# Unit 2
# EQUIPMENT

# Words of Experience

***Click icon to hear firefighter story about pumps.***

# Objectives

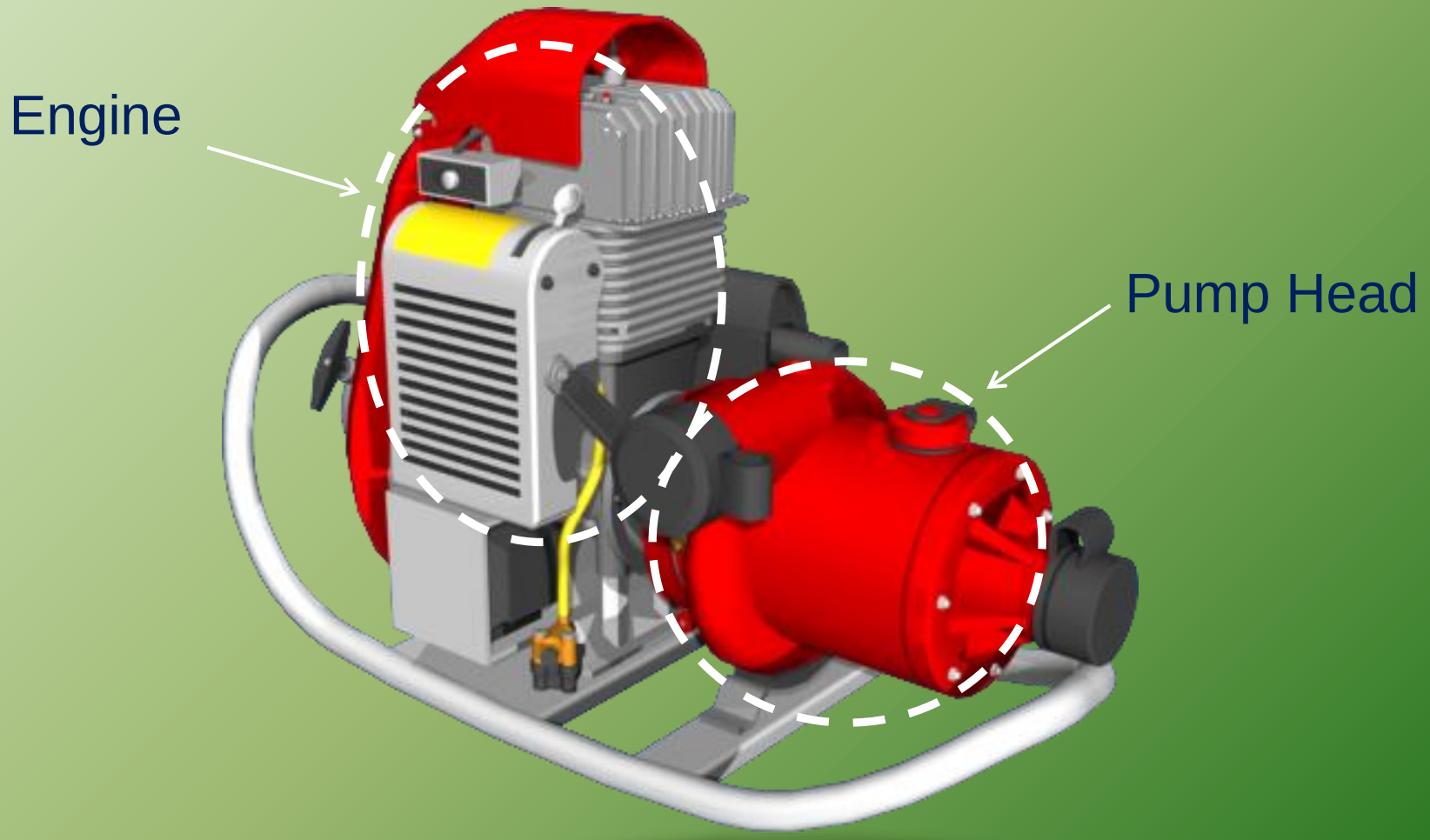
1. Distinguish the differences between the two cycle and four cycle engines, and identify which one of these differences is most important to a pump operator.
2. Label the parts of a commonly used portable pump.

