Everyday Mechanics

"It Tells You How to Make and How to Do Things"

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CONSTRUCTION OF A ONE-HALF HORSEPOWER GASOLINE ENGINE

BY WM. C. HOUGHTON, M.E.

THE engine to be described in the present series of articles is a modification of the Parsell & Weed design, published years ago by Norman W. Henley & Co., and is given in these pages with the kind permission of that company. While many of the original features are retained, the development of gas engines has made possible many improvements. This is particularly true in most of the smaller details, and also in some of the more important parts.

The engine is of the four-cycle type, moderate speed and intended for stationary use, particularly for driving small dynamos. While it is rated at one-half horsepower, it has been found capable of giving considerably more. The author has obtained nearly one-half kilowatt of electrical energy from using a generator of probably not more than 75 per cent. efficiency. A brief comparison of the new design with the older one may be of interest.

General Construction. Fly-wheels reduced from 14 to 12 inches diameter but made somewhat heavier. Bed-plate shortened and side cylinder supports omitted. The cylinder is now supported by the front collar and overhangs the bed-plate. The connecting rod is also shortened. This construction gives a smaller, lighter and cheaper engine, but with no sacrifice of power. The side rods are substantially unchanged, being merely shortened to correspond with the bed.

The smaller fly-wheels permit a lower bed-plate, which is made with a pocket for the wheels. This, together with a slightly wider base, gives rigidity. The very admirable fly-wheel crank-pin, which eliminates the difficult construction of a crank shaft has been retained, but the method of assembling shaft and wheels has been improved. No

effort has been made to avoid the use of a screw cutting lathe as in the original.

It is believed that any amateur having sufficient experience to attempt the construction of a gas engine, would be likely to have access to an engine lathe and the ability to use it. A 9 in. lathe will, however, take care of everything but the fly-wheels.

Smaller Details. The special spark plug used in the Parsell & Weed engine has been abandoned and a standard (½ in. pipe size) automobile plug is to be used.

The valve gear has been simplified and the rather complicated governor omitted. Where the engine is used to drive a dynamo or other steady load, no governor is needed. This is especially true in charging storage batteries. A governor of a different type will, however, be described later. The contact device is of a new design, simple, rugged and sure fire. It does not require the use of platinum nor of light and delicate parts. It has been found that the steel tube used in the cylinder and piston of the original engine is rarely smooth enough to serve without either boring or lapping. Such being the case, the best quality of iron pipe may be substituted as being cheaper and easier to obtain. The piston is to be of shell construction, but provided with two broad packing rings which fit in grooves in the cast iron piston head.

The half-speed gears are made somewhat wider, and the smaller one is to be integral with the half shaft on one side of the engine.

Construction

The first question to be taken up is that of casting. If the builder has sufficient courage and the necessary skill in woodworking, he may wish to make his own patterns. As a commercial proposition, however, it would hardly pay to make a set of patterns for one engine. The castings may be purchased with or without a complete set of parts. The patterns, about 15 in number, are all simple, and no complicated problems of coring, etc., are involved. No special pattern drawings will be needed, as dimensions may be taken from the machine drawings, with due allowance for finish where required, and in the larger pieces, such as bed-plate and fly-wheels, a shrinkage allowance of ⅛ in. per ft. In the smaller castings, the "rap" will more than make up for the shrink. No attempt will be made to give a thorough course of instruction in pattern making in this connection. The builder who tries to make his own patterns may be presumed to have some familiarity with the subject. If not, he is advised to consult a standard book on the art. A gen-

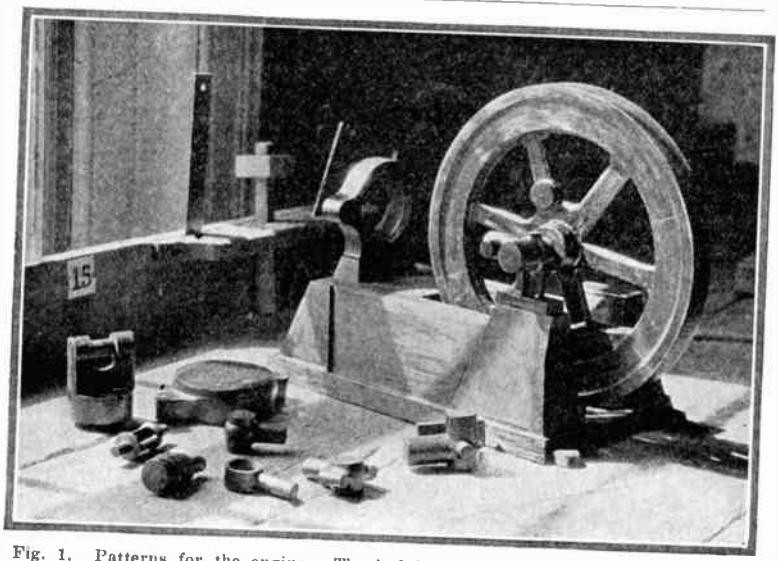


Fig. 1. Patterns for the engine. The bedplate, bearings, wheel, cylinder collar, etc., are in the position they occupy in the finished engine

eral description of the patterns may, however, be useful.

Some idea of the general appearance of the engine may be gained from Fig. 1, where all the patterns are shown with bedplate, bearings, wheel, cylinder, collar, etc., in the position they occupy in the finished machine.

The bed-plate, as may be seen in Fig. 2, is simply a hopper-shaped box, open at the bottom, with a jacket for the fly-wheels also tapering and wider at the top to give plenty of "draft" to the pattern. It is made of ⅛ in. pine, reinforcing strips under the bearing blocks and a strip ¼ in. thick and ¾ in. wide around the bottom for the same purpose. The "threshold," so to speak, of the wheel pocket, is also reinforced. All corners must be well filleted and the surface smoothly finished. Leather or wood may be used for the larger fillets inside the base, and wax for the smaller ones in the corners of the pedestal strips. The pattern is provided with four lugs for fastening the engine to its foundation. The casting will weigh about 25 lbs.

Fly-Wheel. Fig. 3. This pattern may be cut from a solid plank if only one engine is to be made, but if this plan is adopted, it will soon warp out of shape and will lack strength. A better plan

is to build it up on the face of a lathe. A 12 in. lathe will be required unless provided with outside face plate and floor rest. This construction requires three layers of stock, each of six segments beside the six spokes. Bosses are glued and nailed on for hub and crank pin. The pattern must be well filleted in the angles of the spokes. A counterbalance weight of about 1 pound is provided for at the outer end of the spoke opposite the crank-pin boss. Weight of castings is approximately 18 lbs. each.

Bearing Pedestals. Fig. 5 shows the two bearing pedestals, which are alike except that they are made right and left, and one has a boss for the half-speed gear. One pattern may be made to serve by making the two ends of the bearing proper of equal length, and cutting off the gear boss from one of the castings. They are moulded lying flat, as one of them shows in Fig. 1.

Cylinder Collars. The front collar is provided with an extension on one side to support the cylinder. The inside is given liberal draft and not stepped as in the finished part. It is moulded as shown in Fig. 5. The rear collar is combined with the cylinder head. It is of the same general shape but thicker by ⅜ in. and has no extension for support. Combined cylinder head and collar will be found to save a considerable amount of work

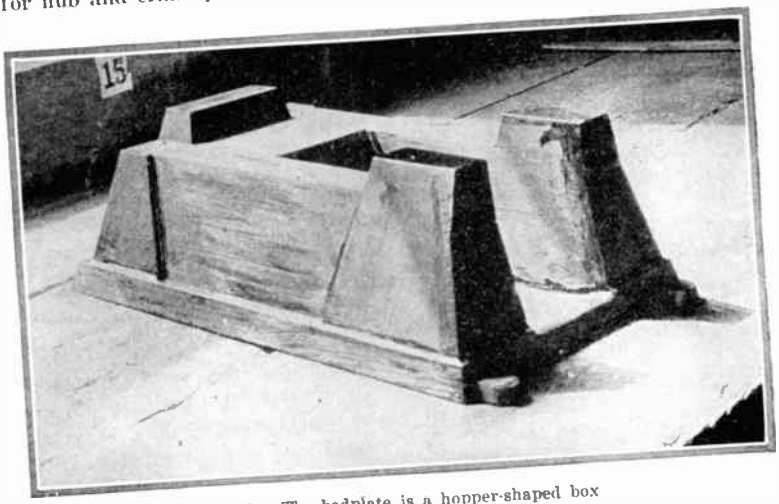


Fig. 2. The bedplate is a hopper-shaped box

in drilling, tapping and fitting, and eliminates many possible leaks.

Piston and Piston Ring patterns are shown in Fig. 6. The piston may be made almost entirely in the lathe. Three turned parts are used—the base, the two bosses with connecting bridge, and the two uprights which are turned in one piece. This piece is split, glued in place and the outside afterward turned down flush with the base. The web between the uprights is a single piece of ⅛ in. stock glued in place to stiffen the casting. The ½ in. bridge between the bosses is cut away in machining.

The piston rings call for a simple casting considerably heavier than the finished rings with plenty of draft inside. It is moulded as shown. Piston is moulded lying on its side.

All the above patterns are to be cast in iron.

The *Inlet and Exhaust Valves*, Fig 7, are intended to be "com-

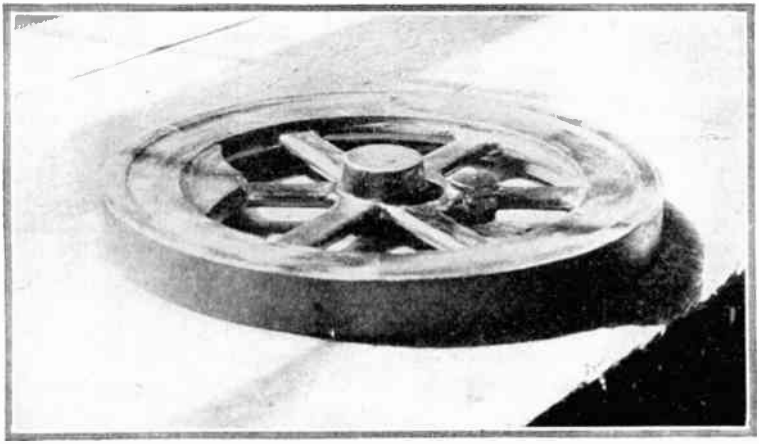


Fig. 3. The flywheel is best built up of segments of wood to prevent warping.

position," *i.e.*, heavy red brass. Iron will do, however, if the present high price of bronze is an objection. One pattern, the inside of the inlet valve, is omitted in the cut. Both valve heads are cast in the one pattern, which is moulded in nearly the position shown, but rolled over enough to bring two of the vanes perpendicular. Exhaust valve casing is shown standing

but is moulded on its side. Inlet valve casing is moulded as shown.

The *Connecting Rod Ends.* Fig.

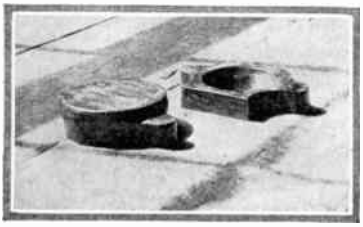


Fig. 4. Front cylinder collar and rear collar which combines with it the cylinder head

S must be cast in the best quality bronze if durable parts are wanted. They get the hardest wear. The cut shows the shape and the position in the sand. If preferred, the crank-pin (larger) end may be made in two parts, but the single pattern gives less work and is no more difficult to machine.

For the whole engine, about 80 lbs. of iron castings and 4 lbs. of composition will be required. The balance of the engine's total weight of about 90 lbs. is steel-bar stock, tubing, etc.

Special Tools. A small angle plate for the lathe will be required in machining the bearings, valve casing, etc., in this engine, together with some special arbors for centering bearings on the same. A suitable one will be described later.

If the builder is not provided with ½ in. and ¾ in. hand reamers, they will have to be bought. One or two taps of special (24) thread will also be handy. It is very convenient in such construction as this to have a number of sizes of taps with uniform thread.

