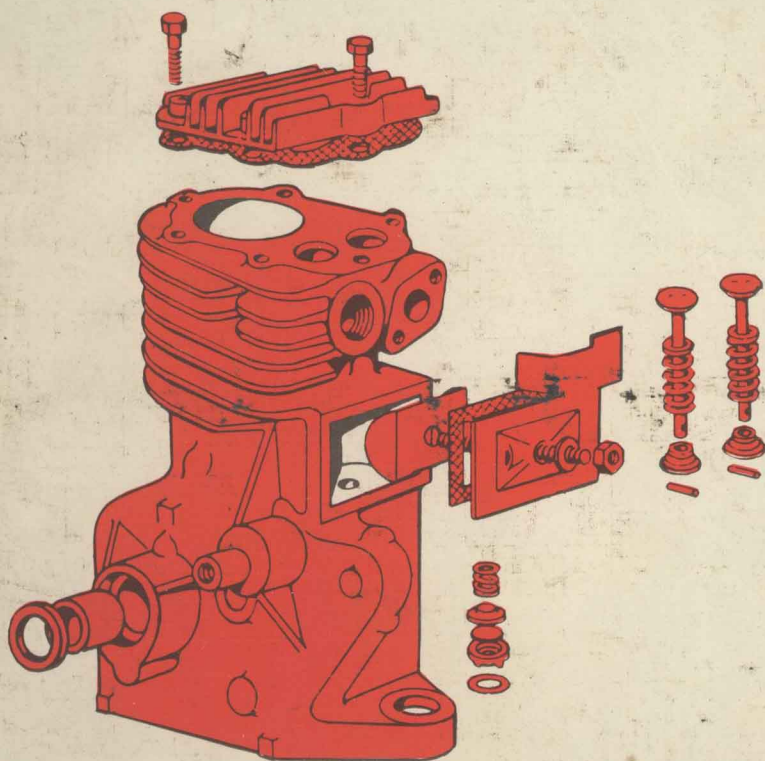


The Basic Book of

Power Mechanics

Jay Webster



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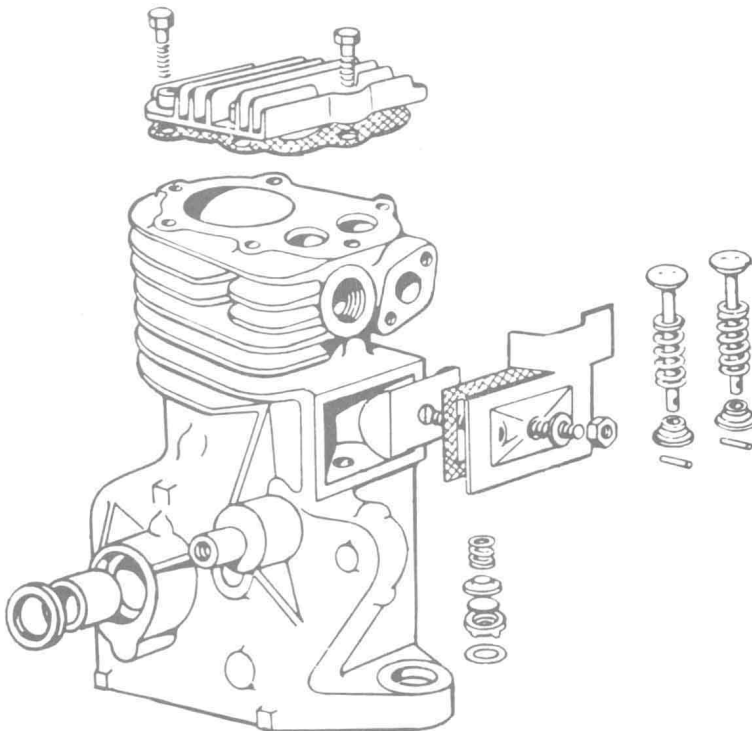


