Converting Scrap Into Useful Articles

How to Make An Electric Forge

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Improvising substitutes from pieces of metal and discarded parts may become a sport in which every true American will take an active part.

Here is an opportunity for him to demonstrate his inventive turn of mind and, at the same time, put into use some of the material now relegated to the scrap heap.

"Because of a shortage of many common items in the home," states a U. S. Department of Agriculture report, "it will be necessary to improvise substitutes from pieces of metal and discarded parts. The variety of things that can be made in garages, particularly where there is a forge, is almost endless. The Bureau of Agricultural Chemistry and Engineering mentions such things as gate and door hinges, latches, braces, brackets, and rings."

An electrically operated forge can be made from an old vacuum cleaner, automobile brake drum, and a few iron scraps. Here again discarded parts are utilized.

The diagram on this page illustrates how this is done. A large auto brake drum (1) is fitted with a cone (2) at least 5" long. The diameter at the top should fit the opening on the inside of the brake drum. For this purpose, sheet iron is quite suitable. Tabs are cut at the top of the cone and holes are punched or drilled through them in line with holes in the brake drum. The cone and brake drum are then bolted together. At the bottom this cone is fitted with a short "T," the side arm of which connects with the blower side of a vacuum cleaner.

Any old vacuum cleaner (3) will work, just as long as the motor runs and the fan blades are still in fair condition. You do not need a powerful blast of air in a forge; instead you need an even supply, easily regulated.

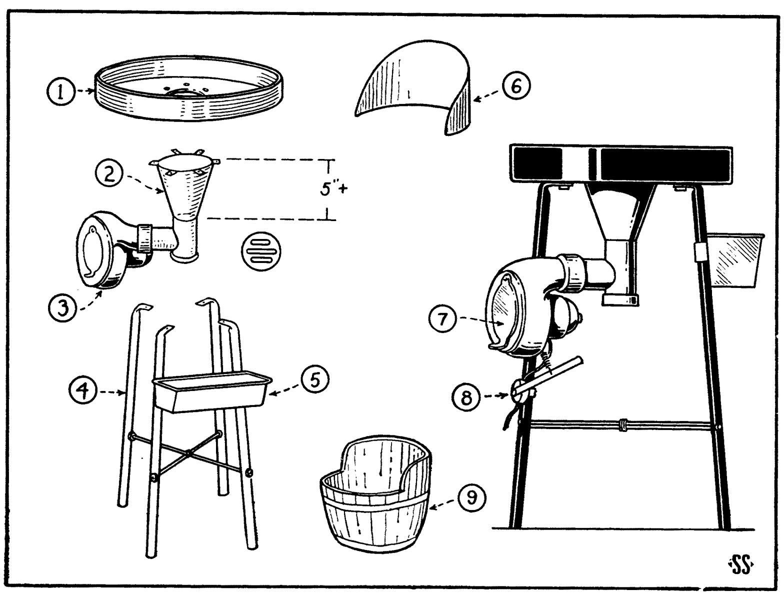
In many vacuum cleaners it will be found that the "suction" nozzle can be removed entirely or this nozzle can be cut off with a hacksaw. However, some of the modern, streamlined units are not amenable to this change. If a change can be made easily a simple air control (7) should be attached to the air intake side of the cleaner. A single bolt and nut with a lock washer holds this in place. The fit should be tight; the port should remain in any pre-set position.

If the vacuum cleaner cannot be treated in this fashion the nozzle should be fitted into a block of wood having a cut-out port. Molding around this port and a sliding wooden closure then may be used to regulate the draft.

The switch (8) preferably should be of the one-way type, that is, it should automatically turn off except when pressure is applied. But any other switch will serve the purpose just as well if a spring is used to bring it back to the "turned off" position.

Old iron pipe, one inch or larger in diameter, makes the legs for this forge. The pipe is cut off to the desired length and then the ends are heated in a coal fire or gas flame, hammered flat and bent over at the top. Holes are drilled through the legs and through the brake drum. The legs are then attached with ⅜-inch machine bolts. Two crossed tie-rods are fitted to the bottom of the legs as shown in the illustration.

If the forge is to be used out of doors, or in a place where there is likely to be a draft, it is recommended that a draft screen, made as shown at 6, be attached



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to the brake drum. On the other hand, if the forge is to be used in an enclosed space it should be provided with a hood and connected with a pipe leading to the out-doors. In either event one or more trays (5) should be attached to the legs. The one illustrated is for fuel.

Referring again to detail 2, it is recommended that the bottom of this "T" be provided with a cleanout door. The method of doing this will suggest itself to the builder. The door may be held closed by a spring or it may be a friction cap or plug.