A modification of this engine will be given later for the benefit of those who wish more power. A longer bed plate and a few changes in bearings, etc., permit the construction of a two-cylinder engine of the opposed type capable of one full horsepower. The normal speed of the engine may be taken as 500 r.p.m., and its power rating is on that basis. It has been found possible to increase the speed to nearly 1000 r.p.m., with somewhat less than a corresponding increase of power. The comparatively small valves cause more or less choking, and virtually prohibit higher speeds. At normal speed, the machine, if carefully built, is very quiet and generally satisfactory as well as reliable. The writer had an engine of this design running in the basement of his home at one time, entirely without the knowledge of his near neighbors. It is primarily adapted for gas, either natural or manufactured, but if the mixing valve is omitted and a carburettor substituted, can be used with gasoline fuel. It could

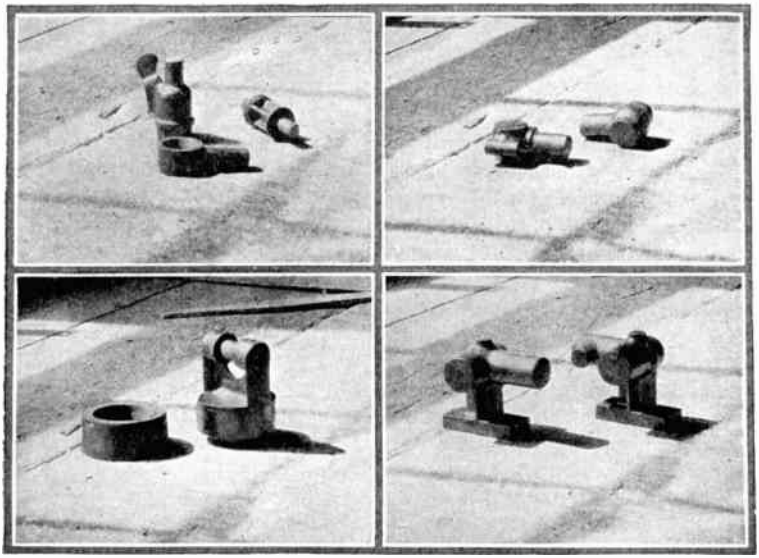


Fig. 5. Bearing pedestals. Fig. 6. Piston and piston ring patterns. Fig. 7. Inlet and exhaust valves. Fig. 8. Connecting rod ends

doubtless be adapted to kerosene, but this has not been tried out.

The next instalment will take up the machining of some of the castings, giving full working drawings, and later ones will deal with assembling, adjusting and testing the finished engine.

To Prevent Salts from Creeping in Primary Batteries

It will be noted, particularly in the case of the common carbon cylinder wet batteries, that the salts creep up the jar and on the carbon, corroding the connections. These salts also form on the zincs, and in some cases cover same to the extent of preventing the battery from delivering its full quota of current.

This can be prevented by the simple expedient of mixing 2 oz. of sugar with the sal ammoniac used in each battery, thereby prolonging the useful life of same.

Contributed by Thos. W. Benson.

Bureau Drawers

Give the inside of the bureau drawers a coat of white enamel. This will keep them fresh, and make them easy to clean.

THE CONSTRUCTION OF A THREE SLIDE TUNER PANEL SET

By Maxwell K. Burckett

AT the present time quite a number of amateurs throughout the country are bringing the three slide tuner into use more than ever. For the main reason the three slide tuner is simpler in construction than the loose coupler, which has been given a great preference by the wireless authors in our American scientific periodicals. This article is to describe a panel set which has a tuner of the three slide type, but controlled by contacts instead of by sliders. This article will be of use to those amateurs who favor the simpler construction or who have sometime tried the conversion of a two slide tuner into one of the three slide type and have been greatly pleased with the results, and are now ready for the construction of a set embodying the three slide tuner at a moderate expense, but modeled after the large and costly panel sets.

The panel is of ¼ in. hard rubber 9 in. x 7½ in. The holes for the contacts are drilled with a ⅛ in. drill, the holes for the binding posts, detector and wood screws are drilled with a 11/64 in. drill, the holes for the condenser shaft and switch stems are drilled with a 13/64 in. drill, the holes for the condenser plate tie rods are drilled with a 9/64 in. drill, and the holes for the stop-pins are drilled with a ⅛ in. drill. The case should be of birch wood, finished in mahogany and of suitable dimensions to allow the panel to be mounted, as shown in Fig. 2. The panel is laid out as shown in Fig. 1, and should have a space of at least 3½ in. in back of it for the condenser and tuning coil tubes.

The tuning coil is of the three slide style, but with leads to the switches for connection rather than by means of sliders. The tuner consists of 6 ounces of No. 22 S.C.C. magnet wire wound on cardboard tube 8 in. long and 3⅛ in. in diameter. The leads are brought out in three sets; one set for each switch. There are a total of 225 turns of wire on the tube, with leads brought out every three turns. A strip of linotape is run the length of the tube over the windings, but under the connections to insulate them from the adjoining turns of wire. The beginning of the winding is fastened to the first contact on the left-hand switch, the lead from the third turn is brought to the first contact on the center switch, the lead from the sixth turn is brought

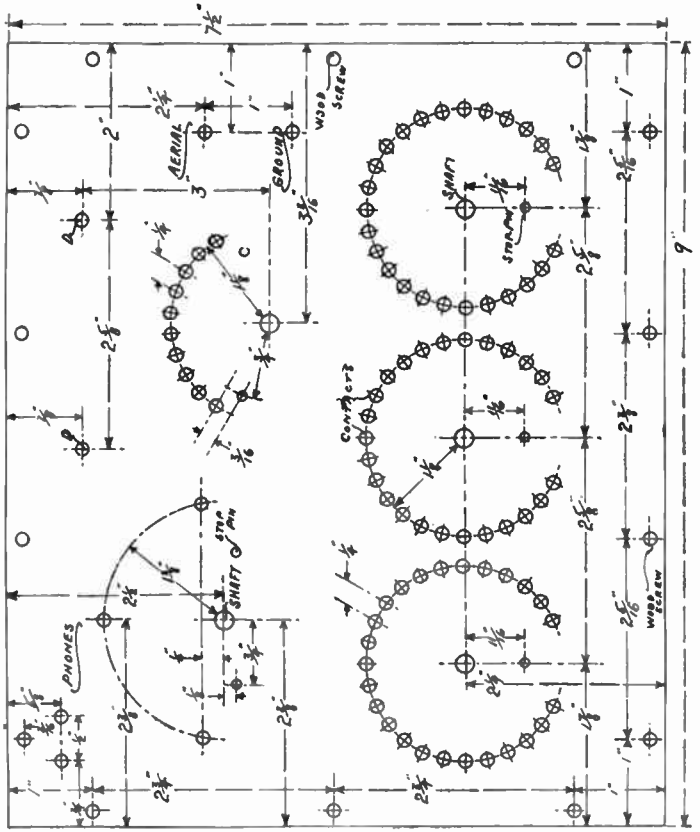


Fig. 1. How the panel is laid out

to the first contact on the right-hand switch, the lead from the ninth turn is brought to the second contact on the left-hand switch and the lead from the twelfth turn is brought to the second contact of the center switch and so on until the seventy-five

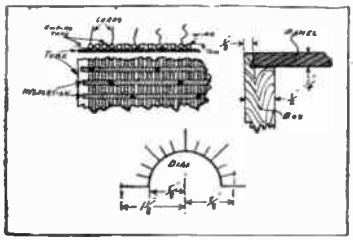


Fig. 2. This shows how the panel is mounted in the case

leads have been attached to the three sets of switches, which have twenty-five contacts each. The lead wires from the winding should be soldered parallel to the winding wires at the connections, so as to prevent the winding taking up more space than is allowed for it. The complete coil is given a couple of coats of insulating varnish and baked in the oven to dry it out thoroughly.

The loading coil consists of 3 ounces of No. 22 S.C.C. magnet wire wound on a tube 4⅛ in. long and 3⅛ in. in diameter. The tube is wound with 108 turns of wire, with 10 leads, 1 lead every twelve turns. The leads are connected to the winding and insulated the same as the three slide tuning coil, except that the ten leads are brought out all in one set.

The rotary variable condenser consists of thirty-one semi-circular aluminum plates. Sixteen stationary plates and fifteen rotary plates are needed. The other condenser materials needed are as follows: fifty-one stationary washers, fourteen 1/16 in. rotary washers, two ⅛ in. rotary washers, one hard rubber plate 3¼ in. x 1⅞ in. x 3-16 in., one steel shaft 2½ in. long and 3-16 in. in diameter threaded with 10-32 threads for ⅜ in. on one end, three machine screw tie rods 2 in. long with 6-32 threads on the threaded end for at least ½ in., and three 6-32 threaded brass hex nuts. The details of the parts and the assembling of the condenser are shown in Fig. 3.

A fixed condenser may be used with the set, although it is not necessary. The necessary parts are as follows: two sheets of tinfoil 30 in. x 2½ in., three pieces of thin wax paper 36 in. x 3½ in., and one piece of 1/16 in. stiff cardboard 3½ in. x 1 in. The condenser is wrapped tightly around the cardboard with each piece of tinfoil separated by a piece of wax paper. The leads from the two sheets of tinfoil are brought out on opposite sides of the completed bundle.

The quantity and details of the other parts are as follows:

eighty-five contact points turned out of round brass rod 3/16 in. in diameter and drilled and tapped with 4-36 threads for 3/16 in., whose overall length is ¼ in.; two detector uprights 1 in. high out of ½ in hex. brass rod with the tops turned oval for ⅛ in., which is fitted with a knurled thumb-screw to hold the detector arm in place; the large detector cup is turned out of ¾ in. round brass rod ¼ in. deep, with 3/64 in. walls on the sides and a 1/16 in. wall in the back; a hole is drilled and tapped with 8-32

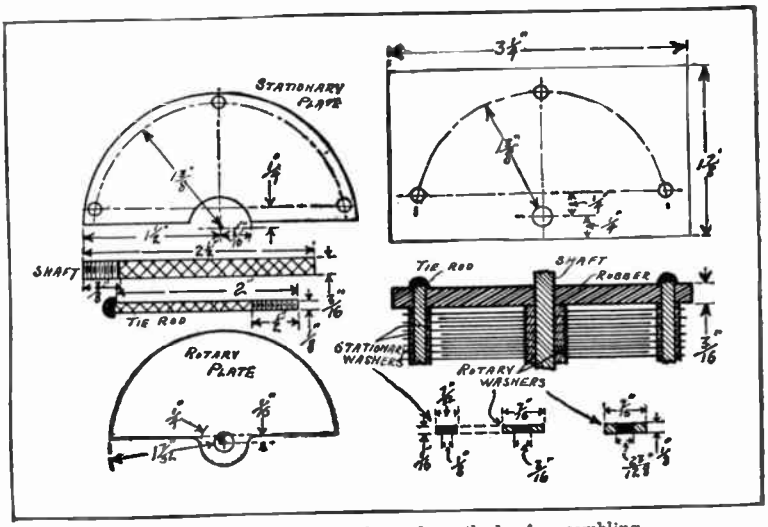


Fig. 3. Condenser details and method of assembling

and the bottoms drilled and tapped with 8-32 threads for ¼ in.; one has a hole drilled and tapped for ¼ in. on one side, ⅝ in. from the bottom (this is the upright for the large permanent crystal cup) and one has an 8-32 clearance hole all the way through it ⅝ in. from the bottom and an 8-32 threaded hole from the top running down to it, threads in the center of the back of the cup and three such holes are made in the sides of the cup of equal distance apart, for the holding of the crystals in the cup; the small cup is turned out of ½ in. round brass rod and has the same turning dimensions as the large cup. The hole in the back of the cup is drilled off-center and only one hole is

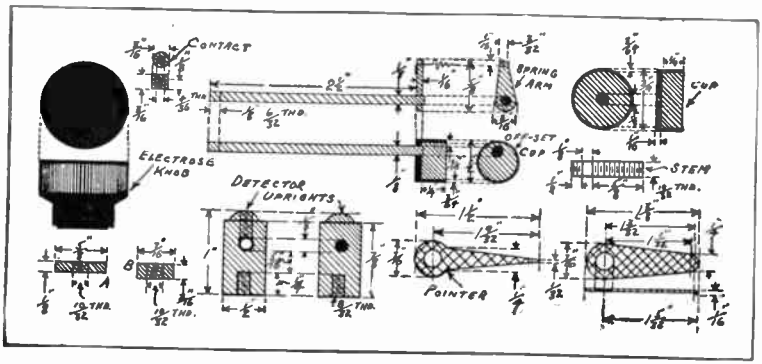


Fig. 4. Details of pointers and switch arms

drilled in the side of the cup—both are tapped with 8-32 threads. The four stems are of 3/16 in. round brass rod ⅞ in. long, threaded with 10-32 threads on one end for ⅝ in., and on the other end for ⅛ in. The four thin washers *A* are of ⅝ in. diameter round brass rod cut ⅛ in. thick and drilled and tapped with 10-32 threads in the center. The five thick washers *B* are of 7/16 in. diameter round brass rod cut 3-16 in. thick and drilled and tapped with 10-32 threads in the centers. The pointer and four switch arms are cut out of 1/64 in. sheet brass to the dimensions shown in Fig. 4; the switch arms have their points bent over for 1/16 in. to make a tighter contact with the contact points. The spring detector arm is made of 1/16 in. brass sheet, cut as shown, with a fine phosphor bronze spring mounted in the fine hole at the small end. Both the spring arm and the offset cup are mounted on arms of 5/32 in. round brass rod 2 9/16 in. long threaded on both ends for ⅛ in. with 8-32 threads. The five large knobs and the two small knobs are of standard electrose styles; the seven stop-pins are ½ in. medium sized brass nails; the four connections to the switch arms are made of 1/64 in. sheet brass ⅝ in. x ⅜ in., with ¼ in. hole in one end of each; four standard type binding posts and fourteen ¾ in. oval head brass wood screws are used.