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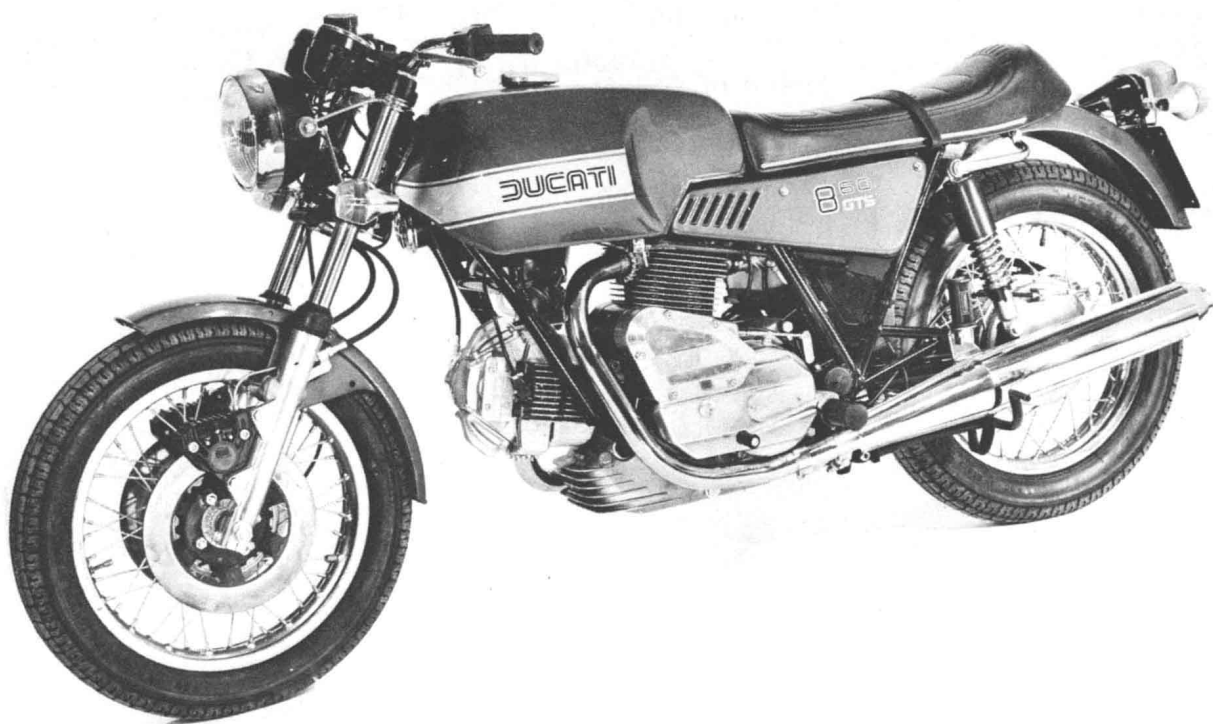
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PREFACE

THE BASIC BOOK OF POWER MECHANICS is part of an integrated series of Industrial Arts textbooks designed to teach basic skills to beginning students. Its major objectives are: career exploration, development of consumer awareness, manipulative skills, and craftsmanship. The philosophy of THE BASIC BOOK OF POWER MECHANICS is based on a recent, nationwide survey in which power mechanics teachers at all levels were asked to outline the courses they taught and let us know what types of instructional materials they actually needed. The result is a highly-visual text with a controlled reading level that will help insure student success.

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The Publisher



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INTRODUCTION

1

What's your idea of a sharp automobile? A Corvette with a turbo-charger? A VW with a diesel? A full race Lotus? Perhaps a '32 Ford chassis with four on the floor behind a big block Chevrolet V-eight?

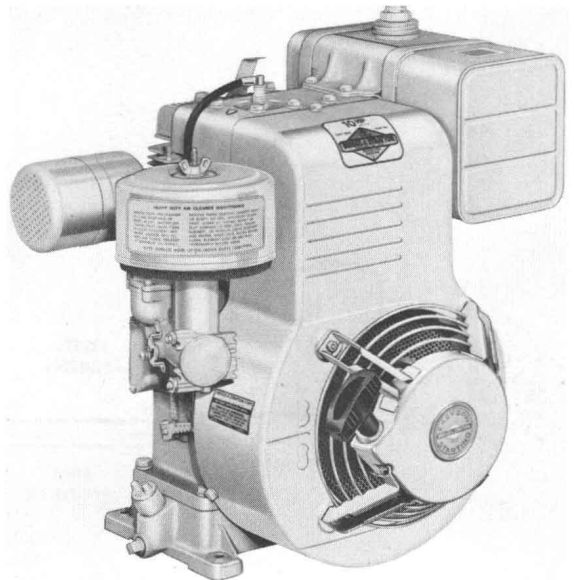
You may think something else is a better machine. All cars have one thing in common: they depend on their engines. Everything you want to know about engines is included in power mechanics.