A round, iron disc, about 3/16ths of an inch thick, should be slotted as shown in the insert detail. This disc should fit the bottom of cone 2 (which in smithy circles is called the tuyere).

For practical smithing the tools found in the average home or garage are not exactly suitable.

Of great importance is a suitable anvil mounted on the end grain of a well-placed wooden block or log. The anvil should weigh 120 pounds or more and ring true when struck with a hammer.

Again you will have observed that these anvils are not set solidly on the block. When struck by the hammer the anvil bounces an imperceptible fraction of an inch. This is a very desirable performance because in that way iron scale is knocked off the face of the anvil.

Other suggested tools are a ten-pound sledge, a four-pound cross-peen, and a two-pound ball-peen hammer. Then the blacksmith will need such tools as hot cut, cold cut, gouge, flatters, swages, tongs, bending blocks, a tin can perforated at the bottom for sprinkling water and a water trough which may be a barrel, cut off as shown at 9.

If you are ingenious you will be able to make many of these tools as well as others.

To start the fire in the forge place an ordinary brick down into the tuyere. Bank good coal, free from sulfur, around this brick, then remove the brick and put wood shavings into the hole so formed. Light the shavings. When they have burned down well add some pieces of coke and apply a gentle blast. Dampened coal should be banked around the fire. This coal, properly charred, should be used for replenishing the fire. Coal around the edges of the fire should be kept wet enough to prevent combustion. This operation insures a constant supply of hard coke.

Never increase the draft to such a point that you will have a large fire.

When a piece of metal is not being heated the blower turns off automatically. This conserves coal and prevents the fire from getting out of hand. The size of the fire is regulated by opening or closing the air intake port.

Do not attempt to forge cast iron. Also, be sure that there are no brass, lead or bronze parts in the fire.

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The piece of iron or steel which is to be worked is placed in the fire and heated slowly and uniformly. The heat must penetrate to the innermost portion. Depending upon the nature of the material, the color of the metal may range from a dull cherry red color to a high lemon yellow. Ordinary steel will give a full red color. If the right temperature has been reached the metal will yield freely when scraped with an iron poker.

When the metal piece has reached its flowing temperature remove it from the fire, smack it against the anvil (or use a wire brush to remove any scale) and then hammer.

Proficiency in handling metal is the first step. After a little practice you can experiment with the making of a simple bracket.

Tongs should always fit the metal which is to be handled. If they do not, the jaws of the tongs should be placed in the fire and, when hot, they should be hammered around the metal piece. If this hammering brings the handles of the tongs too closely together, heat the jaws again, insert a piece of iron between the handles to keep them separated, and then flatten the jaws against the piece which is to be worked.

To make a good bracket it is desirable that the work be upset first as shown at B, in the diagram on this page. The center of the piece which is to be bent is first heated to the proper temperature and then struck on the edges to form a bulbous portion at the midpoint. Properly to confine this "bulb," a perforated tin can is used to spray water upon the metal adjacent to the part being worked; this is illustrated at F. After the upset has been formed, the piece is heated again and bent to form the bracket C. To bend a flat strip along its wider dimension see details D and E.

In illustrations G, H, I, J and K you will see several suggestions for forming joints. Notice that in each case the ends of the pieces have a slight convex surface, the purpose of which is to squeeze out the scale.

Heat both pieces uniformly. Then shape them to get them ready for the weld. Heat again, and place the two pieces on the anvil. Brush off the scale with a wire brush (or cover with flux) and then hammer together at an angle so that, as the weld proceeds, the scale will be squeezed out. If the parts get cold, heat them in the fire again.

A satisfactory flux is ordinary borax, heated in a crucible until liquid, then poured on a flat surface. When cool pulverize this with a hammer. Ordinary sand also is satisfactory. Either may be sprinkled on the hot metal where it serves to flow out the scale.

The plain lap weld down at J is used most frequently. This is first knitted at the center and then gradually hammered down to force out any scale.