The condenser dial is scratched in the hard rubber with a sharp pointed piece of steel rod. The names at the binding posts, "Phones," "Aerial" and "Ground," are stamped in the rubber with steel dies. The condenser dial may be numbered, dividing it into the degrees of a semicircle.

These impressions are filled in with white lead to make them show up.

The spring detector arm is for use with either galena or silicon crystals. The off-set cup is for use with detectors that require two different crystals, such as Perikon. If the amateur desires to use a sharp, stiff point with silicon or any other crystal, a sharp piece of metal may be mounted in the off-set cup and a spring put over the long arm between the cup and the detector upright to give a slight pressure of the point against the crystal.

The connections of the instrument are shown in Fig. 5. In making the connections care should be taken to make all the leads as short as possible so as to reduce the amount of losses due from so great a number of leads from one tuner. Connections from one instrument to another should be made with rubber covered stranded copper wire, with all connections soldered. The connection to the moving plates of the condenser should be made by mounting a piece of spring brass bent in an "L" shape with the free end pressing against the steel shaft.

When the three slide tuner panel set is completed it should be used with at least a hundred-foot aerial forty feet above the ground and a good pair of 1000 ohm receivers. Then, when the amateur receives wireless signals with ease of tuning far above the loose coupler, he will be well

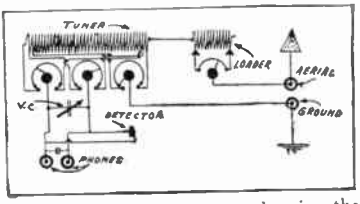


Fig. 5. Wiring diagram embracing the three slide tuner

pleased that he chose the construction of such a set, instead of the numerous sets of difficult construction.

A Receiving Cabinet can be fitted with an attractive goose-neck lighting fixture without the generally attending alternating current induction troubles by wrapping a tinfoil sheath around the lamp cord where it approaches the receiving set and then grounding the tinfoil.—C. H. BIRON.

Tablecovers and Centerpieces.—You can wash tablecovers, centerpieces, etc., without fear of the colors fading, if you first soak them for an hour in weak turpentine water, and then wash them in tepid water to which melted soap and a small quantity of borax have been added. Put a little borax in the rinsing water also to soften it and prevent the colors running.—F. H. SWEET.

HELPFUL HINTS FOR THE MOTORIST

By Mrs. A. Sherman Hitchcock

ONE of the most uncertain members of the entire motor car is the spark plug, because it is exposed to an exceedingly wide range of temperature from the varying heats of the cylinders, from the deposits of lubricants, to the carbonization caused by excessive fuel, all within the cylinder, while on the exterior the presence of water or mud or the contiguous metal construction may cause loss of current to a considerable extent, if not entirely.

The plugs are numerous enough in design and construction with different functions in mind in addition to the principal one of igniting the explosive mixture of gasoline or other vapor within the compression chamber of the motor cylinders. Aside from the special construction the material chiefly used consists of mica or porcelain for the insulating portions, the latter being highly regarded for its heat-resisting qualities.

As is well known, and generally from experience more or less painful in character—ranging from burned fingers to stops of hours during storm and without shelter, the insurance of perfect combustion is keeping the insulating surfaces free from carbon, whether this be in the form of light soot from the fuel or burned lubricating oil. It is obvious the smooth surface is that which will remain free from deposit the longest, and that the rough surface will accumulate dirt more quickly. The usefulness of the spark plug should not be ended by using a file or sandpaper, emery cloth, or some other roughened surface in effort to remove the deposit and to the destruction of the glazed or polished surface.

In cleaning the plugs some gasoline will frequently soften the carbonization sufficiently so it can be removed with an old tooth brush, and a bit of soft metal like copper, zinc or tin will be all that is necessary to cleanse the plugs well. Sometimes merely polishing with a strip of cloth brings the plugs back to their former condition.

It should be remembered that the sparking points of the plugs should be one thirty-second of an inch apart, this being varied to meet the conditions which arise in the battery. There is no limitation to the life of a spark plug provided it be given care and is not damaged in cleaning. The moment the finish is scratched this forms a point for

accumulation of carbon, and from that moment on there cannot be otherwise than trouble with this plug. As with almost anything else it pays to be careful and reasonable in the care of even spark plugs.

The Care of Gasoline

When the gasoline is kept at home, as it is in so many cases, metal cans or drums should be used in storing it, rather than any wooden receptacle. The gasoline escapes more readily from wood than if kept in metal drums. The drums should be protected from sun and all heat to prevent evaporation. Sink the drum into the earth; this will prevent evaporation. The matter of evaporation is a big item in the expense of running a motor car. Stop the leakage and your expenses will be materially reduced.

In purchasing gasoline always be sure that it is pure and free from water and other substances. It is essential that good liquid should be used in your car. In manufacturing gasoline it is washed with water. Small portions of water may remain in the gasoline and will sometimes settle after several months. Caution should be used in not buying too fresh gasoline for this reason. Then, too, as gasoline barrels must be tight, it is necessary to wash the inside. In washing, oftentimes particles of soap and other settlings will form. These settlings are liable to work their way through the tubing of the car and cause no end of trouble. The funnel through which the gasoline is poured should be kept clean, especially the seive. The sieve should be wiped off before the gasoline is allowed to pass through it. It is well to feed the car tank from a small measure. In doing this it gives one the opportunity to examine the gasoline before it enters the car. Poor gasoline is the downfall of many carburetors. The carburetor is a delicate piece of mechanism and very little dirt will clog it.

In the filtering of gasoline there are few means which can be employed which are not open to objection. The fuel must be purified, that is certain, and fine wire gauze, closely woven cloth and chamois skin can be used. The chamois is the best because it will retain all sediment and the water, and it can be used by spreading it over a funnel and pouring the gasoline through it. This, however, is open to objection, as the skin rests against the funnel, and because of this fact the fluid does not filter freely and there is a decided loss by evaporation as well as the loss of time. By using a funnel large enough and having a ring of wire with three or four arms extending outward for several inches from the

ring, and sewing a chamois skin from the ring so as to make a shallow pocket, the gasoline, when poured into the pocket, will filter rapidly and there will be comparatively little loss. The contrivance costs practically nothing and lasts a long time, while it can always be kept thoroughly clean.

MAKING WINDOW SCREENS

By Thos. W. Benson

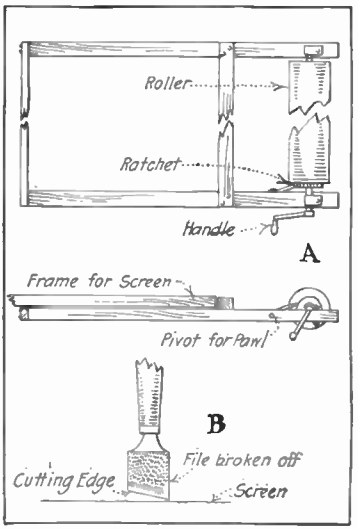
A LOCAL jobbing contractor undertook to inclose several porches with screens. Since in required a large number of screens the problem of fastening the wire was important until the device described herein was used.

The main difficulty in making screens is to get the wire meshing stretched evenly and tight, it being almost impossible to do so by hand.

A simple stretcher was made from spare parts around the shop, as shown in the illustration. Two strips of oak 2 in. wide, 1 in. thick and 18 in. long were first cut. Across these, 6 in. from one end was nailed an oak strip 40 in. long, while another strip was nailed over the ends to brace them.

A wooden roller 3 ft. long and 3 in. in diameter was secured and a hole ½ in. in diameter and 8 in. deep drilled in the center of each end. Into these holes were forced two lengths of iron piping to form axles. One pipe was hammered to a wedge point before driving into place, thus getting a good grip on the roller to turn it.

A small gear wheel and a strip of iron properly bent and drilled acted as a ratchet. The handle from a discarded meat chopper



No difficulty is experienced in stretching the screen

was put on the end. The roller was pivoted near the end of the wood strips by bending a length

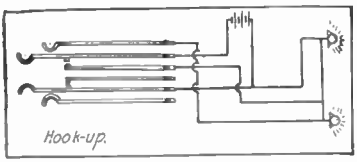
of strap iron around the pipes and clamping in place with two bolts. The illustration gives all other details omitted in this description.

The screening was tacked onto the roller, then rolled up. In use, the screen frame was butted up against the crosspiece, sufficient screening unrolled and tightly tacked into place at the end. A few turns on the handle drew it up tightly and the ratchet held it so. A few more tacks and a quick, neat job was done, the screen being as smooth and tight as a drumhead.

Another tool of great convenience for cutting off the screen was made from an old file, broken off two inches from the handle. It was heated red hot, hammered to shape shown and a cutting edge put on with a grindstone. By holding firmly in the hand in an upright position as shown and drawn toward the operator, a quick, clean cut is made.

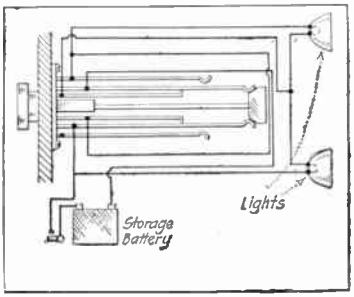
Dimming Auto Headlights

The writer recently solved the problem of dimming the head-



How the lights were hooked up

lights on an old Packard-four in the simple manner described herewith. The lighting system had been installed after the car had been in use some time, and consisted of a small 8-volt dynamo feeding a 6-volt 6-ampere storage battery through the usual



When the knob is pushed in, the current flows through the lamps in parallel

cutout. The lights were 6-volt.

The switch on the dash was made from a ringing key as used on telephone switchboards. The key was of the plunger type, so the spring inside the tube surrounding the plunger rod was removed. The knob would then stay in any position. The key was wired according to the attached diagram. It looks very complicated, yet is simple enough when understood, since the key is acting as a D. P. D. T. switch.

When the knob is pushed in, the current flows through the lamps in parallel, and when it is pulled out the lamps are in series, giving one-half the brilliancy. This is far superior to soaping the headlight glass or gluing on tissue paper as is ofttimes done.

DESIGN AND CONSTRUCTION OF AN ALTERNATING CURRENT GENERATOR

¾ Kilowatt Output, Single Phase, 110 Volts, 7 Amperes, 1,800 R. P. M.

By A. E. Watson, E.E.

Professor of Electrical Engineering in Brown University

Editor's Note: It is a pleasure to announce the beginning of a series of articles on dynamo construction by Prof. A. E. Watson, already well known to many readers through previous writings on this interesting subject.

At first a generator for single-phase alternating currents of ordinary voltage and frequency, the sort most useful for experimental purposes, will be described, no detail being omitted that would be expected or desired in a perfect machine of small size. The series will extend, however, to include two-phase and three-phase generator windings, then, by a sort of backward progression, continue into a number of articles on direct current constructions for which the design of many of the parts is equally well adapted.