Maybe you'd like to build your own helicopter, or pep up the family ski boat. Well, that's power mechanics too.

Of course, it's easier to start by fixing the family power lawn mower. It's only a small step from lawn mowers to motorcycle engines and

another step to car and truck and airplane power mechanics.

You can use your knowledge of power mechanics for emergency repairs on the side of the road, or become a professional mechanic. If you go to college to study power mechanics you may become an automobile engineer or an aircraft engineer. There are thousands of careers (lifetime jobs) for men and women who study power mechanics.



Do you know what a family car and a power lawn mower have in common? They both have an engine that uses fuel to make power (figure 1-1). They are both power machines. Power mechanics is the study of machines that make power.

The study of power mechanics is the study of airplanes, boats, cars, motorcycles, go-carts, mopeds, and snowmobiles. Learning how any one of these machines works will help you to understand how all power-driven machines work (figure 1-2).

This book explains small engines. Big engines work the same way as small ones, they just have more parts.

There are four basic things you need to know in order to understand all engines:

- How they work
- The names of their parts
- How they get spark and fuel
- How they are cooled and lubricated

Learning about small engines will help you find out why any engine won't run—or runs badly. You will learn how to make carburetor adjustments, change oil, clean air filters, gap spark plugs, and do many other jobs that are common to most engines.

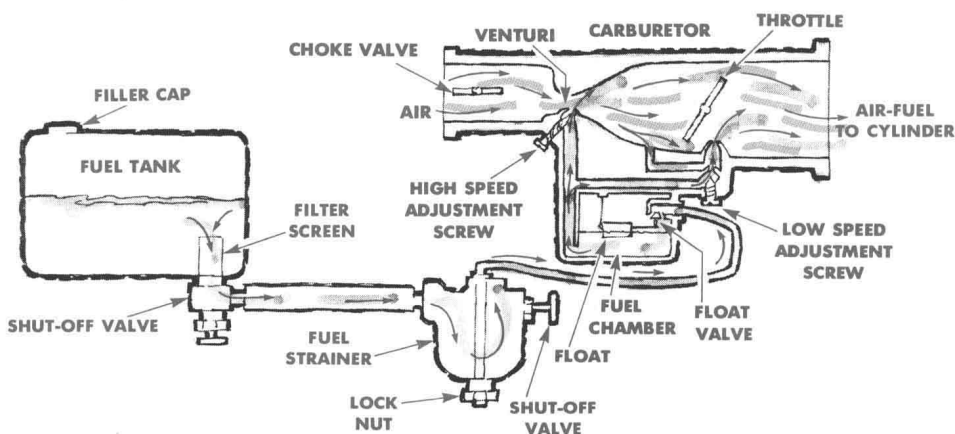


Figure 1-1: All power machines have a system to deliver fuel.

