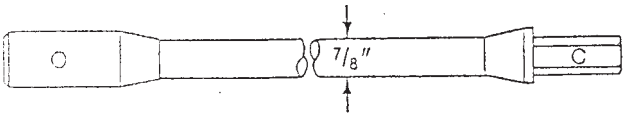
Station the Helper at the exit trench to watch the service if necessary, and to secure the area while the work is being done. He should be in radio contact with the operator. Clear the entrance trench area and start the machine. (See Fig.3)

Use FORWARD rotation and the drill stem will RETRACT itself back into the entrance trench by the "screw" action of the REAMER. Allow the machine to RETRACT until the joint of the rod is beyond the end of the entrance trench. Stop ADVANCE, shut down the machine, uncouple and remove the rod, and manually move the machine to the edge of the trench and couple it to the drill string.

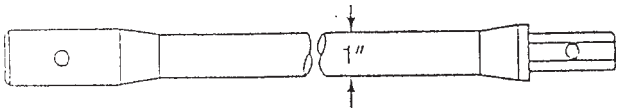
Clear the area, start the machine and continue to remove ONE ROD AT A TIME until the service has reached the entrance.

NOTES
M427

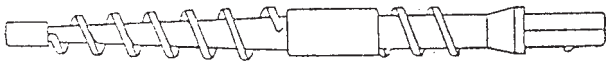
DESCRIPTION AND USE OF TOOLS



Standard Drill Rod 7/8" diameter (22.2mm), x 5', 10', and 20' lengths (1.5, 3, and 6 m). Supplied with either the standard 13/16" (20.64 mm) hex shank and socket with snap button connector, or the 1" (25.4 mm) hex Bulldog Connector.

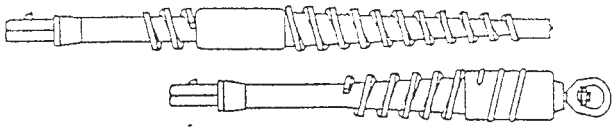


Heavy Duty Drill Rod 1" diameter (25.4mm), x 5', 10', and 20' lengths (1.5, 3, and 6m). Supplied with either the standard 13/16" (20.64 mm) hex shank and socket with snap button connector, or the 1" (25.4 mm)Bulldog Connector.

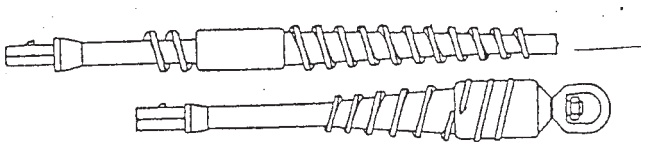


1 1/4" Mole. This is the smallest tool in the McLaughlin line. It is used primarily for the installation of small residential gas services (5/8" plastic). It is recommended for 25' to 30' (6.35 M - 7.62 M)(residential street crossings, with no reaming involved.) **THE SWIVEL SHANK CANNOT BE USED WITH THIS TOOL. NOT AVAILABLE WITH BULLDOG SHANK.**

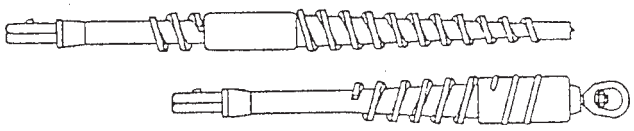
1 3/8" Mole. The Sand Mole is to be used only in sandy soil conditions where any degree of compaction is impossible. Usually no reaming pass is possible because the hole will collapse after the Sand Mole has passed through. The Swivel Shank can be used with this tool to retrieve small diameter electrical cable or similar services. **NOT AVAILABLE WITH BULLDOG SHANK.**



1 7/16" Mole. This tool is used in conjun
the 2" Reamer. It is also used when the ground is very hard in the late fall and early winter. The reasoning behind this method is that there is very little displacement of the soil at any one time and the bore has a greater chance of success. **NOT AVAILABLE WITH BULLDOG SHANK.**

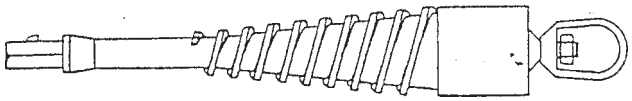


1 3/4" Mole. This tool is used in conjunction with the 2 1/2" Reamer, and is the most widely used tool. Most utility work will fall somewhere within this range. Installation of the service can be accomplished by reaming and pulling the service through simultaneously, or if the hole is large enough on the initial pass, the Swivel Shank can be used to pull the service through as the rods are withdrawn. Supplied with either the standard 13/16" (20.6 mm) hex shank, or the 1" (25.4mm) hex Bulldog Connector.

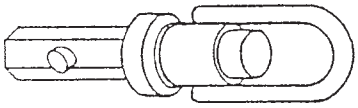


2" Mole. This Moleing Head is to be paired with the 2 7/8" Reamer for maximum effectiveness. It can also be used in conjuction with the Swivel Shank when enlarging the hole is not necessary. Supplied with either the standard 13/16" (20.6mm) hex shank, or the 1" (25.4mm) hex Bulldog Connector.