Whether the reader is inclined or not to build one of the machines, it is hoped that he will find interesting and reliable information on many of the essential points of dynamo construction. A study of the drawings alone will yield an education and appreciation of both the simplicity and mystery of these mechanical devices for turning mechanical into electrical power.

Perhaps to some the descriptions will appear too much drawn out, certainly so to an experienced artisan, who would at most care for only the drawings. The intention has been, however, to make the articles directly helpful and sufficient to a beginner in dynamo construction, to one anxious to find out how to do a new piece of work in an acceptable manner without danger of spoiling his only set of materials. Certainly after making one machine he would have devised his own methods for making the second. His reputation is at stake on the first, but he may do what he pleases on the second.

SMALL alternating current generators are rather difficult to find on the market. While any direct current motor, however small, may readily be turned into a generator, the nearest counterpart in alternating currents—the induction motor—cannot thus have its functions so conveniently reversed, so if alternating currents are to be produced, a special construction is necessary.

An alternating current generator can, however, be made from an induction motor by substituting a revolving field magnet for the squirrel-cage motor, and such a design has already been given by the author in another publication.* If the armature is to be the revolving member the appearance may quite resemble that of a multipolar direct current dynamo. In small sizes and for safe voltages this latter type has some advantages, for the materials may be easier for the experimenter to obtain, the machine work simpler, and the result be

* Construction of Small Alternating Current Motors. E. M. Book Dept. $1.00.

capable of more modifications. Indeed, some existing direct current motor may readily be fitted with a new armature winding of the sort to be described, a pair of rings substituted for the commutator, and the change is fully accomplished, or, if the builder finds his supply of alternating current in some newly extended lighting circuit, he can, by making a new armature or by rewinding the other, at once make the machine useful as a direct current generator. Even if the supply is with alternating currents, a separate source is frequently desirable, say at some special frequency, or for some purposes may be insisted upon by the local authorities. For instance, if the supply is at 25 cycles, 60 may be preferred. If at 60, then it may be that 100 or more may be desired, and when "surges" or "kickbacks" are feared, that would puncture the insulation of house meters, the independent source of power is imperative.

The design adopted in this article follows well accepted models, the intention being to show a machine as nearly perfect as the builder could wish. While he may not have the means or time to follow the directions to their full extent, nothing short of an excellent design and a high grade of work should be held up as a pattern. With the fine equipments now found in technical schools and private workshops, and the natural aptitude shown by so many experimenters, there

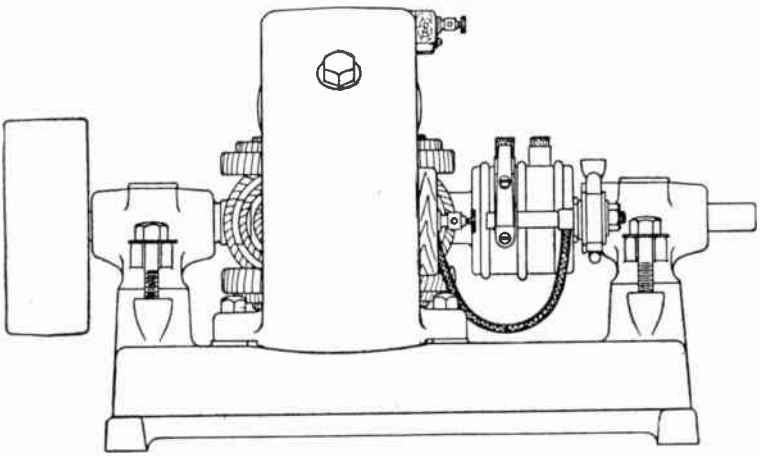


Fig. 1. Side view of assembled machine

is small excuse for any careful amateur or artisan making a failure in the construction of a machine from these directions. Indeed, even if a person had never seen a dynamo, he ought, nevertheless, to be able to construct a perfect model. While the drawings necessarily show some particular size of machine, presumably adapted to many experimental purposes, the design can be considered as quite general, and to serve as a useful guide in other sizes and for other numbers of poles.

The greater part of present small 60-cycle motors are wound for four poles, therefore operate at approximately 1800 revolutions per minute, and these having been found practical and convenient values, the same have been adopted for this generator. The machine is made very substantially, and if desired, can be operated at higher speeds for greater frequencies, but 2400 revolutions should be looked upon as a good limit for regular running; 3600 turns may be used for intermittent use, but for this speed the armature should be very carefully balanced, and every care taken to insure adequate lubrication of the bearings. For permanent applications of 120 to 140 cycles the design should be altered into one for six or eight poles.

Only such materials are specified as the builder can readily procure, and except for the coring of the self-oiling bearings the pattern work is simple. While a steel frame and laminated pole pieces would have yielded a lighter weight or increased output, cast iron, as being more readily secured and easier worked, has been preferred. Armature punchings, even of the toothed sort, formerly quite out of a purchaser's reach, are now regularly offered for sale. With the ability of purchasing both the castings and sheet iron, the time and expense of making patterns or fixtures is entirely eliminated, so that a builder can spend his time on the final construction work before his opportunities have become exhausted in preparations.

Aside from the use of the generator to operate wireless telegraph apparatus of the familiar types, low voltage transformers for electro-cautery operations, it will prove valuable for general experimental purposes. Being not too heavy for lifting, it can be used on a lecture table for class or lecture demonstration, illustrating the peculiarities of alternating currents at various voltages and frequencies, and further, the very interesting case of a synchronous motor.

Of course, the field magnet of the machine must be separately excited from some direct cur-

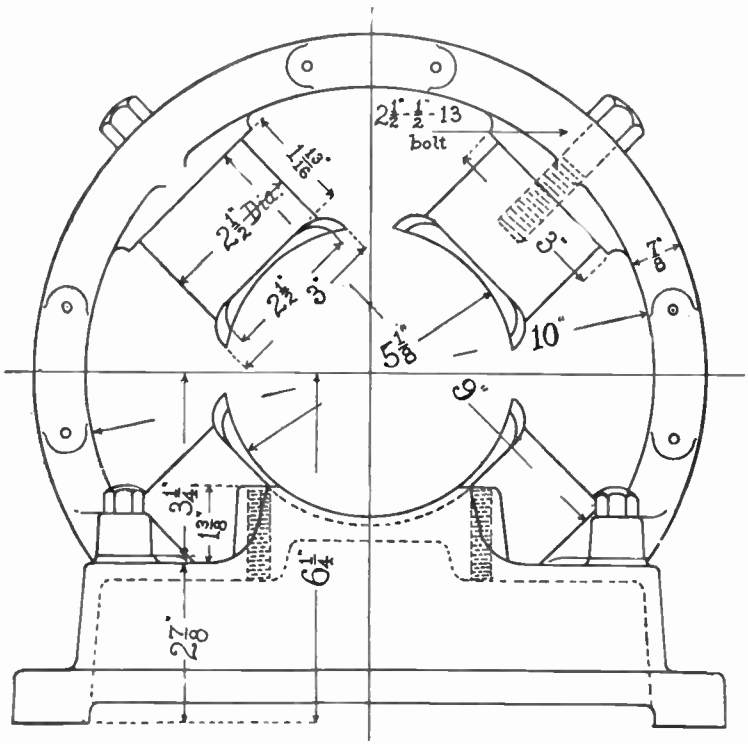


Fig. 2. End view of assembled machine

rent source. One method of making an alternator apparently self-exciting is to provide a special independent winding on the armature, occupying a small portion of the space in the slots, and connected to a commutator. The main winding is connected to the rings only. A second method is to make the exciter with its own field and armature, but on an extension of the main shaft. Both of these methods would complicate the construction to the extent of obscuring the inherent simplicity of the alternator itself, so are omitted from the description. The shaft is merely extended at the collector-ring end whereby a pulley may be fitted for driving a suitably small direct current generator,

but frequently there will be direct current available from the regular lighting circuit, and, of course, this will be the preferred source.

As described, the machine is for about 110 volts, but the reader will understand that other standard voltages may be substituted merely by winding the armature with a proportionate number of turns. In general, however, the proposed voltage will be found satisfactory, while for ranges above and below this the use of transformers will be advisable.

A set of the iron castings for the machine wil lweigh about 80 lbs., of brass or bronze 5 lbs.; for the shaft 5½ to 7 lbs. of machinery steel will be needed; for the armature core about 10 lbs. of toothed sheet iron punchings, and for all the winding about 16 lbs. of cotton-covered copper magnet wire. An allowance of about a dollar can be made for fiber for the spool flanges and for the insulation of collector rings. From these figures the builder will be able to predict the total cost of the materials and the finished weight of the dynamo.

For continuous operation at 1800 revolutions per minute the machine will readily supply a current of 7 amperes, but for short periods, say half an hour, the output can safely be 10 amperes. This means that with a non-induction load—incandescent lamps or other heating devices—the output will be three-quarters of a kilowatt, but with an inductive load—induction motors—the rating should be estimated in volt-amperes instead of watts.

Figs. 1 and 2 show side and end views, respectively, of the assembled alternator, the appearance, however, being quite similar to that for a direct current machine, the resemblance being heightened by the presence of the familiar shiftable brush holder yoke, as is expected with the latter type of dynamos. The reason for introducing this device with its admittedly superfluous adjustability for alternating currents is due to the fact that this is about as easy a method as any for supporting the brushes as well as for paving the way to utilize the main part of the machine for direct currents, if desired. Base, bearings, field magnet and armature core will appear in recognizable form. If a large number of machines were to be made, as well as special tools for the making, economy of materials and time would dictate a construction now largely followed by most manufacturers of having the field and base in one casting, or having legs on the field magnet, and the bearings contained in end plates or covers. In the design

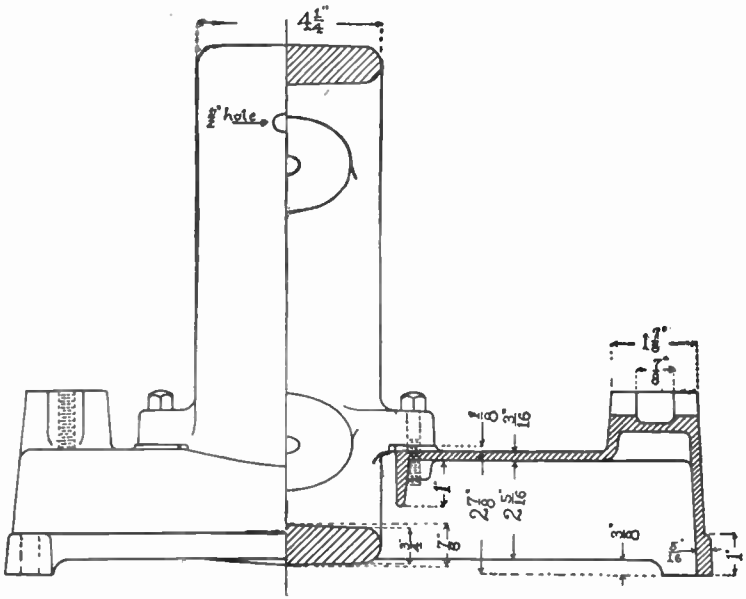


Fig. 3. Base, and field magnet yoke and frame

shown in this text greater simplicity of pattern making is attained, and the construction brought within the reach of smaller machine tools. For experimental and demonstrative purposes the open character of the construction is much more attractive than the semi-closed sorts so commonly seen on the market and in operation.

If the pattern for the base, see Figs. 3, 4 and 5, is to be made it can be regarded as a sort of cabinet-maker's job, being merely a shallow tray 3-16 in. or ¼ in. stock, with slanting sides and ends. A bead runs around the lower edge, enlarged at the four corners into lugs for readily securing the machine in place. A large central opening admits the field magnet that is to rest on four bosses, while curved seats are provided at the ends for receiving the bearing-pedestals to be bored out concentric with the field magnet. For general appearances as well as for comfort in handling, all posible corners should be rounded. Good-looking castings cost no more than ugly ones, and aside from the satisfaction in looks it is true that

round-cornered patterns alone produce smooth castings. For the base a single-part pattern will suffice, but some foundries might request, as an aid for the molding and as a protection to the frail pattern, that a mold-board be supplied. Field magnet, bearing lining, and bearing pedestal patterns, should be made in halves, that for the latter being fitted with three generous core prints, especially the print that extends from the oil reservoir, so as to overbalance the internal part. Single piece patterns will suffice. of course, for the pole piece, yoke and oil cover. In addition to allowance in the patterns for the shrinkage during the cooling of the castings, a suitable allowance must be made for a stock of metal on the surfaces to be machined, common practice with castings of this size being to add about 1-16 in. The dimensions shown are those that result after doing all the work.