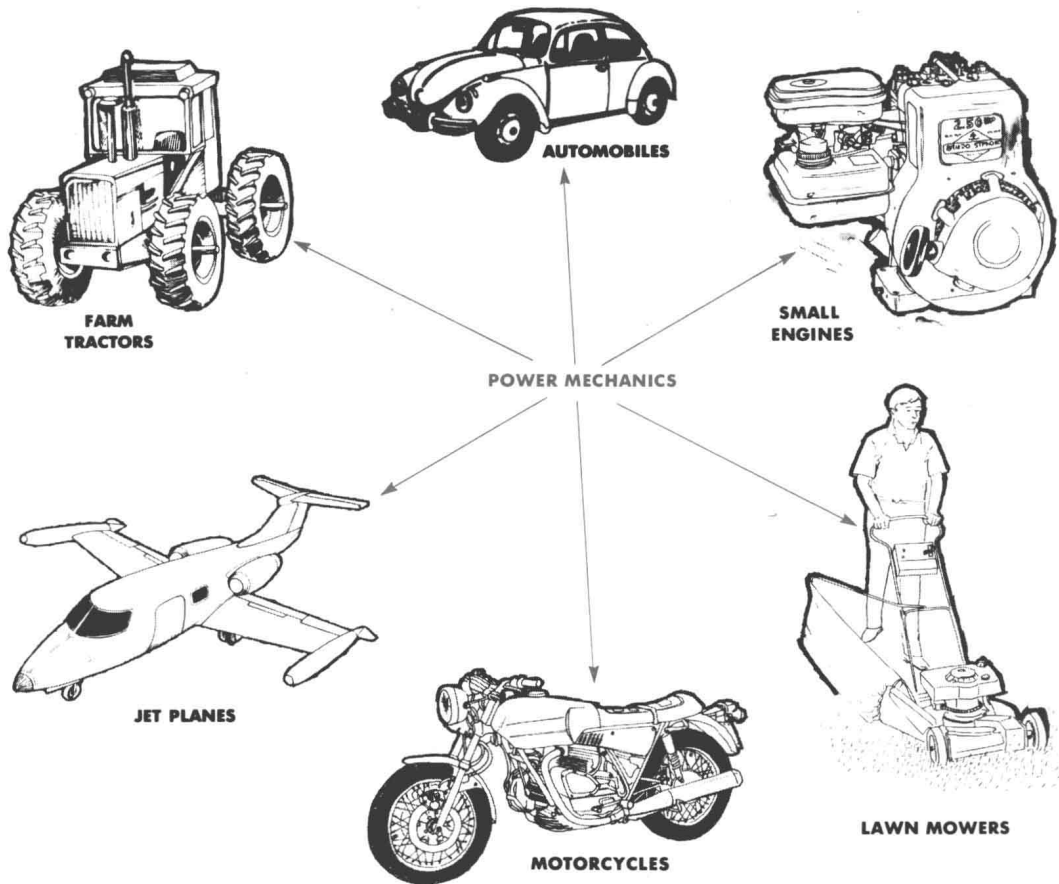
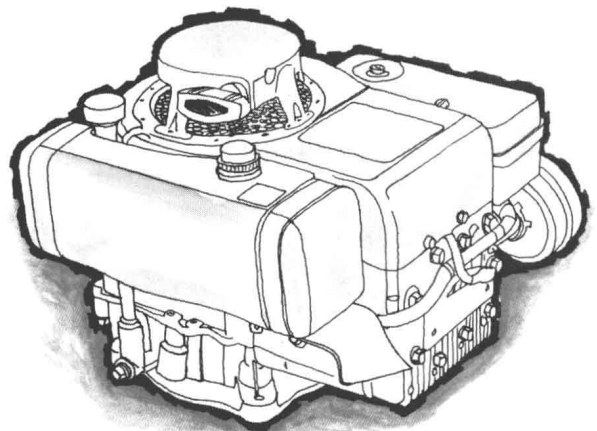


Figure 1-2: The study of power mechanics is the study of engines—large and small.

Figure 1-3: Since all power machines are similar, the study of small engines helps you to understand how big ones work.



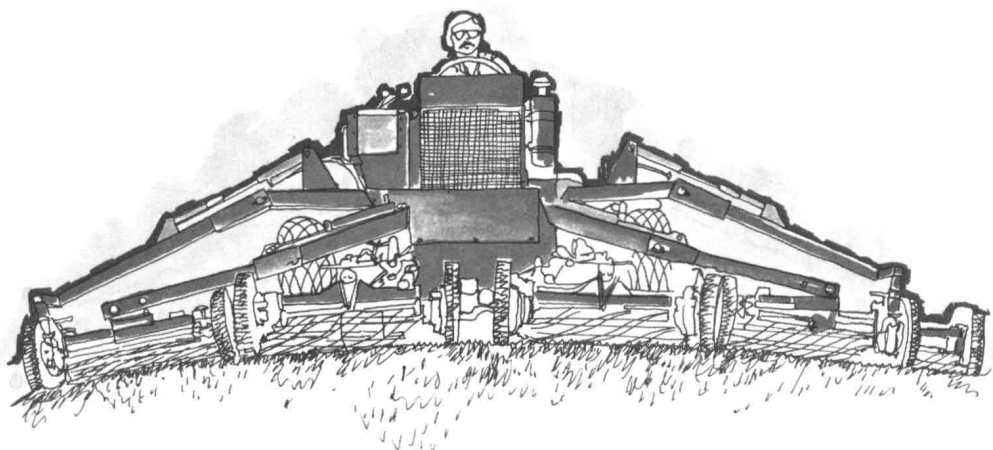


Figure 1-4: The lawnmower can be a simple power machine or a complicated piece of heavy duty machinery.