# Objectives

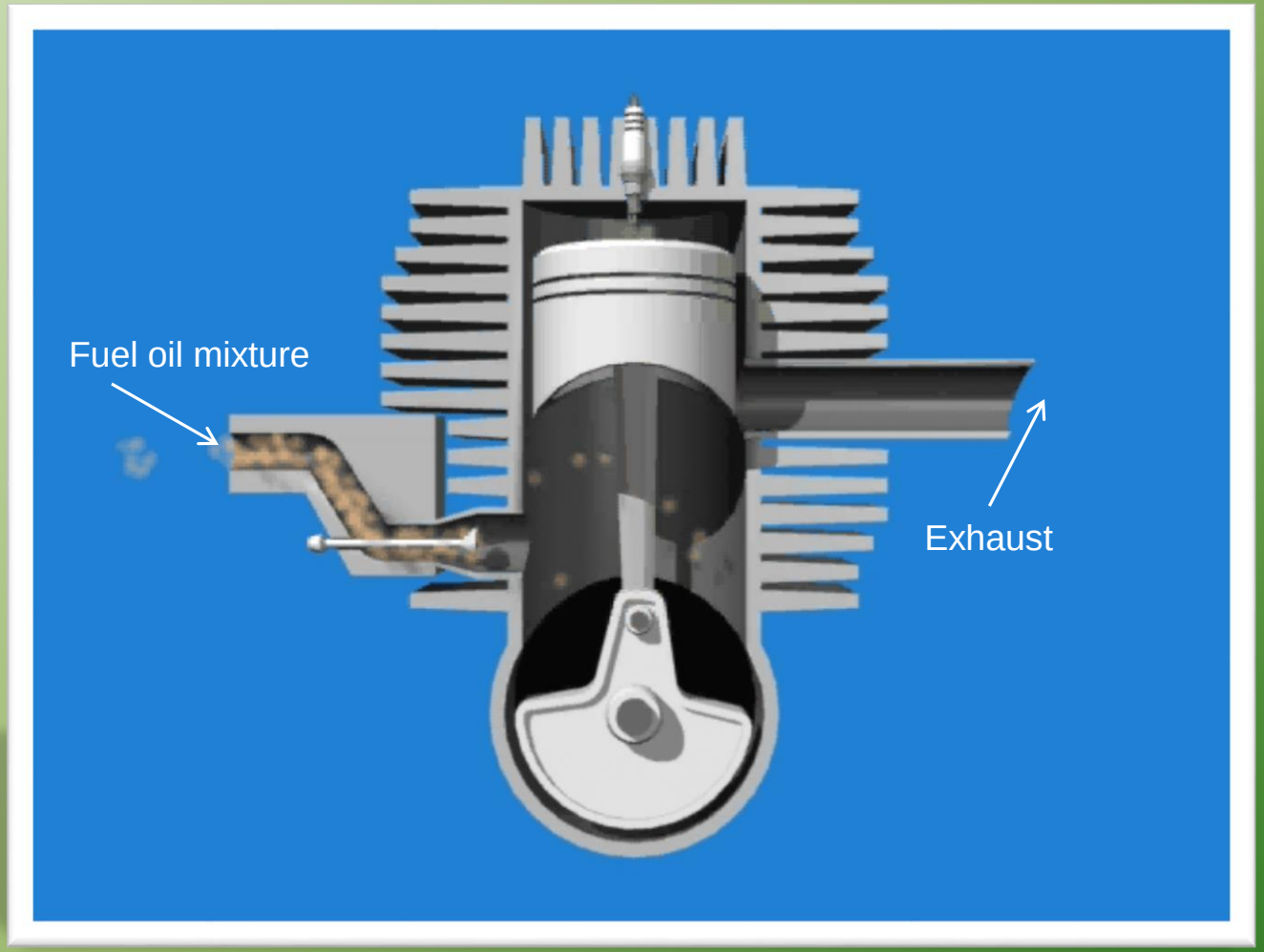
3. Identify the purpose of a suction hose and a discharge hose.
4. Match types of wildland fire appliances and tools with their respective purpose.
5. Identify nozzle types.
6. List one type of national portable pump kit.

# PORTABLE WATER PUMPS

# How Pumps Work

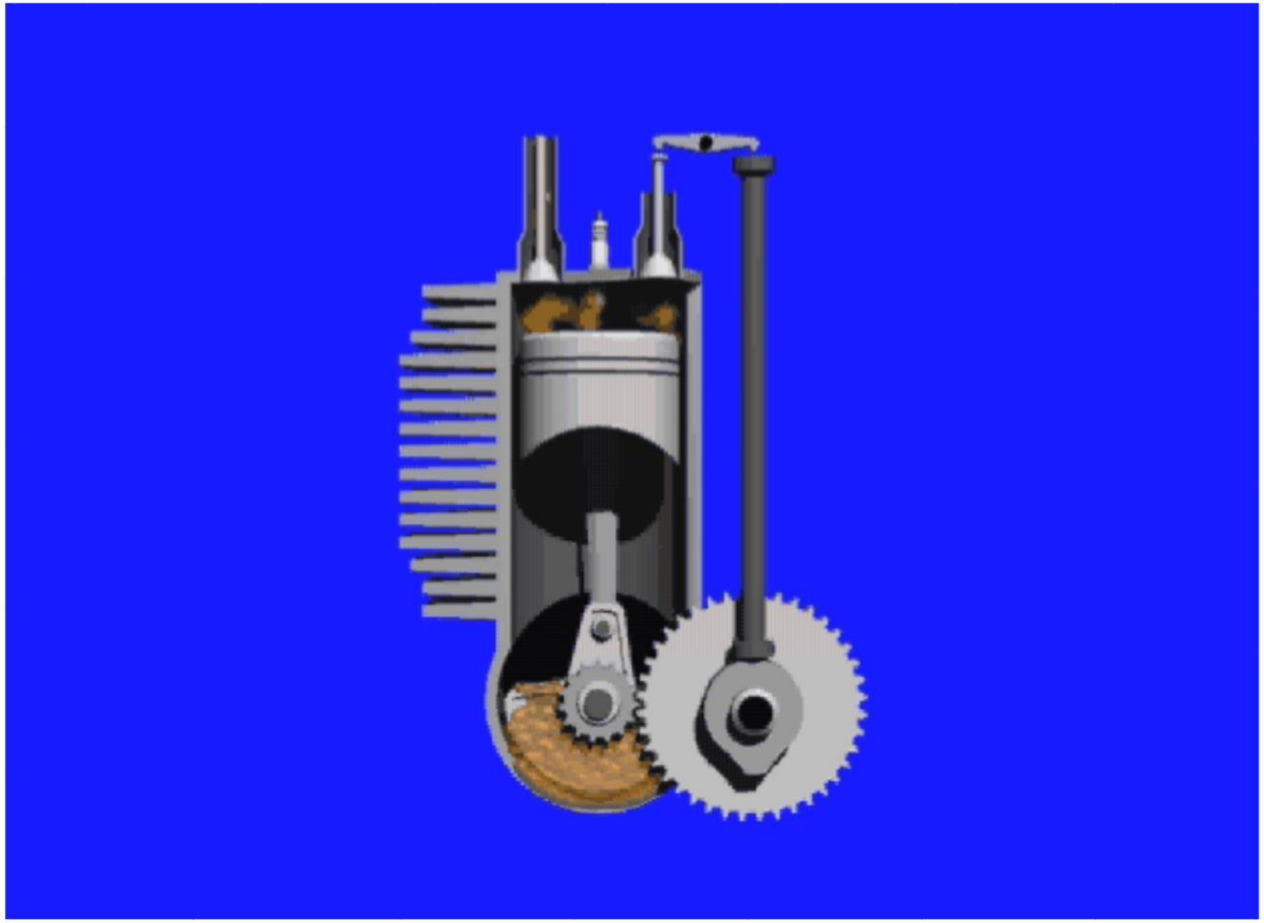


# Types of Engines – Two Cycle




Click on image to play animation.