With the castings at hand the first operation can well be to plane off the four lugs at the corners until a firm setting is obtained, by testing on a reliable plane surface. In the lack of a better, a marble-topped table will be admirable, the separation by a sheet of paper being sufficient to prevent scratching without interfering with the test. The four bosses on the top, on which the field magnet is to rest, can then be planed. Some awkwardness may be experienced in machining the field magnet, but a straightforward method will be to fit a piece of board to the interior, on which the center of the casting can be accurately located as well as the line to which the four projecting lugs are to be planed. The planing itself can well be done with the casting fastened to an angle iron in a planer. In the absence of access to such a tool a shaper will answer, but the clever and persevering experimenter will not balk at chipipng and filing the surfaces to an acceptable fit. No rocking when placed on the base is to be permitted, for in tightening the four bolts the base would then certainly be sprung. The proper idea is to stiffen, not distort the base.

For finishing the four internal surfaces on which the poles are to rest a planer, unless it be of the crank type, is hardly suitable. As the stroke will be short and a long-nosed tool required, it would easily catch and break, or the planer itself overrun. A shaper will be the best tool, for its head can easily enter the free space. Having already planed the surfaces on the lugs these can be used for setting the casting in the vise of the shaper, a 45 degree bevel gauge giving the correct angle. As a reliable guide for marking the position for the four bolt-holes for the pole-pieces

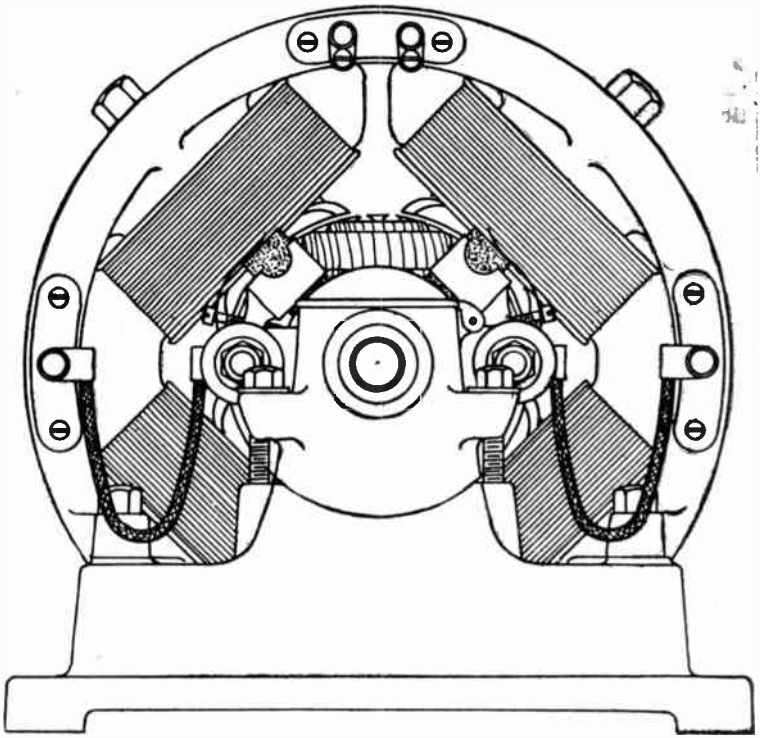


Fig. 4. Field magnet and base assembled

a strip of paper just long enough to wrap around the outside, and divided into four equal parts, will be simple and sufficient. If an upright drill is at hand with a table small enough to permit sliding the casting onto it, the drilling can be done quite perpendicular to the several faces, otherwise it may be done between centers on a large drill press or lathe bed. Small holes may first be drilled, then enlarged to the final size; four other holes may then be drilled, as indicated, for dowel-pins to prevent the pole pieces from skewing. The holes in the four supporting lugs are preferably drilled from the top, the casting resting on two parallel strips. A long drill will be required, and it will also be useful for locating the field on the base. For this purpose an ordinary

twist drill can be driven or soldered into a piece of tube or small gas pipe. Finally the six small holes for attaching on the connection-blocks can be drilled and tapped for 10-24 machine screws.

Place the field on the base, and as carefully as may be, prick-punch the location for one of the screws. Remove the field, drill the hole for nearly ¼ in. in depth to the full ⅜ in. size, then for the rest of the distance through the casting with a 5-16 in. drill; tap the hole entirely through with ⅜-16 thread; replace the field, insert the bolt, and with the long drill, start a second hole; again remove the field, drill 5-16 in., and tap the thread; now replace the field, secure it with two bolts, and start the two remaining holes; all will then be found to be correctly located, and the bolts will enter without jamming. The device of drilling full size for a short distance is a great help in starting the tap perpendicular to the surface. Sometimes it is worth while to insure a correct start by holding the tap in a drill press, working the tool back and forth with one hand while the pressure is maintained with the other. After securing a few threads for a start the rest may be done with the aid of the ordinary tap wrench. While the base is still at hand the four holes near the pedestal seats can be drilled and tapped, the latter being also accomplished in a correct manner by the means just described. Corner holes should be drilled at least 1-32 in. larger than the size of lag screws to be used.

The pole pieces should be centered, and for this purpose the castings can well be held in a chuck while marking with a hand tool the center of the face, but for the mark on the other end a little trial may be necessary, spinning the pieces in a lathe until suitably true running is obtained. The outer ends of the cylindrical portions should be squared off until the indicated available length for the spool is secured. If the pattern was well made with not too much taper, there will be no need of machining the 2½ in. diameter portion nor that adjoining the polar face. The builder will have to judge the necessity for this himself. Limits on the length of the poles can also be estimated by making sure that in the thinnest place the polar face or extension is not less than 3-16 in., and that the diameter for the armature before boring is not more than 5 1-16 in., 5 in. being a safe minimum.

Of course, it will be highly important to drill and tap the central holes in the pole pieces perpendicular to the machined surfaces, and the builder will have already obtained his methods

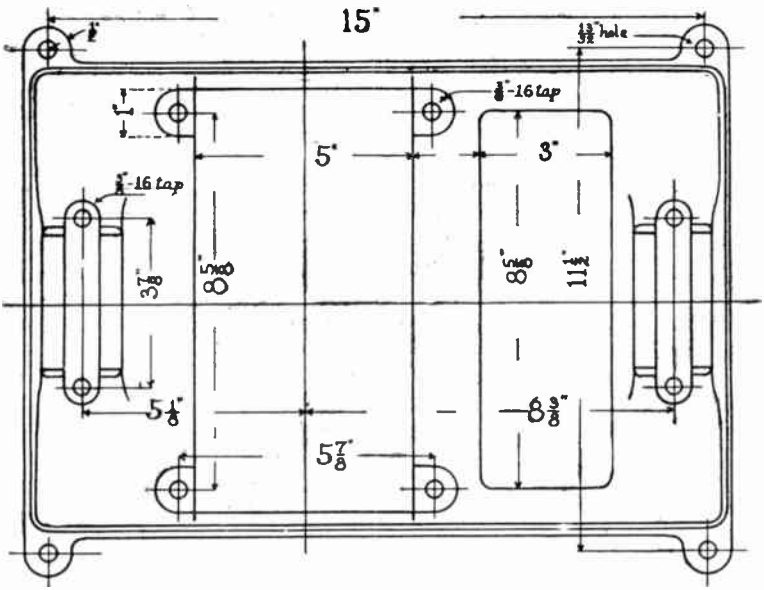


Fig. 5. Plan of base

for accomplishing the desired result, observing that he can drill for a considerable distance for the full size, and use a sufficiently long bolt; but if the drilling is not axial, the longer the bolt the worse will be the results. After tightly bolting the pole pieces in place, setting them so that the rims match in an even manner, the ¼ in. holes for the dowel pins can be drilled. Then when removing the pole pieces they should be numbered, and always returned to the right places. While the drilling will not be exactly alike on any two, it may yet be so nearly alike as to cause inconvenience in recognizing them. The marking is simple and sufficient.

(*To be continued.*)

For the convenience of readers who do not wish to make patterns, certain advertisers have arranged to supply castings for this machine.

Everyday Chemistry

OBTAINING FINGER-PRINT IMPRESSIONS

By W. C. Dumas

SINCE finger-print impressions are beginning to find a use for identification purposes in criminology, and as they have also been proposed as methods of identification in certain business transactions, the manner of obtaining these impressions is of interest.

A sheet of filter paper impregnated with an alkaline solution of sodium sulphide is used as a pad. The impressions can be easily made by pressing the tips of the fingers lightly on this moist pad, and after carefully wiping off the excess of liquid which adheres to them, again pressing on a sheet of glazed paper treated with a solution of lead acetate. A chemical reaction takes place between the sulphide of sodium which adheres to the minute ridges of the finger, and the acetate of lead which is on the glazed paper, and a black compound of lead sulphide is formed. The whole relief outline of the finger is indicated by the black lines of sulphide of lead on the glazed paper.

This print of the finger is not in a very permanent form, but if it is desired to preserve the outlines for some future purpose, a photographic enlargement can be made. For this purpose, instead of using the heavy glazed paper, a silk paper saturated with acetate of lead must be used. After the finger-print has been made upon this paper, as described above, the silk paper is rendered transparent by treatment with turpentine. The outline of the finger-prints, shown by the black lines of sulphide of lead, may now be transferred to potassium ferrocyanid paper in the same manner as blueprints are made, or the transparent paper bearing these lines may be used as a negative, and an enlargement made in the usual manner by using an enlarging camera. By the above method any number of finger-prints can be preserved in a permanent form.

In much the same manner, designs in lace and other fabrics can be reproduced or transferred. Suppose, for instance, that it is desired to make a lace design from the piece of lace itself. The fabric is laid upon a piece of slightly moist paper and securely fastened. It is then sprinkled with very finely powdered lead

acetate. After removing the fabric, and brushing off the excess powder, the paper is exposed to moist hydrogen sulphide gas, which forms the pattern on the paper in black and white by the precipitation of lead sulphide This developed impression of the fabric can be transferred to glass if so desired. A piece of silk paper coated with a mixture of white gelatin 10 parts, sugar 11 parts, glycerol 60 parts and water 35 parts, is allowed to dry, and then coated with formal, and again allowed to dry. If this paper is pressed on the black outline obtained above, the design will be completely removed to the treated silk paper. The impressions can then be transferred to glass.

SAVING THE TIN OFF CANS

By W. C. Dumas

THE amount of tin and sheet iron wasted each year in the form of old tinware is enormous. Tin cans cannot be used directly in the open hearth furnace on acount of the tin, and the tin cannot be completely melted off to separate it. The problem then was to separate the tin and iron completely, at as low cost as possible. It has required a long time and great perseverance to perfect methods of separation of these two metals in such a manner as to make the products pay for the cost.

In the older electrolytic process, the tin is obtained as a spongy mass or dirty slime, which was melted into block tin. There were many objections to this process, the greatest being that it required extreme care in order to be at all successful.

The chlorine process has largely replaced the electrolytic. In the early days of the detinning industry, only clean scrap from tin plate factories was used. However, many attempts had previously been made to use old cans, but a great many difficulties arose. The cans were not clean; they contained grease, paper labels, and often other foreign matter. Discarded and used cans also had solder, which is composed partly of lead, adhering to them, and other kinds even had rubber rings around the top to make them air-tight. Still another objection to the use of old cans was that they were very bulky, unlike the clean waste from the plate factories, and were not readily pressed into bundles.

It is evident that if the above

difficulties could be surmounted at as low cost as possible, a material of such small value as waste cans could be made to yield a profit by working it over. It was necessary to remove the paper labels, destroy the rubber, and separate the solder, as well as reduce the bulk.

The chlorine method surmounts these difficulties, as follows: The cans and scraps are first compressed into small bundles, which are then punched full of holes by means of rolls with sharp teeth on them. This operation is for the purpose of increasing the available surface and allowing the liquids necessary later on to penetrate to the interior of the bundle. Next, the bundles are treated with a strong lye solution which removes grease and adhering organic matter. After washing, the solder and rubber are removed by heating the bundles in a furnace. The material is now clean and ready for the removal of the tin which it carries.