Everything you learn to do on a small engine is also done on big power machines. Everything you learn about

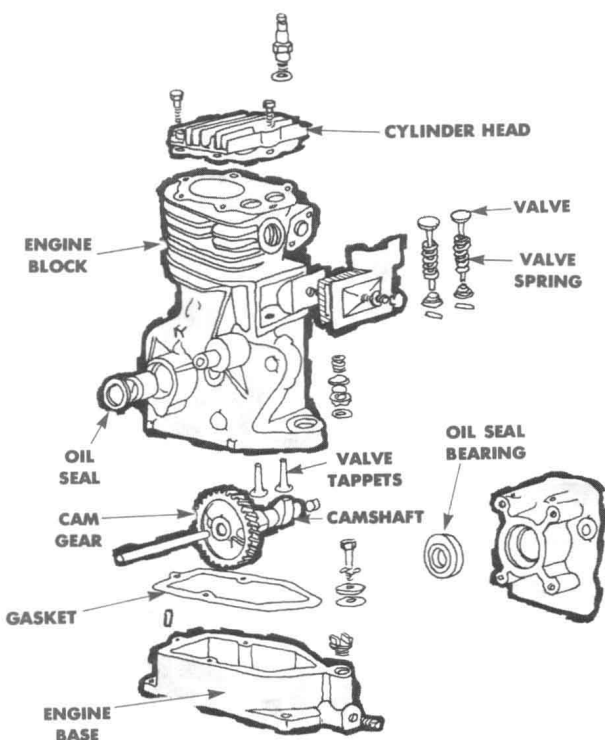


Figure 1-5: The study of power machines is a study of their parts.

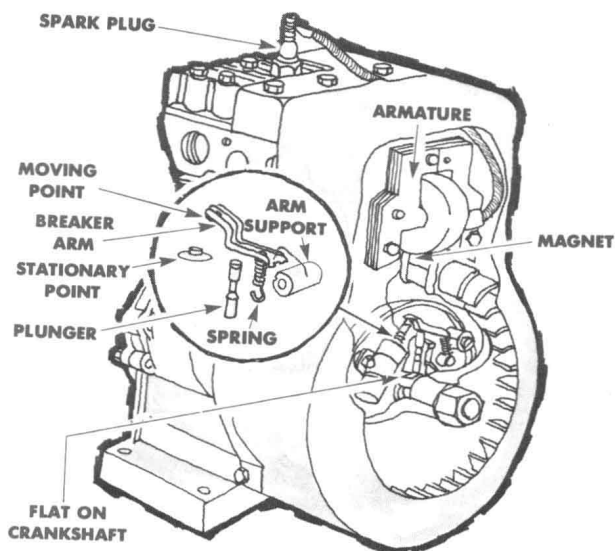


Figure 1-6: Many power machines have a system to provide an electrical spark.

small engines will help you understand all engines. Big engines have the same problems as small ones, and they are repaired the same way.

SELF CHECK

1. What do lawn mowers and cars have in common?
2. Name the four things you need to know to understand all engines.
3. What is power mechanics?

4. Why should you study power mechanics?

Activities for Unit 1

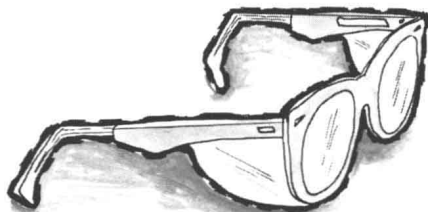
1. Make a list of all the power driven machines you can think of that use fuel to make power.
2. Make a list of all the power driven machines your family owns.
3. Make a list of all the things you would like to learn how to do on an engine.

Power mechanics is not dangerous as long as you always think—“SAFETY FIRST!” Safety First means preventing accidents before they happen by always asking yourself, “Is what I am doing safe?” If you don’t know, ask your teacher (figure 2-1).