# Types of Engines – Four Cycle



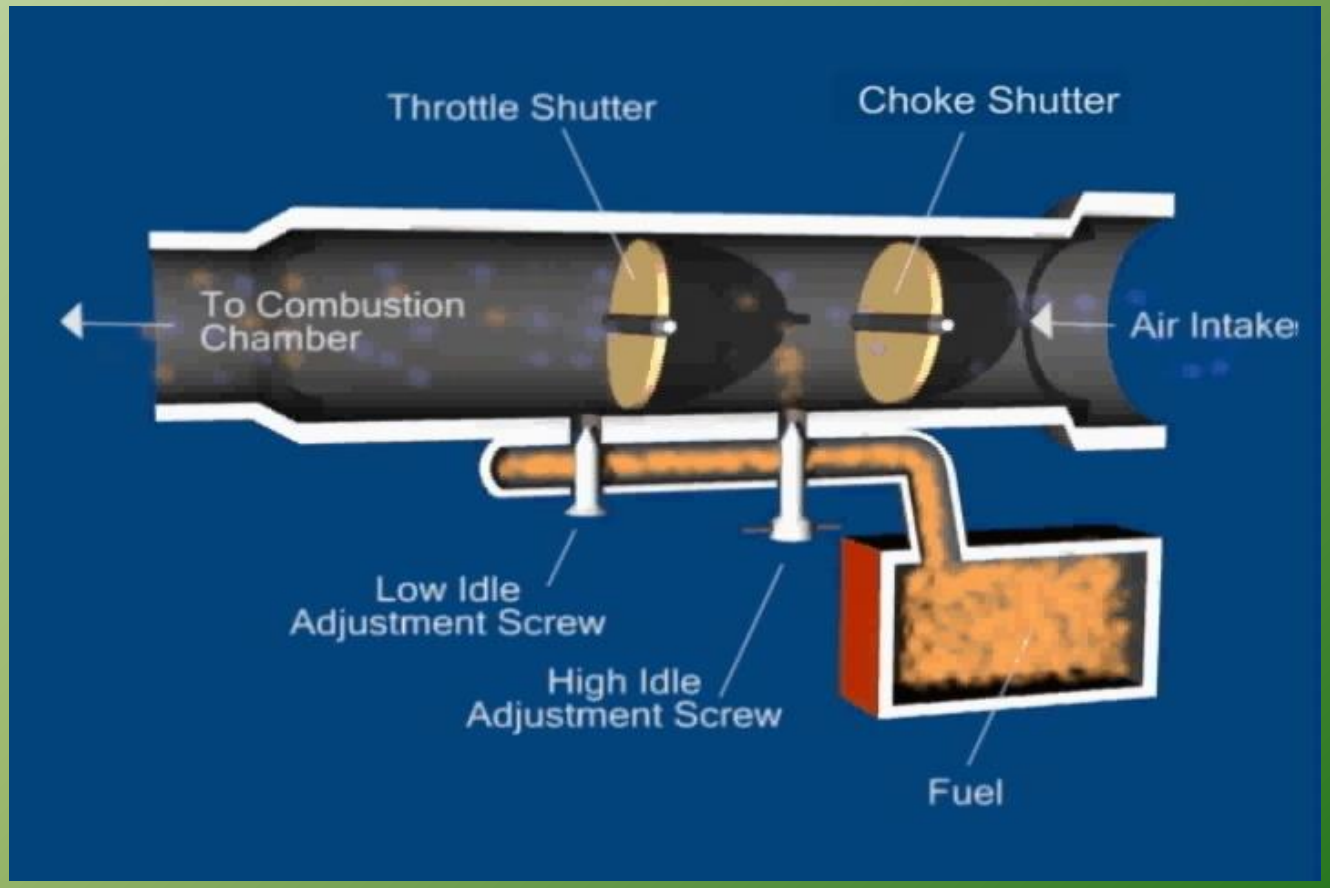
Click on image to play animation.