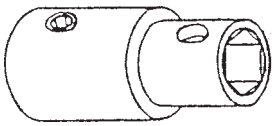
DESCRIPTION AND USE OF TOOLS



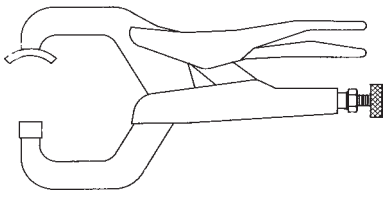
3 1/4", 3 1/2"and 4 1/2 Reamers. Whenever these tools are used, the soil condition must be ideal. By using these tools, 2" water and gas lines can be installed together with their connecting couplings. However, in some cases where the service is very heavy and awkward to handle underground, i.e. copper with large hex coupling, or plastic pipe that tends to snake in the hole, a cable or chain can be pulled through by the Reamer, and then attached to a backhoe to pull through the service. Supplied with either the standard 13/16" hex shank, or the 1" hex Bulldog Connector.



Swivel. This tool can be used with any Mole except the 1 1/4" (M-157200). Use this tool when no addtional reaming is needed.

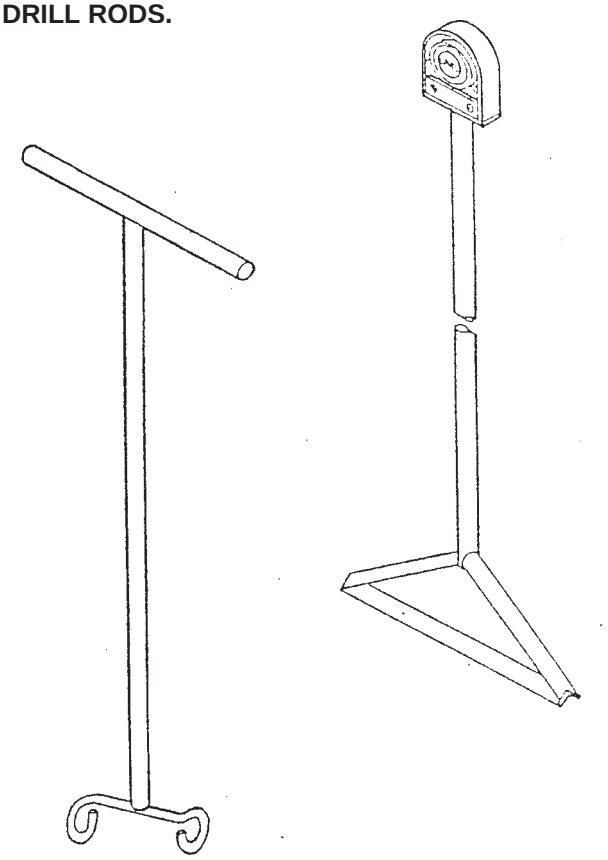


Adapter. For M-1800, and M-427 Gasoline and Hydraulic Machines. This component is a replacement part normally permanently coupled to the machine.



Uncoupler. Used for disenganging 13/16" (20.6mm) and 1" (25.4mm) snap button connectors on standard or heavy duty drill rods.

Rod Guide. PT# M157100 - Used at the start of the bore to locate and level the Mole and first rod at the entry face. At all times the hel[illegible] the trench and holding the ROD GUIDE [illegible]ling on the right hand side of the trench. **ROD GUIDE IS REMOVED AFTER 1/2 OF THE LENGTH OF THE FIRST ROD HAS BEEN INSTALLED. ALWAYS USE GUIDE TOOL WHEN POSITIONING ROTATING DRILL RODS.**



Devil Level. Used to determine the difference between the angle to the rod being installed and actual horizontal level. Always shut down the machine before using the level. Check as close to the face as practical. Keep base of tool clean to obtain accurate readings. Each one degree is a rise or fall of approximately 20 inches (50.8 cm) in 100 feet (25.4 M).

Moleing heads, reamers, adapters, and swivels are supplied with the proper hex size to match the rods being used. Always use a complete string of either standard or heavy duty rods, and select the tool with

Refer to McLaughlin's Drilling Tools catalog for the complete line of moleing tools and accessories.

MACHINE SPECIFICATIONS
M427

M427 SPECIFICATIONS
Moleing Machine

Boring Range:	ENGLISH	METRIC
Bore	1 1/4” - 2 1/2” Compacted holes	3.175cm -6.35cm
Reams	3 1/2”	8.9cm

Hydraulic Requirements:

9 gpm (34 lpm) max. forward and reverse
1325 psi (93 Bar) max.
Hydraulic Control: Spring loaded to neutral.
Torque: 320 ft*lbs (434 Nm) at max. pressure.

Dimensions

M-427 Cart
34” (86 cm) wide x 12” (34 cm) long x 60” (152 cm) high x 85 lbs. (38 kg).

M-427 Skid Shoe
8” (20cm) wide x 12” (30 com) long x 60” (152 cm) high x 45 lbs. (20 kg).

M-427 Track
16” (41 cm) wide x 72” (182 cm) long x 60” (152 cm) high x 90 lbs. (41 kg).