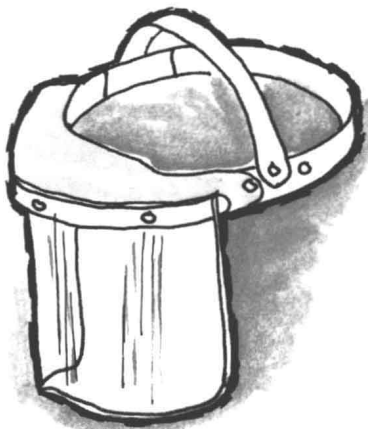
The misuse of ordinary hand tools causes a lot of accidents. Greasy tools

are easy to drop. A tool that falls into a moving engine may shoot out like a rocket and injure someone. Sharp tools are as dangerous as sharp knives. Treat tools right and they’ll treat you right. Figure 2-2 is a list of basic safety tips. The better you know them, the safer you will be.

Compressed air is a useful tool in power mechanics shops, but it can also be dangerous if it is used carelessly. Figure 2-3 is a guide to the proper, safe use of compressed air. Pay attention to it!



SAFETY GLASSES



FACE SHIELD

Figure 2-1: Safety glasses or a face shield should be used for eye protection when cutting, filing, using compressed air, or running an engine.

- **BE SURE YOUR HANDS ARE CLEAN OF DIRT, GREASE AND OIL.**
- **USE THE PROPER TYPE AND SIZE HAND TOOL.**
- **MAKE SURE THE TOOLS YOU ARE GOING TO USE ARE SHARP AND IN GOOD CONDITION.**
- **USE SHARP-EDGED OR POINTED TOOLS WITH CARE.**
- **WHEN USING A SHARP-EDGED TOOL MAKE SURE TO POINT THE EDGE AWAY FROM YOURSELF AND YOUR CLASSMATES.**
- **WEAR A FACE SHIELD OR SAFETY GLASSES WHEN FILING OR CUTTING METAL. ARRANGE YOUR WORK SO THAT YOUR CLASSMATES ARE PROTECTED FROM FLYING CHIPS.**
- **PASS TOOLS TO CLASSMATES WITH THE HANDLES FIRST.**
- **CLAMP SMALL WORK ON A BENCH OR SECURE IT IN A VISE.**

Figure 2-2: Safety rules for using hand tools.

- CHECK ALL HOSE CONNECTIONS BEFORE TURNING ON THE AIR.
- HOLD THE AIR HOSE NOZZLE TO PREVENT IT FROM SLIPPING WHILE TURNING AIR ON OR OFF.
- DO NOT LAY THE HOSE DOWN WHILE THERE IS PRESSURE IN IT. IT MIGHT WHIP ABOUT AND STRIKE SOMEONE.
- DO NOT USE AIR TO DUST OFF HAIR OR CLOTHING, OR TO SWEEP THE FLOOR.
- WEAR SAFETY GLASSES WHEN USING COMPRESSED AIR.

Figure 2-3: Safety rules for using compressed air.

- CHECK WITH YOUR INSTRUCTOR BEFORE STARTING AN ENGINE.
- CHECK THE FUEL LINE FOR POSSIBLE LEAKS.
- EXHAUST ALL GASES TO THE OUTSIDE OF THE BUILDING, AND BE SURE THERE IS ADEQUATE VENTILATION WHEN YOU RUN AN ENGINE.
- KEEP YOUR HEAD AND HANDS AWAY FROM MOVING PARTS.
- DO NOT RUN AN ENGINE AT HIGH SPEED FOR A LONG TIME.
- WEAR FACE AND EAR PROTECTION WHEN RUNNING AN ENGINE AT HIGH SPEED.

Figure 2-4: Safety rules for running an engine.

Running an engine is what power mechanics is about. The safe way to run any engine in the class room is outlined in figure 2-4. These rules protect against:

- Exploding an engine by running it too fast
- Injuries from broken engine parts
- Carbon monoxide poisoning from the engine exhaust

Carbon monoxide is a colorless, odorless gas that can cause suffocation. It comes from the engine exhaust. Carbon monoxide poisoning is prevented by making sure exhaust gases can escape from, and fresh air can get into, the room.