# Differences – Two Cycle and Four Cycle

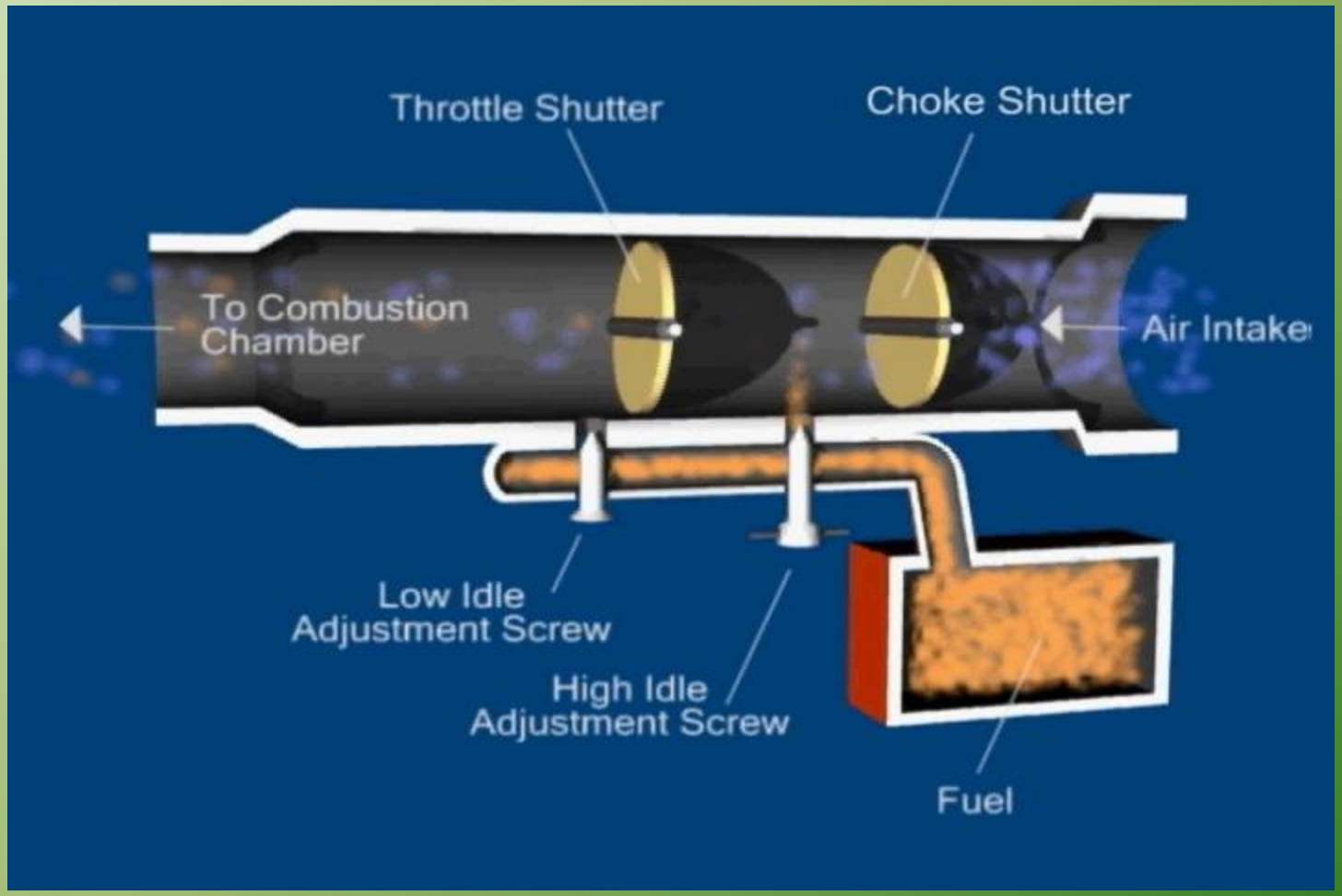
| Factor | Two Cycle Engines | Four Cycle Engines |
|---|---|---|
| **Lubrication (very important)** | Oil is mixed with the gas; engine runs on two cycle oil mixed with unleaded gasoline. | Has a separate oil reserve and lubrication system; runs on unleaded gasoline (gas is NOT mixed with oil). |
| **Weight** | Typically lighter weight. | Typically heavier weight. |
| **Fuel Efficiency and Exhaust Emissions** | Typically less fuel efficient and produces more exhaust emissions. | Typically more fuel efficient and produces less exhaust emissions. |
| **Orientation** | Can operate in any vertical orientation. | Can only operate on relatively level surfaces due to the location of the oil reservoir and the need for the engine to draw oil from this reservoir to the top of the engine. |