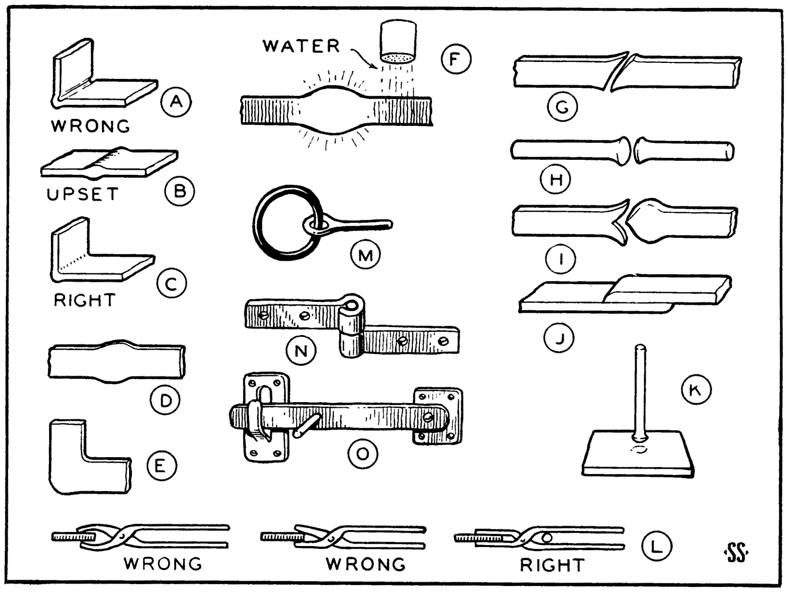

Diagram K illustrates the making of such things as metal stands, engine valves, etc. Note that the bottom of the rod is rounded. This fits into a slight depression in the plate. Both pieces must be heated to welding heat and then hammered together.

After you have gotten this far you will want to swage down pieces, making them either thinner, heavier, longer, rounder, flatter, etc. After some practice you will want to do all sorts of work with iron and steel. A few of the simpler suggestions are given at M, N and O in the diagram.

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NEWS OF CLUBS

COMMERCE, Texas—The TexSciana, a magazine devoted to the work of the Texas Junior Academy of Science, reports on the Dallas meeting held on Dcember 31 of last year. The 30 mimeographed pages of this periodical are filled with experimental information, reports of Academy Chapters and schedules of forthcoming meetings. A special department has been set aside under the name of "Tradin' Post." Science club members are invited to use this department to arrange for exchanges of plant specimens, insects, reptiles, minerals, etc. Such a "tradin' post" might well be included in most school magazines. It offers every student and club member an opportunity of disposing of surplus stock and getting materials which he needs, some of which may be difficult, if not impossible, to secure today.

Editors McIver, Ervin, Laves and Hayes, and Mrs. Barry Walker, chairman of the Junior Academy Committee for Texas and Director of the Texas Science Center, deserve a great deal of credit for a fine job.

ST. LOUIS, Mo.—An artificial stomach with a heating unit with which to study the effect of vitamins on the digestion of milk has been made by Gerald Perkoff. Gerald also was elected honorary junior member of the American Association for the Advancement of Science from the St. Louis area.

CAPE GIRARDEAU, Mo. — The Southeast Missouri State Teachers College met here. Exhibits and programs showed a marked war influence. A demonstration of black light was given by Elwood Mills and Michael Summers of Central High School. Madelyn Comfort of the Burbank Chapter at Beaumont High School, displayed "Living Casts of Honey." Synthetic Rubber and Plants and the War were featured by Francis Smith and Margaret Harris of the Carver Chapter at Vashon High School. Plastics were shown by Marilyn Shouse of the Davy Chapter at Normandy High School and Strategic Materials for Defense were exhibited by Edgar Thorpe of the Phy Bi Knights Chapter at Flat River. A repelling magnet, a quadrant electrometer, water softeners, oscilloscope, electrolysis, potassium and refrigeration also were demonstrated. Warren Harter, president, presided. Ernestine M. J. Long is Director of this Missouri Science Center.

SALEM, Mass.—The Weizmann Amateur Science Club of Salem, Mass., is seasonally publishing a small magazine under the name of Science News. The editors and advisers hope that this venture will be sufficiently profitable to help equip a club laboratory for which space has already been obtained on the third floor of the Salem Community Center. Leonard J. Sushel is the sponsor.

JACKSON, Mo.—The production of a device to set up air disturbances powerful enough to throw an airplane out of control is being undertaken by the chemistry committee of the Jackson Junior Academy of Science with headquarters at Jackson High School. The Physics group is building a film enlarger while the Biology group is collecting and identifying as many invertebrates as can be found in the region of the club. The club plans to present a program at a local college soon. The sponsor is A. Paul Vance, Head of Science Department.

Clubs are invited to become affiliated with SCA for a nominal $2 for 20 members or less. You can become an associate of SCA for 25 cents. Address: Science Clubs of America, 1719 N St., N.W., Washington, D. C.

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SCIENCE CLUBS OF AMERICA

SCA, under Science Service sponsorship, continues the pioneering activities of the American nstitute of City of New York over the past 15 years and the Student Science Clubs of America which was merged with that movement. The American Institute continues to foster the regional activities of the junior clubs of the New York City area as a science center.

To effect close cooperation between the American Institute and Science Service, an advisory committee on SCA is being formed.

The principal SCA staff consists of Joseph H. Kraus, SCA editor, and Margaret E. Patterson, SCA membership secretary, based at New York in offices at 310 Fifth Avenue, also occupied by the American Institute. H. D. Lufkin in charge.