Fire prevention and fire fighting methods are important to know. Fuels that run engines burn easily and are a hazard in every power mechanics shop.



Figure 2-5: Too much noise can be a hazard. Ear protectors cut the noise level.

To burn, fires need oxygen, fuel, and temperature. To put out a fire, you must remove one of these elements. Most fire extinguishers put out fires by preventing oxygen from reaching the

flames. Every shop should have a fire extinguisher. Before you start working in the shop you should know where the fire extinguishers (figures 2-6) are, and how to use them. The rules for fire prevention are shown in figure 2-7.

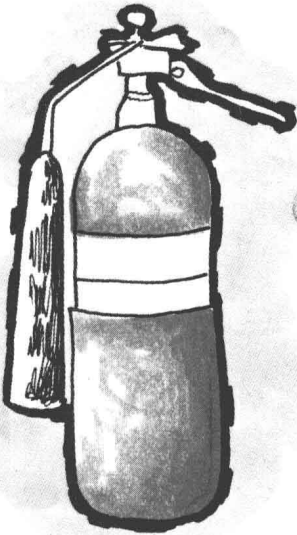


Figure 2-6: Know where the fire extinguisher is and how to use it.

SELF CHECK

1. How should you handle sharp tools?
2. What is the danger of running an engine too fast?
3. Why is carbon monoxide unsafe?
4. List three things a fire must have.

Activities for Unit 2

1. Draw a sketch of your school shop showing where the fire extinguisher and other safety equipment can be found.
2. List the steps you would follow to start an engine safely in your school shop.
3. Make a list of the safety rules you think are most important.

- STORE ALL COMBUSTABLE LIQUIDS IN A FIREPROOF ROOM OR CABINET.
- STORE GASOLINE IN A SAFETY CAN (ONE WITH A TOP WHICH IS HELD CLOSED WITH A SPRING).
- PLACE RAGS WITH OIL, GASOLINE, PAINT, OR SOLVENTS ON THEM INTO A SAFETY CONTAINER.
- KEEP THE TOP OF OIL CANS CLEAN.

Figure 2-7: Safety rules for fire prevention.