# Carburetor

Choke
Carburetor
Throttle

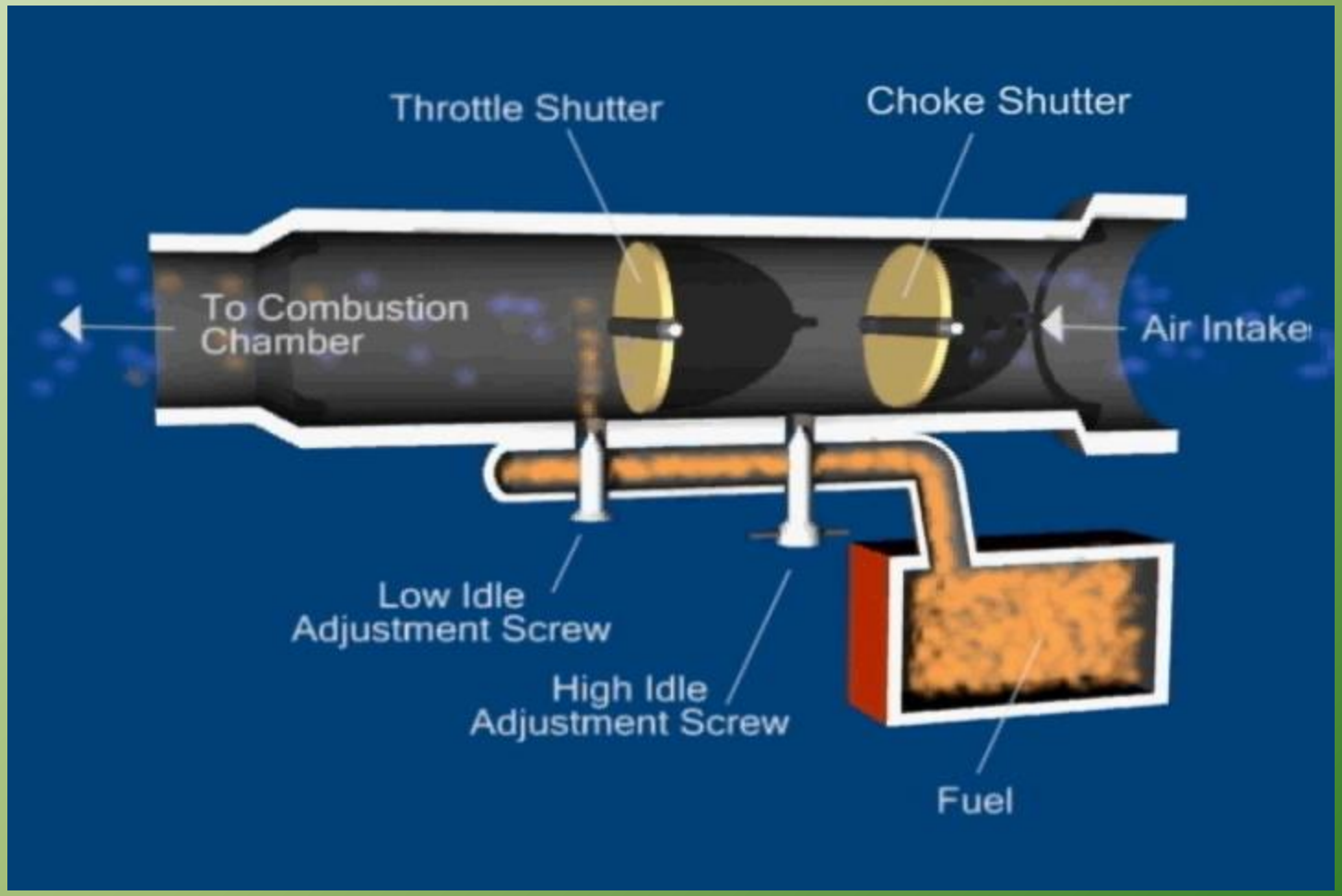

Throttle Shutter
Choke Shutter
To Combustion Chamber
Air Intake
Low Idle Adjustment Screw
High Idle Adjustment Screw
Fuel

# Carburetor - Starting Engine



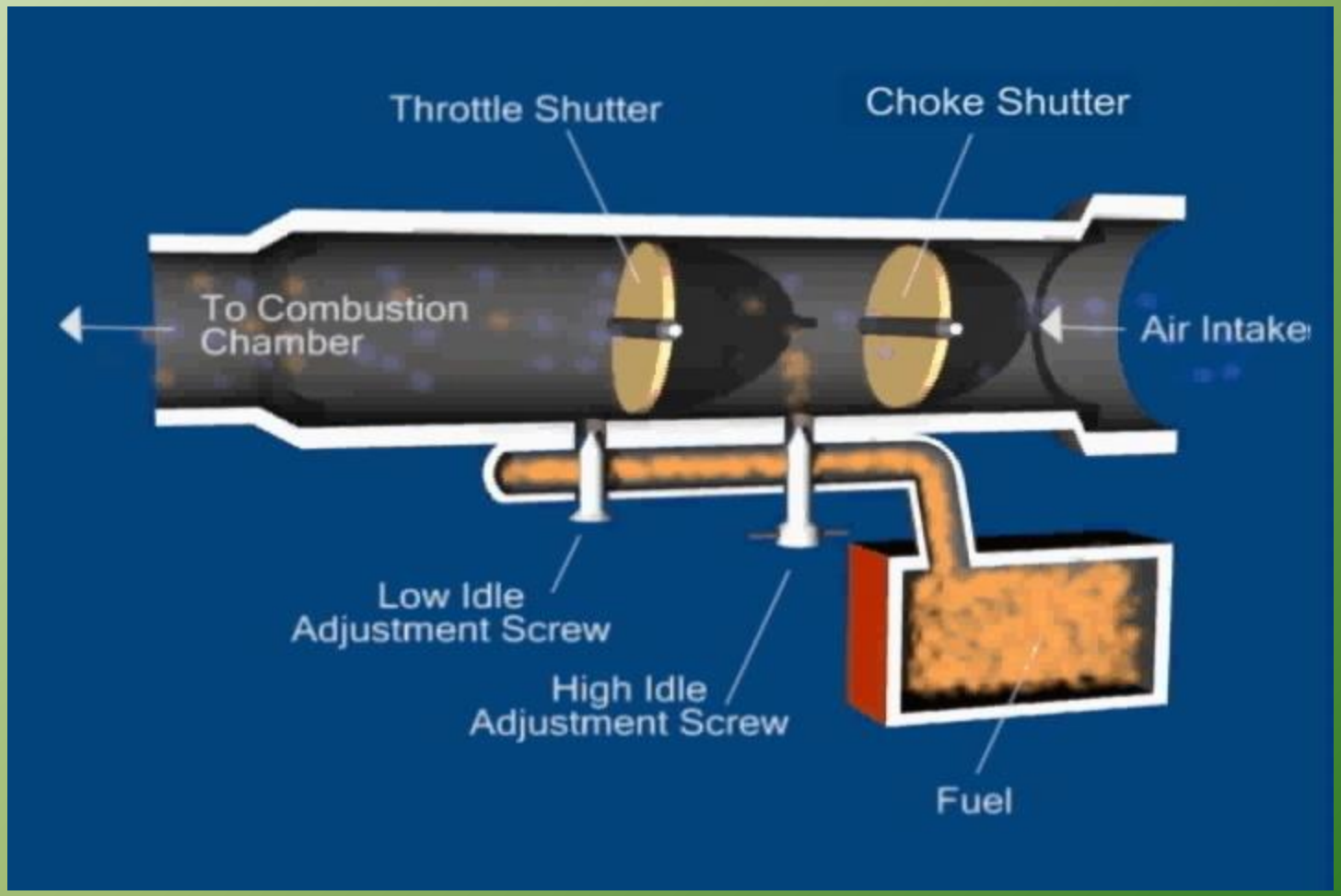

Click on image to play animation.