The bundles are next placed in closed steel cylinders, and chlorine gas run in under pressure. The chlorine attacks the tin forming a compound known as tetra-chloride of tin but does not affect the iron. When this chemical reaction takes place considerable heat is produced, and in order to prevent an undue rise in temperature, a special method for regulating the temperature is used. The chlorine penetrating the bundles through the holes and crevices, completely separates the tin from the iron plates of the cans. Up until the time all the iron is removed, the pressure in the cylinders continues to drop, and when the pressure becomes stationary, the detinning is complete.

The bundles are then removed, and the tin tetra-chloride separated. It is a very valuable product, and is much used in the silk mills. The sheet iron remaining is sent to the open hearth steel works.

The total consumption of tin scrap of the world is about 170,000 tons, containing about 3,500 tons tin. This is a little over 3 per cent. of the total yearly output of tin.

Sweet peas will bloom in May if started in cold-frame and the glass removed about April 1. Get as choice seeds as you can. To have early flowers from outside sowing, plant in the fall 4 in. deep. The soil should be deep, rich and heavy, and a well-drained spot should be chosen. For succession sow after spring comes, in trenches 6 in. deep. Cover seeds with 2 in. of soil and earth up as they grow. Thin to 8 in. apart and provide a trellis. Keep the flowers picked clean, to prolong the season.—F. H. Sweet.

THE PORCH A LIVING-ROOM THE YEAR ROUND

By F. H. Sweet

FOR the reasons that led to the enclosing of the porch, making a glass room of it, let it be known that the owner had never lived in the country and therefore appreciated more the out-of-doors idea and the fresh air. Fresh air was the largest product of the scrubby, abandoned farm that he had purchased and whereon he built a home for both summer and winter. To utilize this largest product, the fresh air, to the utmost, the house was designed with few, but large, rooms and with a ten-foot-wide porch nearly surrounding it, and located on the highest open ground on the farm.

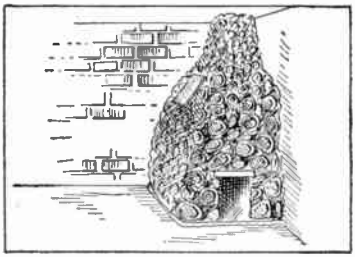
The porch has the disadvantage of darkening the first floor and is a mistake to that extent, but allows by its use the greater advantage of living in the house and yet out of doors in winter and summer. It was not enclosed to begin with, but happened to be well arranged for the purpose, having a low, wide rail closed to the floor by shingling. In the first he found that in summer the rain blew in on the porch, and even at times without rain, the chairs danced and the papers and books were blown about, all of which made the family go indoors, when all that was needed was a wind-break that would not exclude the light too much. Then in winter the difficulty of heating the house exposed to a northern blizzard was encountered.

For two good reasons, therefore, it was decided that the porch should be enclosed. Since then they have discovered many other reasons sufficient in themselves to warrant their appropriating for better use the outdoor living-room. And since it would not entirely deserve that name without a fireplace, they had to add that center of good cheer. This was readily done, as a chimney with a spare flue was available. To be in keeping with the informality of a porch, the mason work is of boulders and hard-heads, a product of the farm, laid up with raked-out joints.

The only methods the owners had seen of porch enclosure all seemed to have the disadvantage of interfering with the view or being unsightly themselves. They took up good room on the porch, or else had to be entirely removed from their hinges and stored away for the summer, thus impairing their usefulness. Many a short storm of rain and wind can be kept off, and the life on the porch go on just the same, if a quick and easy means are provided for enclosing it.

Here, the eight-inch-square posts supporting the roof are from ten to twelve feet apart. The window sashes, strongly made, are three in number, hinged together, and hung on the outside of the porch beam and under the eaves. These sashes are long enough to lap on the posts two or three inches at each end, thus keeping out snow and rain, but letting in some air. They desired only to keep the storm out. However, strips and good fitting will keep the air out if desired. These sashes are eighteen inches wide, and the three sashes just fill the space between the rail and the beam above.

The eaves of the porch are about two feet wide and protect the sashes from the weather when they are not in use. The two upper sashes are hinged to swing outward and the lower to swing inward. Two ordinary window cords are attached to the inner side of the upper sash and the cord extends through a pulley on the outer edge of the cornice, the cord going below and completely around the lower sash. It is necessary to have a notch the size of the cord in the lower edge of the lower sash; this contains the cord when the sash is down. A brass hook on each post holds them in place. Pulling on the outer ends of these cords when standing on the porch, after the sashes have been unhooked from the posts, doubles them up together and swings them up under the eaves. The cord is fastened around the awning cleats, located on the inside of the beam, holding all secure, practically out of sight from the porch, and safe from the weather. Two cords are used for each set of sashes. To raise the sashes readily the cords should be pulled together. One person of ordinary strength can



An open fireplace in one corner of the porch lends a cozy atmosphere

raise or lower them, but two can do it much quicker and more easily. Thus the porch, used as a living-room, can be temporarily closed in summer when a storm comes up suddenly, and as quickly opened up again to the clear, cool air after the storm.

The opening to the stone steps is ten feet wide and is closed in a similar way, but with the sashes hinged vertically. Five sashes, each eleven inches wide, filling one-half of the opening, are hinged to each post. The first and last sash of each set

are paneled instead of being glazed, is order to protect the glass from breaking when closed against the post when not in use. If desired these could go into a pocket in the post, as the old-fashioned inside blinds go into the window casings. Small brass bolts sunk flush with the surface are used at top and bottom on some of the sections, to fasten them in place whether open or closed.

On a chilly day or evening, with a log fire in the boulders, the enclosed porch is the pleasantest place in the house.

Now as to cost. The bill for the doorway, consisting of four paneled and six glazed sashes, all seven feet high and eleven inch wide, including hinges and bolts, was $15.80, and the carpenter's work about $5 more. The three sashes forming a section between two posts, twelve feet apart, cost, with hinges, cleats, hooks and cord, $15.25; and carpenter's work, fitting and erecting, about $2.50 additional.

On the whole, considering its utility and efficiency, the enclosed porch is the best and cheapest part of the home. Figure out for yourself the cost of one room in your house and compare with it the cost of making another room of your porch.

SLIPPING AND CUTTING PLANTS

By G. E. Walsh

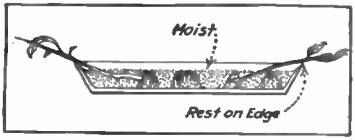
THE multiplication of garden plants by slipping or cutting in the hands of an expert seems little short of the miraculous to an outsider. Many amateurs have tried it with indifferent success, and others have achieved results that have increased the number of their plants ten, twenty and even a hundredfold. It seems simple to snip off a branch and stick it in the soil to sprout and grow a new plant, but, unfortunately, many do not sprout, and the amateur is perplexed and disgusted. It is a simple operation, but it must be done absolutely right to achieve any results.

There are several varieties of cuttings that a florist recognizes, and these should be clearly understood, viz., root cuttings, tuber cuttings, stem cuttings and leaf cuttings. Then there are "hardwood cuttings," which must be made when the plants are dormant in winter or very early spring, and "soft" or "green" cuttings made in the summer when the plants are full of sap and growing.

Most of our common garden plants are multiplied by the

stem-cutting process. These include the geraniums, begonias, verbenas, abutilons, hydrangea, and rose.

The mistake most frequently made in starting cuttings is to use garden soil. Instead of sprouting in this the cuttings rot and die. The proper soil for starting the cuttings is coarse, sharp, clean sand, which can be gathered easily from almost any sand bank without the admixture of any other soil. Richer soil is too much for the digestion of the baby plants. To attempt to start them in it is much like feeding a baby on strong food instead of a pure milk diet. That is why so many meet failure in this work.



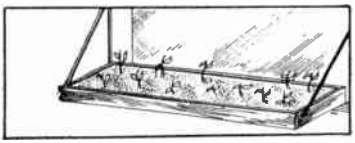
A deep saucer filled with sand may be used to start the cuttings

The simplest and perhaps the best way for the amateur gardener to start cuttings is to fill a deep saucer with sand nearly to the rim, and then stick the cuttings in it so they recline against the side of the pan. Keep this thoroughly moist at all times, and nature will do the rest. It is not even necessary to shade the cuttings when raised in this way, although exposure to a very hot sun is not advisable. It is commonly called the Henderson's saucer method. Slips can be started in this way in the house in February or March, and new plants be ready for transplanting to the garden as soon as the weather is warm enough.

Flats or shallow boxes are most commonly used by florists, and where a considerable number of cuttings are raised, they are necessary. The flats are nothing but shallow boxes of any convenient size, from 2 to 3 in. deep, filled with clean, sharp sand. These can be kept in the window or greenhouse, and as the weather grows warmer they can be moved outdoors. When first transplanted to these flats the cuttings should be shielded from the direct rays of the midday sun for the first week.

A third method is called the single pot process. The smallest size pots are used for this purpose, and a single cutting is inserted in each one. When the plants get rooted in the small pots they can be transplanted to larger ones filled with rich soil without disturbing the roots. This is one advantage this method has over the other two. No matter how carefully plants are transferred from the flats or saucers to the ground or pots there will be a certain amount of check in their growth. Several days of growth is thus lost.

One other system of starting cuttings is to plug up the hole in a 2-in. pot. Then fill a 6-in. pot one-third up with stones or broken shells for drainage purpose, and put the small pot inside of it. The space between the inner and outer pot is filled

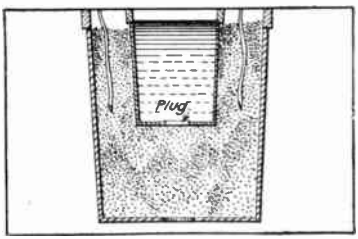


Flats or shallow boxes are commonly used by florists

with good sand. The cuttings are placed in this, and the middle pot filled with water. The advantage of this method is that the sand is always kept moist through the seepage of water through the inner pot. Many amateurs find this the most satisfactory method, for there is less danger then of having the cuttings spoiled through forgetfulness in watering them. The inner pot should be kept pretty full of water all the time.

Cuttings can be taken from any green sturdy plant for propagation, but only when the parent plant is in the right condition. You can tell this by a simple test. Take a geranium branch, for instance, and break it off with the fingers. If it snaps off easily and cleanly it is ready for slipping, but if it bends and does not break readily it is not suited for the work. The same holds true to begonias and coleus, although these flesh-stalked plants will often start sprouting any time.

Cuttings should be slipped off with a sharp knife, making a clean, straight cut. A sharp knife is better than the fingers or scissors. The bark of the slip above the cut should be bruised as little as possible. In order to sprout there must be a bud or eye somewhere on the lower end which will be buried under the sand. The sprouts start from the eyes. Be careful, therefore, to slip off the cutting so an eye will be inserted in the sand. It is generally better to have several buds or eyes under the sand, for if one fails to sprout then one of the others will.



The larger pot is filled with sand while the smaller one holds water

A cutting should be inserted in the sand to a sufficient distance to bring the eyes an inch below the surface. Deeper insertion is not necessary. Before inserting the slip in the sand, prune off the leaf stems, and also cut back

the top at least a third of its distance. This will cause the strength of the plant to go into root formation instead of leaves. Early leaf growth is not desirable. That indicates the plant is wasting its strength in the wrong way. Root growth is what we want.

From two to three weeks are required for the roots to get a start. Even then it is doubtful if the plant will stand transplanting. It is better to leave it a full month before attempting to give it stronger food. A little nourishment may be administered by sprinkling liquid manure in the sand after the third week. This should be weak at first, and increased in strength and quantity the fourth week.

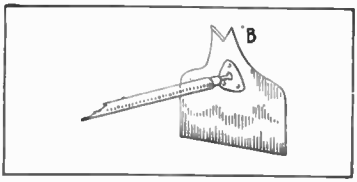
An Improved Method of Using Extension Ladders

Extension ladders are rather unweildy and usually cause some trouble in their manipulation. The following method is much simpler than the ordinary method. A long rope, twice as long as the ladder, is fastened to the lower round of the top ladder. It is then run over the top round of the lower ladder. Now, to raise the extension, pull down on the rope. This is the method used by large circuses where quick action is required.