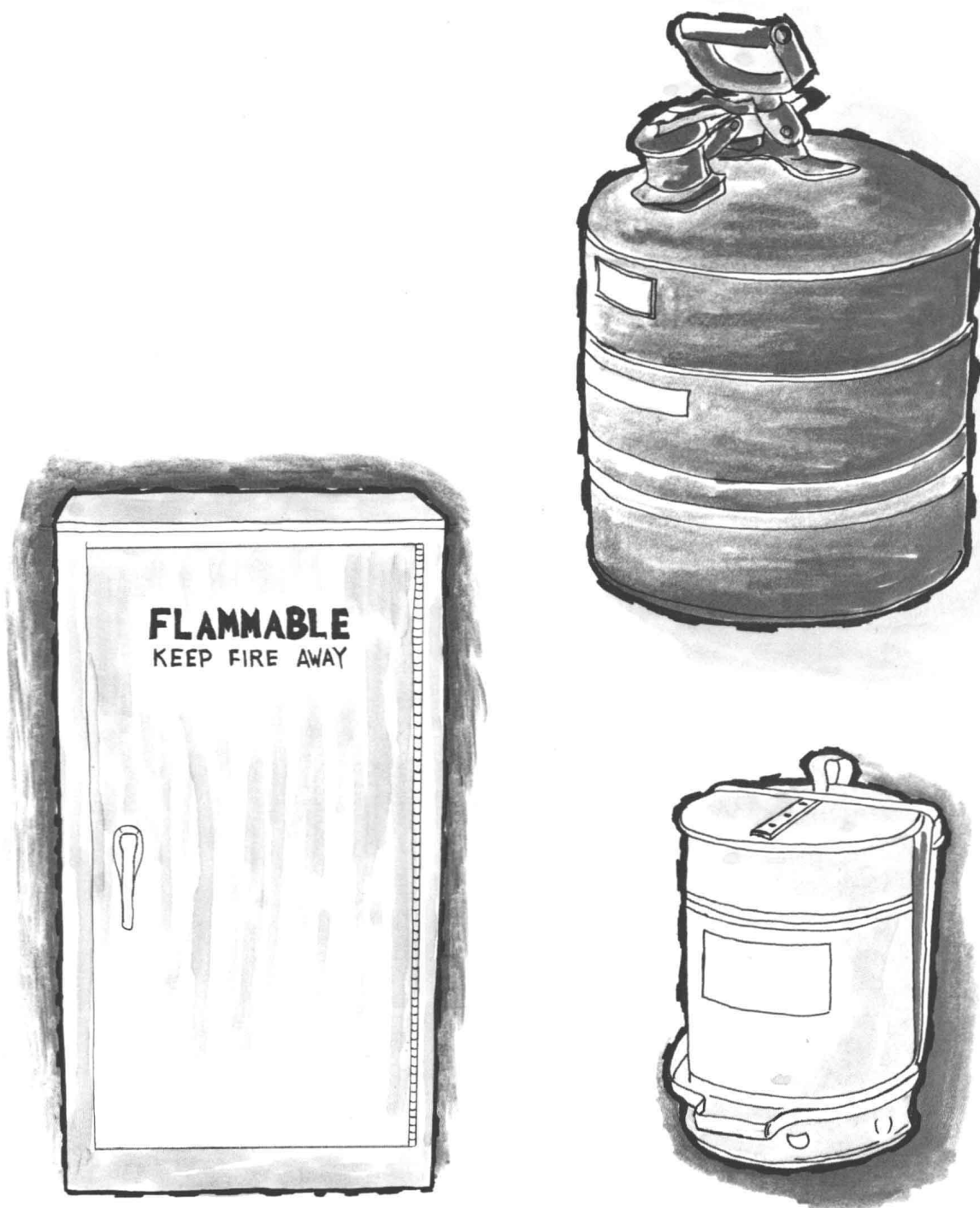


Figure 2-8: Putting fire hazardous material in the proper container prevents fires.

An engine is a machine that changes heat into mechanical power. There are several types of engines. The main engine in use today, and the one this book is about, is the internal combustion engine (figure 3-1).

When combustion, the burning of air and fuel, takes place inside an engine (internally), the engine is called an internal combustion engine (figure 3-2). The modern engine has five main working parts:

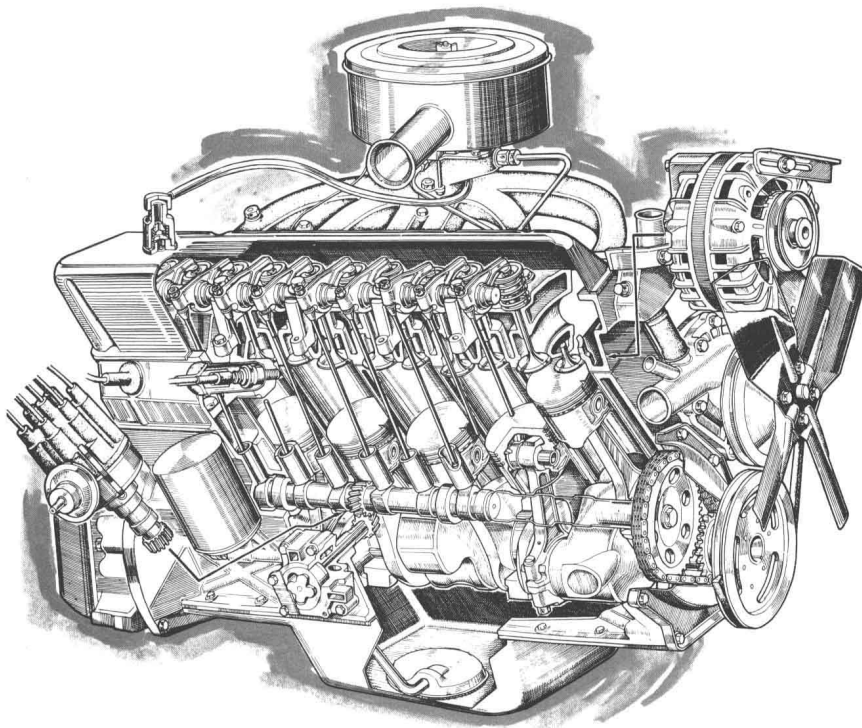


Figure 3-1: Engines change heat into mechanical energy.