# Carburetor – Engine Idling



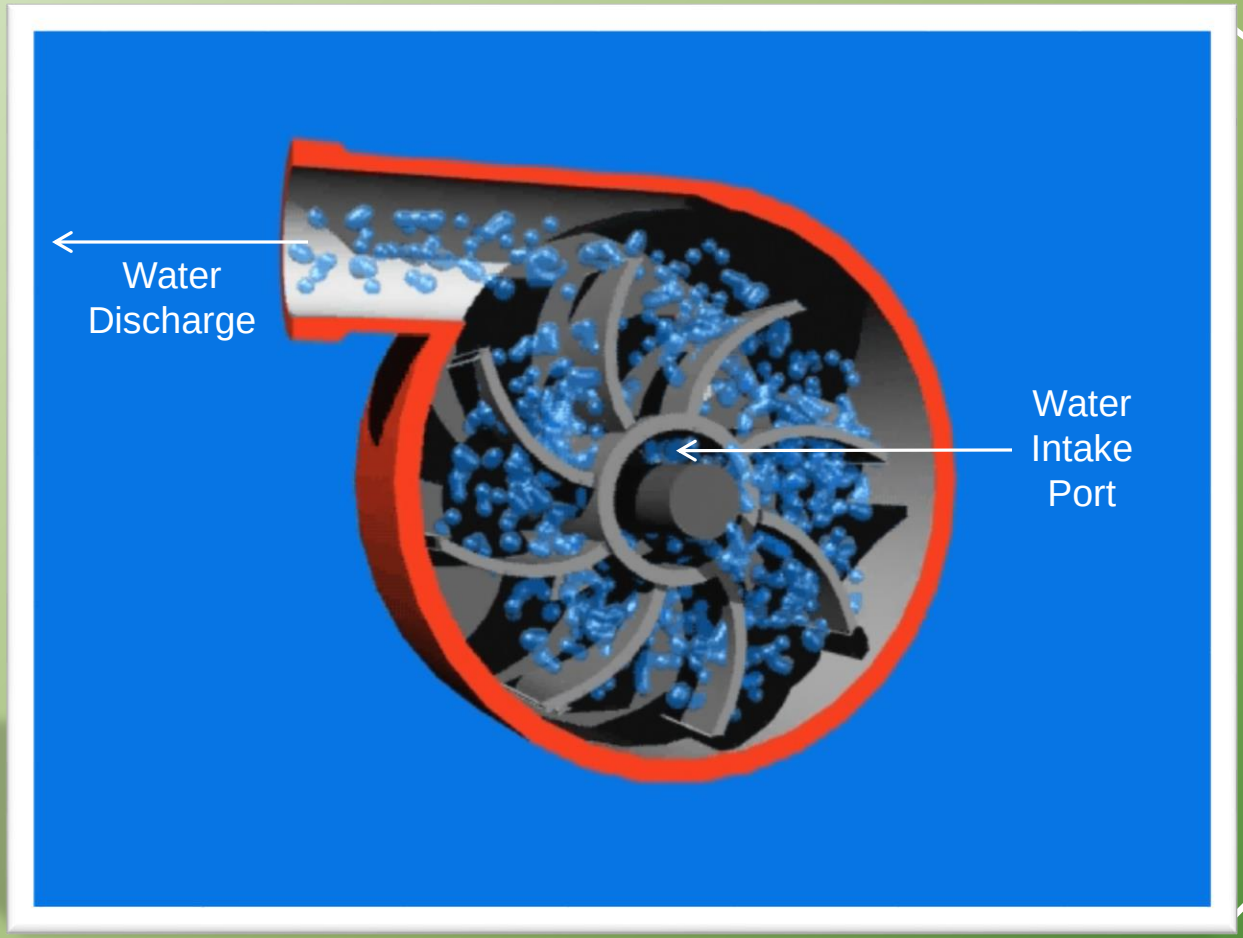

Click on image to play animation.

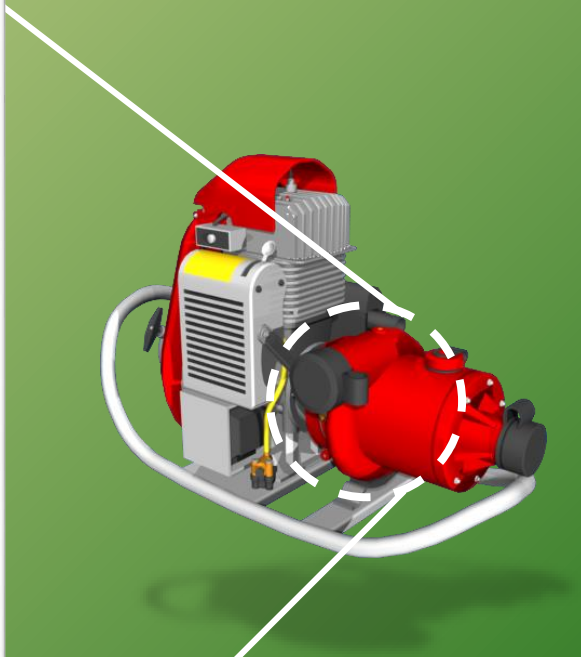
# Carburetor – Engine Running at Full Throttle




Click on image to play animation.

# Pump Head



Click on image to play animation.

# Parts of a High Pressure Pump

**Click on the image above to launch the interactive application.**
**Click "OK" if Microsoft Office asks you to confirm opening the executable file.**
If for some reason the link to the application is broken, look for the file named "M3_Pump360.exe" in your Unit 2 PowerPoint folder, and double click on it to launch the interactive program.

# Types of Portable Pumps

## Lightweight Pump

## High Pressure Pump

## Floatable Pump

# Portable Pump Performance – National Cache Pumps

| | Pump Pressure (PSI) and Gallons Per Minute (gpm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Pumps** | **Free flow** | **50 psi** | **100 psi** | **150 psi** | **200 psi** | **250 psi** | **300 psi** | **350 psi** | **400 psi** |
| Wildfire Mark 3 [a,b] (High Pressure Pump) | | 89 gpm | 78 gpm | 65 gpm | 52 gpm | 38 gpm | 25 gpm | 9 gpm | 0 gpm @ 380 psi[d] |
| Wick 375 [b] (High Pressure Pump) | 90 gpm | 84 gpm | 78 gpm | 65 gpm | 48 gpm | 32 gpm | 18 gpm | 3 gpm | 0 @ 360 psi[d] |
| Waterous Flotopump HP [b] | 60 gpm | 56 gpm | 42 gpm | 20 gpm | 0 gpm @ 175 psi[d] | | | | |
| Shindaiwa GP-45 [c] (Lightweight Pump) | 66 gpm | n/a | 0 gpm @ 65 psi[d] | | | | | | |
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| Wick 100G [c] (2 stroke) (Lightweight Pump) | 71 gpm | 40 gpm | 0[c] gpm | | | | | | |

a) Mark 3 pump performance in IRPG does not correspond directly with the values in this table. Pump flows are normally given in 50 psi increments; the performance information in the IRPG is reported in 10 gpm increments.
b) Performance data obtained from Water Handling Equipment Guide (PMS 447-1 dated October 2003).
c) Performance data obtained from manufacturer's literature.
d) Pump shutoff pressure is the maximum pump pressure (psi) with the discharge closed (no flow or 0 gpm).