Contributed by George W. Greene.

A Good Weeding Hoe

Fashion a hoe from a piece of heavy sheet iron or steel, and leave a small piece projecting from the top, as shown in the illustration. The small piece is



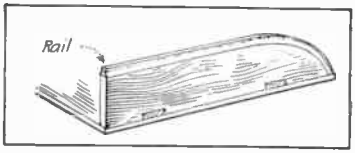
The small, notched projection is useful for weeding out between plants

notched with a sharpened edge. The notched piece is very useful in removing weeds from between plants, while the larger portion is used in the ordinary way.

Contributed by F. H. Sweet.

Sled Shoes

Light weight steel rails when fitted to the runners of a heavy



Light weight steel rails make ideal sled shoes

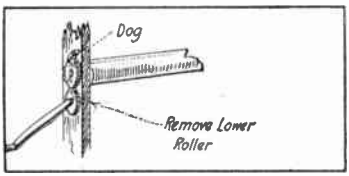
sled make ideal shoes. They are extremely hard, and will last a lifetime of hard usage.

Contributed by J. Skelton.

PRACTICAL MECHANICS FOR EVERYDAY MEN

A Home-made Windlass

A handy windlass can be made from an old wash wringer by removing the upper roller and placing a dog on the framework to catch the cogs. The wringer



This windlass was made from a wash wringer

should be made stationary before using it. The rope is fastened to the roller or else passed over it in a triple turn.

Contributed by Joseph F. Gaynor.

Quick Motor Repair

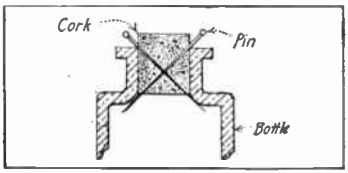
Sometimes the mica insulation between the segments of commutators starts pitting; this leads to trouble later on, as sparking and burnt-out windings. The better the micanite the less amount of pitting, but even the best pits in time.

To overcome this make a paste of powdered mica, plaster of paris and orange shellac, mixing them together until they form an easy working composition. Before applying the paste, scrape all the burnt insulation until the clean mica appears. Press the paste into all the crevices thoroughly without entrapping any air. Allow this to stand for twenty-four hours, then smooth the commutator with very fine sandpaper, after which it is ready for use.

Contributed by F. A. Grohsmeyer.

Locking a Bottle

A cork may be locked in a bottle by the use of two straight



Two pins will lock the cork

pins. The pins are put in the cork diagonally, as shown in the illustration. Thus the pins prevent the contents of the bottle forcing the cork out whenever it is accidentally overturned.

Contributed by James E. Noble.

A Kink for the Motorist

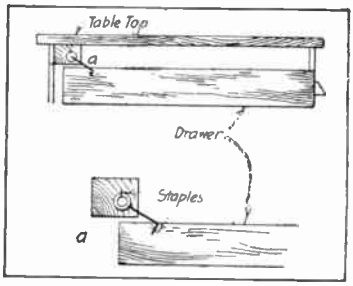
Headlight and small electric bulbs often come loose at the base of the bulb, where it fastens on to the metal part. If allowed to remain in this condition it will soon break off, due to the jar of the car. These bulbs can be saved if some stout thread is wrapped tightly around this place, as it wedges in between the bulb and the base and holds the bulb securely. Many dollars are thus saved, and the annoyance of having bulbs broken off is avoided.

Contributed by Elton S. Brown.

Table Drawer Lock

An easily constructed lock for your table drawer, which will mystify the curious prowler, can be made from a hook and two staples. The hook is shaped as shown in the illustration, from a piece of heavy wire.

A small block of wood is fastened with wood screws to the under side of the table top, adjacent to the upper edge of the drawer. To this the hook is attached by means of a staple. The drawer is then closed and the hook swung into the position it would occupy in holding the drawer fast. This position may be marked by scratching across the upper edge of the drawer side. A staple is now driven in the side of the drawer. The drawer is



The hook locks the drawer

shut and the hook swung into position, thus locking the drawer.

Contributed by George C. Denny.

Furnace Kink

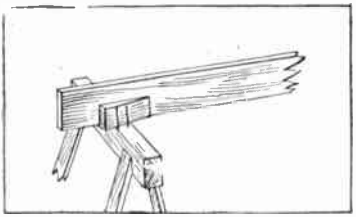
An easily constructed swinging crane can be made of 2 x 3 spruce in the form of a right triangle. The joints are mortised, tenoned and bolted. One side of the triangle is hung with heavy hinges, and at the outside end of the other side a pulley with a ratchet clutch is fastened. The crane is mounted over the outside cellar entrance, where the ash cans can be hoisted from the cellar and placed on a wheelbarrow for removal.

A very wise idea is to have a hose handy when taking the ashes out of the furnace, because by playing a stream of water on the ashes the disagreeable dust is turned into a damp mass.

Contributed by F. H. Sweet.

To Hold Plank While Planing

One of the best arrangements for holding a plank steadily on edge while planing it is to use two saw-horses as above. Two iron pegs standing about four inches high and about five inches apart are set in the top of each



Tap the wedge with a mallet and the board is held tightly

horse, and the plank laid edgewise between them. It is securely held there by means of a hardwood wedge, one on each horse, as shown in the sketch.

Contributed by Jas. Skelton.

Blackboard Surface

When the black surface on a child's blackboard becomes worn, a very good mixture is made by taking four parts good black paint, one part common varnish and one part plaster of paris and mixing them thoroughly. The blackboard needs to be given two coats. When dry this makes a very hard and serviceable surface.—A. Gemmell.

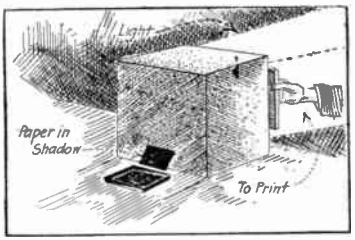
Preparation for Wind Shields

Use glycerine and salt in the proportion of 2 ounces of the former to 1 drachm of the latter, applying with gauze, strokes to be made up and down. In rainy weather the shield will shed water easily, and enable the driver of the car to see very well.

Contributed by H. G. Frank.

Improvised Dark Room

To make a handy dark room contrivance take a small open box about 12 in. x 12 in. x 12 in., and cut a hole in the center of one side. Put a drop light inside and, resting the box on a table, direct the light into one corner of the room. The chemicals and paper



The light need not be turned off when developing

are in the shadow in back of the box. When exposing the printing frame, pass it around into the light. When developing it is not necessary to switch the light off.

Contributed by Lawrence W. Pedrose.

Simple Remedies for Slight Burns

There are several chemicals which give quick and effectual relief from slight burns, if they are applied immediately at the time of the injury. A silver nitrate solution of moderate strength applied to the burned or scalded area will relieve the pain at once. A zinc chloride solution has much the same effect, but in a lesser degree.

There is another chemical which not only causes the pain to disappear, but also prevents the formation of blisters. This is picric acid. A saturated solution of potassium permanganate will also be found useful for relieving the pain caused by burns.

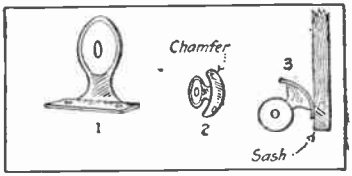
The reason the above named chemicals stop the pain and burning sensation is because they destroy or paralyze the superficial nerves on the surface of the skin. All of them are common substances and are easily procurable at any drug store.

Contributed by W. C. Dumas.

Window-blind Bracket as Fastener or Anti-rattler

Old window-blind brackets such as pictured in Fig. 1 make neat and serviceable sash fasteners or anti-rattlers.

The flange of the bracket is



Window blind brackets are used

bent to form a curve, as shown in Fig. 2, and the outer surface is slightly chamfered with a file. The little device is then fastened with a round-head wood-screw to the window moulding near the top of the bottom sash. When the sash is raised it is held up, as shown in Fig. 3. On windows that are not equipped with weights this simple device is very useful.

Contributed by T. H. Linthicum.

Ink Stains

To remove ink stains, squeeze a little lemon juice on them and sprinkle salt over the lemon juice, then steam by holding them over the spout of a boiling tea kettle.

—Raymond Murray.

Ink Spots on Hands

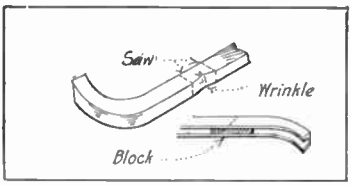
To remove ink spots from hands, wet them and rub with the phosphorus end of a match. Wipe the spot and repeat the action until the spot disappears.

—Emma F. Murray.

Repairing Automobile Fender

Recently a collision between an automobile and a pole resulted in a slightly twisted fender. The manner in which it was repaired may be of interest

The fender was of the square U section, and when bent back into position a bad wrinkle appeared in the metal. This wrinkle could not well be removed without marring the surrounding metal. The repair man, therefore, cut out the buckled part, which was only an inch long, with a fine hack saw. Filing and trueing up the ends just cut, he fitted them together by wedging a square block of iron into the two pieces and soldered the whole, taking care that the joint was thoroughly heated so that the solder sweated well into the union. A few touches with the burnisher and fine emery cloth made the joint unnoticeable, and practically as good as new.



The repaired fender was as good as new

Contributed by Thos. W. Benson.

Warming an Auto in Winter

A doctor employed the following method to warm the motor of his car in winter weather.

An old steam radiator was procured and laid flat on the garage floor and directly under the motor of the car when standing in its usual location. This was piped to the steam heater in the dwelling house, the pipes being buried below the frost line. A forked iron rod with a handle was run down through the partition from the doctor's bedroom and connected with the shut-off valve located in the basement near the heater. This was ordinarily kept closed.

When a night call came in the steam was turned into the radiator by means of the handle in the bed-room, and by the time the doctor was dressed and had opened the garage the radiator was hot, and the rising heat had warmed the motor to such an extent that starting was easily effected.

Contributed by L. B. Robbins.

Cleaning and Brightening Carpets.—After sweeping and beating thoroughly, wipe the carpet with soapsuds to which turpentine has been added, in the proportion of a tablespoonful of turpentine to each gallon of soapsuds. This will remove the dust and also brighten the colors.—F. H. Sweet.

A Method of Remembering the Wire Table

A wire which is three sizes larger than another has half the resistance, twice the weight and twice the area. A wire which is ten sizes larger than another has one-tenth the resistance, ten times the weight and ten times the area.

Number ten wire is approximately 0.10 in. in diameter, has an area of approximately 10,000 mils, and has a resistance of approximately one ohm per 1,000 ft. at 68 degrees Fahrenheit, and weight, approximately, 32 lbs. per 1,000 ft.

The weight of number five wire is 100 lbs. per 1,000 ft. To find resistance, drop one cipher from the number of mils; this result is the number of feet per ohm. To find the weight, drop four ciphers from the number of circular mils and multiply by the weight of number ten wire.

Contributed by F. A. Grohsmeyer.

Dyes for Tinting Photographs

The use of dyes for tinting prints and photographs is so little known that a brief description of the process may not be amiss. Most prepared tints are more or less expensive if a great amount of tinting is to be done, but by using dyes one can cut down the cost tremendously.

Buy a package each of yellow, red, blue and purple (woolen) dyes and dissolve the contents of each package in a quart of boiling water, stirring thoroughly. When cool strain out all sediment. This leaves four quarts of strong color from which all necessary tints and colors may be obtained by proper blending. A few of the special tints needed in coloring are obtained as follows:

Green and purple.....Bottle-green
Red, Black and Blue.....Dark Brown
Yellow and Blue.....Grass-green
Red and Yellow.....Orange
Red, Yellow and a touch of Blue, diluted, make "Flesh-tint."
Purple diluted makes.....Lavender

The black mentioned above is regulation water-color, as that is a little better adapted to tinting than a black dye. These tints are admirable for flat washes. In blending they should be worked rapidly to prevent lap-streaks or harsh edges.

Contributed by L. B. Robbins.

Oyster Shells

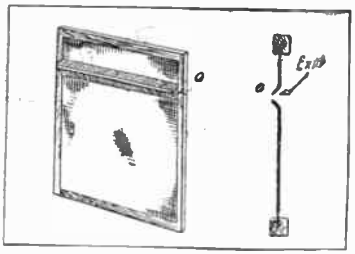
Powdered oyster shells are excellent to mix with the soil for potted plants.