# High Pressure Pumps

- General description
- Weight
- Fuel
- Pump performance (gpm and psi)

***Move to next slide to view chart.***

# Portable Pump Performance – National Cache Pumps

| | Pump Pressure (PSI) and Gallons Per Minute (gpm) | | | | | | | | |
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c) Performance data obtained from manufacturer's literature.
d) Pump shutoff pressure is the maximum pump pressure (psi) with the discharge closed (no flow or 0 gpm).

# Floatable Pumps

- General description
- Weight
- Fuel
- Pump performance (gpm and psi )

***Move to next slide to view chart.***

# Portable Pump Performance – National Cache Pumps

| | Pump Pressure (PSI) and Gallons Per Minute (gpm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Pumps** | **Free flow** | **50 psi** | **100 psi** | **150 psi** | **200 psi** | **250 psi** | **300 psi** | **350 psi** | **400 psi** |
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d) Pump shutoff pressure is the maximum pump pressure (psi) with the discharge closed (no flow or 0 gpm).

# Lightweight Pumps

- General description
- Weight
- Fuel
- Pump performance (gpm and psi)

***Move to next slide to view chart.***

# Portable Pump Performance – National Cache Pumps

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# HOSES

# Types of Hoses

**Suction (Intake) Hose:**
**Designed to handle vacuum.**

**Discharge Hose:**
**Designed to handle pressure.**

# APPLIANCES, ACCESSORIES, AND TOOLS FOR HOSE LAYS

# Fittings

Thread adapter

Reducer

Increaser

# Fittings

Double female

Double male

# Fittings

Plain wye

Siamese wye

# Valves

Gated wye valve

Siamese gated wye valve

Hose line tee with valve

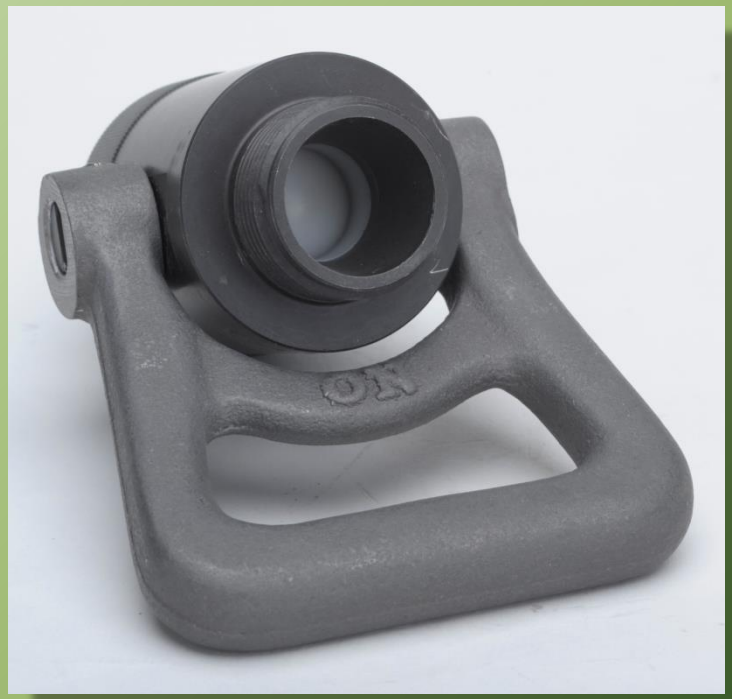
# Valves

Check and bleeder valve

in use

Pressure relief valve

# Valves



Ball valve

# Intakes

Foot valve/strainer

# Hose Accessories and Tools

Hose shutoff clamp

Spanner wrench

Gravity sock

# NOZZLES AND SPRINKLERS

# Twin Tip Nozzle (Forester)

## Straight stream tips (50 psi)

- 3/16" tip – 7 gpm at 50 psi
- 3/8" tip – 30 gpm at 50 psi

- Spray/fog tips (50 psi)
  - Come in different flow rates such as 3, 6, and 8 gpm.

# Adjustable Barrel Nozzle (KK and Lexan)

**Available in different sizes.**

- **1" provides 20 gpm at 100 psi**
- **1½" provides 60 gpm at 100 psi**

**Rated and work most efficiently at 100 psi.**

# Adjustable Barrel Nozzle – Garden Hose Nozzle

- Adjustable spray or straight stream
- Attaches to ¾" discharge hose

# Sprinklers

- 360-degree coverage area
- 40 to 60 feet in diameter coverage distance

# KITS

# National Kits

High Pressure Portable Pump Kit

Lightweight Pump Kit

# National Kits

Mop Up Kit

Sprinkler Kit

# Local Geographic Kits

# Review

# Review

1. In a two cycle engine, where is the oil located that lubricates the engine?

**Answer:**

**Oil is mixed with the gas.**

# Review

2. In a four cycle engine, where is the oil located that lubricates the engine?

**Answer:**

**Oil is located in a separate oil reserve (crankcase).**

# Review

3. Why is it important for the pump operator to know how the engine is lubricated?

**Answer:**

**To ensure the pump's engine is receiving it's lubrication from the proper source, whether it be oil reservoir or mixed with the gas, to prevent damaging the engine and making the pump inoperable.**

# Review

4. Does a two cycle engine typically produce more or less exhaust emissions than a four cycle engine?

**Answer:**

**More**

# Review

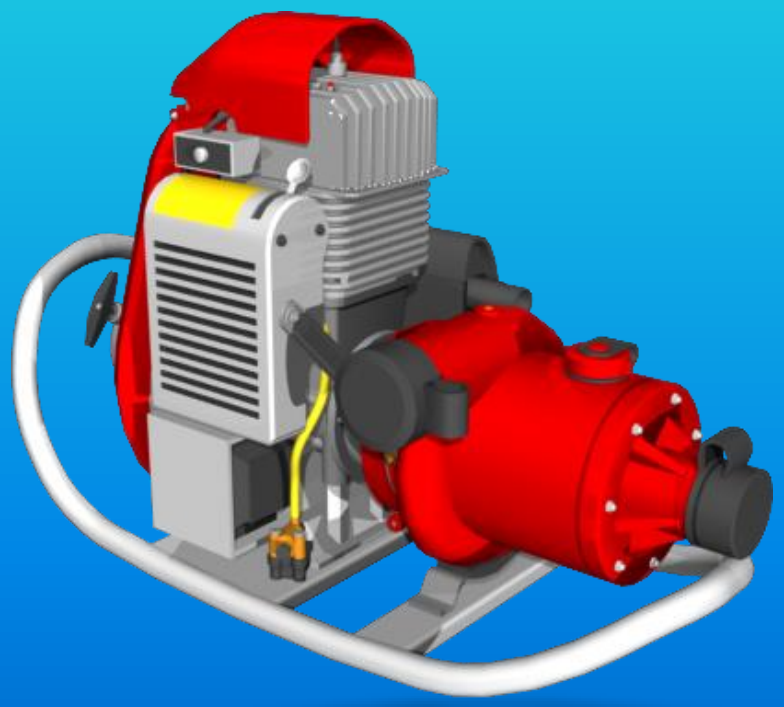
5. The fire is in a remote location (no roads), and you need a pump that can provide a lot of pressure and flow? Which types of pumps would work best?

Answer:

- High pressure portable pump
- Floatable pump
- Lightweight portable pump

# Review

## 6. Identify these parts on the pump:



- Suction inlet (intake port)
- Priming port
- Discharge port
- Air filter
- Throttle lever
- Spark plug
- Muffler

To review parts location, click on the pump image to launch Pump Interactive.

# Review

7. What is the purpose of a suction hose?

**Answer:**

**Draft water from the water source to the pump; designed to handle <u>vacuum</u>.**

# Review

8. What is the purpose of a discharge hose?

**Answer:**

**Carry water from the pump to the fire, portable tank, or other location; designed to handle <u>pressure</u>.**

# Review

9. One of the purposes of this appliance is to help maintain prime if foot valve isn't working correctly. What is the appliance?

**Answer:**

**Check and bleeder valve**

# Review

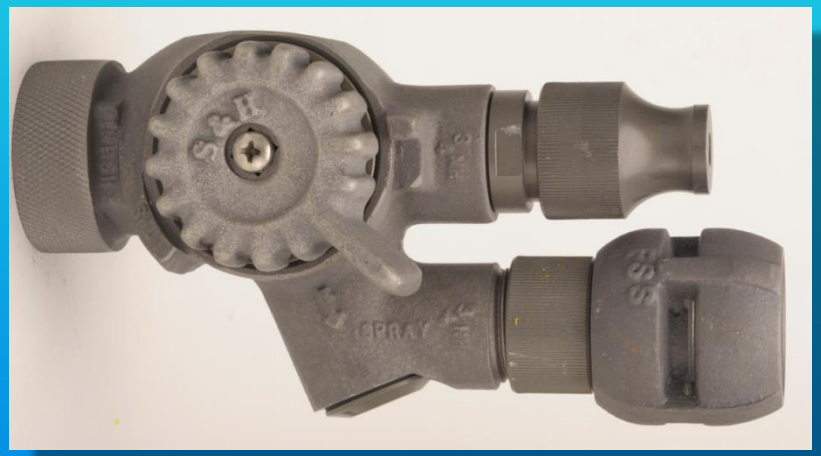
10. The purpose of this appliance is to divide one line into two. What is the appliance?

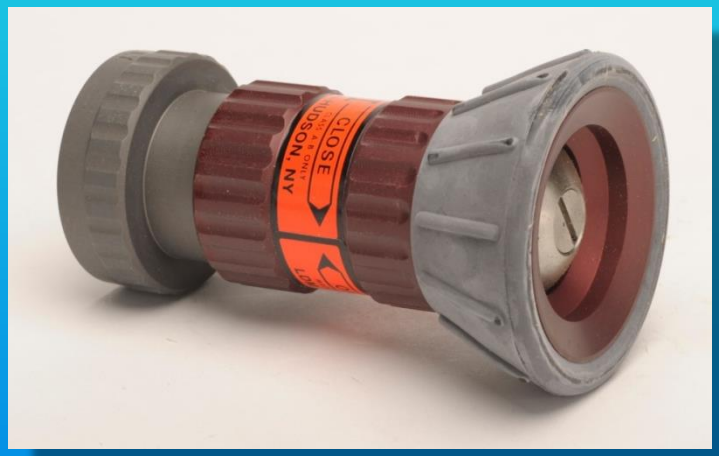
**Answer:**

**Gated wye valve**

# Review

## 11. What types of nozzles are these?






**Answer:**

**Twin tip**

**Answer:**

**Adjustable barrel**

# Review

12. There are several pump and pump-related kits that can be ordered from the national cache. What are the names of those kits?

Answer:

- High Pressure Portable Pump Kit
- Lightweight Pump Kit
- Mop up Kit
- Sprinkler Kit

# Objectives

1. Distinguish the differences between the two cycle and four cycle engines, and identify which one of these differences is most important to a pump operator.

2. Label the parts of a commonly used portable pump.

# Objectives

3. Identify the purpose of a suction hose and a discharge hose.
4. Match types of wildland fire appliances and tools with their respective purpose.
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