Paint Spots

To remove paint spots, saturate a rag with turpentine and rub the spots with it.—Raymond Murray.

A Novel Fly Exit

It is a well-known fact that a fly will try to get out of a darkened room; therefore, if the screens are built as shown in the illustration they will walk up



The flies will go out, but cannot come in

and down the screen until they come to the slot, which slants out, and follow it until they are allowed to fly outside. In defense of the idea that the flies will not use the same method to gain entrance it is sufficient to say that it is known that flies will not crawl up an incline to gain admittance to a space, thus the only possible manner of entrance is for the flies to fly directly in through the slot, which is impossible, as the slot is built only a quarter of an inch wide.

Contributed by C. H. Thomas.

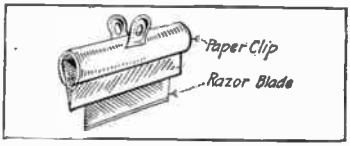
Freeing-up Motors and Generators

In overhauling or in shipping motors and generators many times the bearings become stiff because of rough knocks, which cause the shafts to be sprung. The simplest way to remedy this is by mixing one part valve grinding compound with three parts lubricating oil. Put this in your bearings and run the machine without any load for twenty or thirty minutes. If the bearings still run stiff, use the mixture in the proportion of one to one. As soon as the machine runs freely wash the bearings with kerosene oil and use a very fine grade of lubricating oil thereafter.

Contributed by A. Gemmell.

Paper Clip as Razor-blade Holder

A small paper or bill clip like the one pictured in the illustration has proved to be a very good holder for old razor blades.



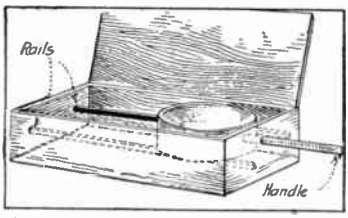
For scratching blots of ink, this is very effective

In such a holder the blades may be safely and effectively used for sharpening pencils, opening letters, cutting cardboard, making erasures, ripping stitches, etc.

Contributed by T. H. Linthicum.

Dustless Ash-sifter

A dustless ash-sifter may be made from a box by hinging the cover, putting in two hardwood rails for a sifter to run on, and cutting a hole in one end of the box for the handle of the sifter to extend through. The sifter should be a little bit smaller in diameter than the width of the box. The sifter bottom should be of very strong wire mesh to allow for rough usage. The ashes are put in the sifter when they are taken out of the furnace, the lid is closed and the sifter handle



The cover is closed and the dust does not leave the box

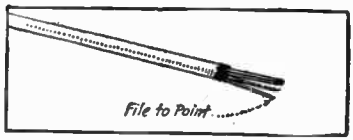
pulled in and out rapidly. When the operation is finished the good coals are in the sifter and the ashes are in the bottom of the box.

Contributed by C. H. Thomas.

To Clean Painted Woodwork.—Cover the soiled places with kerosene oil, after first brushing off the dust, and let it remain for a few minutes; then wipe off with a soft cloth.—F. H. Sweet.

A Quickly-made Spear

A spear which can be made very quickly needs only a handle of convenient length and some hay-wire tines with a short length



An easily-made fish spear

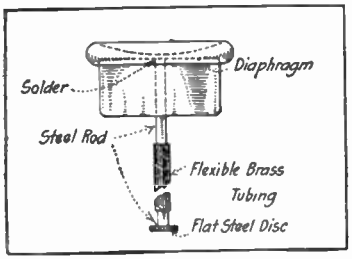
of iron wire. The tines are driven in the end of the handle and then the end of the handle is bound with the iron wire. If other wire is used, it should be rigid enough to penetrate the fish and yet soft enough to bend and hold the fish securely. A file should be carried along to keep the points sharp.

Contributed by Lawrence W. Pedrose.

To Clean Brass Candlesticks.—There is nothing better for cleaning old brassware that has become discolored than the pine ashes that accumulate in stoves. First scour the article well with the fine powder moistened with warm water, then wash thoroughly in warm soapsuds and dry with a woolen cloth or chamois skin dipped in the fine ashes. If this is carefully done the brass will look like new.—F. H. Sweet.

Automobile Trouble Finder

A simple trouble finder is made from the diaphragm and case of an old pony telephone receiver and a shaft made of two pieces of steel rod, a steel disc and a length of small di-



This device detects any knock in the engine

ameter flexible brass tubing. The flexible tubing is soldered to both pieces of steel rod, the disc is soldered to one piece of steel rod and the other piece of rod is put through the hole in the back of the case and is soldered to the center of the diaphragm. The disc is held against the engine while the ear detects any knock in the engine from the sounds emitted by the diaphragm.

Contributed by Elton S. Brown.

To Shine Boots Quickly

Do not blacken, but rub on a piece of orange and let the juice dry in, then polish with soft brush and they will shine like a mirror.

Cleaning Silverware

A method of cleaning silverware that requires only material found in the kitchen, and one that gives a fine luster to the metal, is as follows:

Procure one or more Mason jar caps and break away the opal disk inside. With a pair of heavy shears notch the edge of the cap in two or three places.

Place the caps in the bottom of a non-metallic jar or container large enough to hold the silverware, which is then covered with lukewarm water. Add two tablespoonfuls of salt and the same amount of baking soda.

In five minutes remove the silverware and dry with a soft cloth. The resulting polish will be a surprise, and no rubbing is required. This solution does not in the least injure the silver, the action being entirely electrical in nature but harmless.

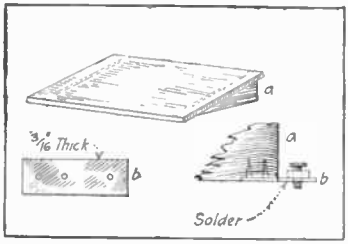
Fitting a Shoe

A lace boot should be fitted so that there will be a space of three-eighths to one-half inch between the lace stays. This will allow the shoe to tighten up as it becomes shaped to the foot. The shoe should not bind over the instep, and should fit the arch of the foot in a snug and even manner.

Contributed by Mary F. Scott.

Attachment for Leveling a Drawing Board

A simple method of getting rid of the warp which is liable to come in your drawing board is shown in the accompanying illustration. This device also gives a slant to the board as well as making it set firmly. Two tapering cleats are attached to the cleats already on your board. A metal strip with a nut soldered to it is attached to the end of each taper



Boards which have warped may be kept from rocking

ing cleat. A knurled thumbscrew is threaded through the nut and is used to raise or lower the back of the board.

Contributed by A. Gemmell.

Fire on Water

Purchase a small quantity of potassium at the chemist's, and place a small piece on the surface of water in a large basin. It will immediately take fire and burn with a brilliant violet flame, darting rapidly about on the water until entirely consumed.

Sod Basins for Trees

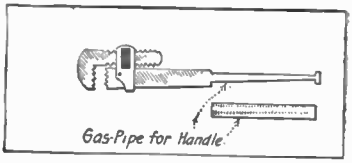
One tree lover has devised an attractive way of protecting the base of tree trunks by arranging a square border of sod, two feet wide, around each one of the trees bordering the boulevard. In this way the sod between the border and the tree trunk may always be kept loose, allowing the moisture of rains to soak into the ground and nourish the roots.

Were it not for this sod basin the gravel path, coming close to the tree, would, in time, become firmly trodden down, causing the tree to suffer accordingly. The idea is one that could be adopted elsewhere to good advantage.

Contributed by F. H. Sweet.

A Sturdy Wrench Handle

When the handle of your Stillson or monkey wrench breaks off, cut a piece of gas pipe the same



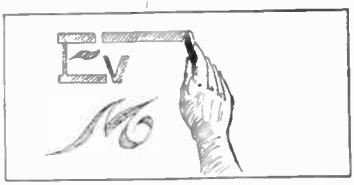
A length of gas pipe replaces the wooden handle

length as the wood handle. Put the pipe on the rod of the handle and grind or file the pipe down to be uniform with the remaining parts of the wrench.

Contributed by E. E. Wilson.

Lettering on Mirrors and Windows

For lettering on mirrors or glass surfaces temporarily, nothing is superior to store cheese. Cut the cheese into a piece measuring 1½ by ¼ in. and of any convenient width. By holding



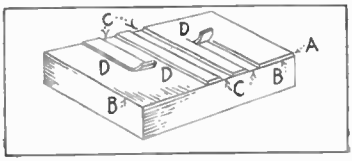
The result is neat and attractive lettering

this at a slight angle, it is possible to produce shaded lettering of surprising clearness.

Contributed by Thos. W. Benson.

Chipping Flat Metal Surfaces

Here is a good method for chipping flat metal surfaces, both large and small. The edges are first chamfered, as shown at *A*, to facilitate starting the chisel and to prevent the stock from breaking off as the chisel leaves the work. This chamfer is to extend around the work with lines that have been scribed to the required depth, as shown by the line *B*. The stock is removed above these lines by first cutting a series of grooves across the surface, as shown at *C*, using a cape chisel or narrow flat chisel, and leaving the ridges, *D*, between the grooves. These ridges are then removed with a broad,



The edges are first chamfered as shown

flat chisel. The width of the ridges should be about the width of the flat chisel available. The advantage of this method lies in the fact that the flat chisel has no straight cutting to do, and no lifting or tearing of metal at the corners is involved.

Contributed by George W. Jager.

To Clean Type Bars of Typewriter

The type bars of a typewriter can be easily cleaned in a few minutes with a rag that has been soaked in benzine. Benzine removes the accumulated ink more quickly than other cleaners and evaporates after it has served its purpose, leaving the type bright and clean.

Contributed by J. Arthur Reid.

To remove dandelion stains from hands and garments use gasoline.—Emma F. Murray.

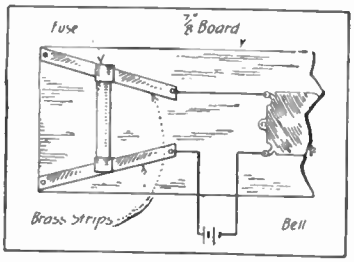
How to Make a Heater Out of an Oil Stove and a Gas-plate

A very useful heater can be made out of a worn out oil heater, the drum only of which must be in good condition. Set a single plate gas burner inside the oil stove into the space formerly occupied by the oil fount. Attach a piece of gas tubing to the burner, drawing it out through the slot at the side provided for the wick rod raiser, and connect the tubing to a hose-cock in the room. A gas burner arranged in this way gives out a great deal of heat.

Contributed by N. D. Dunlea.

Electric Fuse Tester

A simple cartridge fuse tester is made by mounting two brass



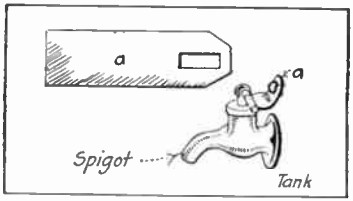
This method is simple and effective

strips on a wood base. The strips are connected in series with two batteries and a bell which is mounted on the same base as the strips. The strips are mounted in a slanting position so as to permit the testing of any size of fuse. If the fuse is good the bell will ring; but if the fuse is blown out the bell, of course, will not ring.

Contributed by A. Gemmell.

Locking a Valve or Spigot

At times it is deemed advisable to lock a valve or spigot to prevent unauthorized persons from helping themselves to the con-



Cut a piece of iron as shown in the illustration

tents of a tank or barrel. Here is a suggestion which will do the trick.

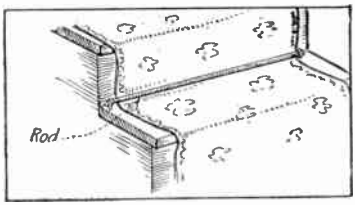
A piece of iron or brass 2 in. wide is cut to the shape shown in the illustration. The flat end of this is bent to fit the handle of the spigot, while the slot fits over a staple riveted to the container. A padlock will complete the job.

Contributed by Thos. W. Benson.

When the oven burns things on the bottom cut a piece of door screen and cover the bottom of the utensil with it.—Emma F. Murray.

Laying Stair Carpets

To facilitate the quick removal of stair carpets for cleaning, the following scheme was evolved and found successful. Small brass screw-eyes were driven into the angle formed by the tread where it is joined by the riser, sufficiently far apart to permit the carpet to be laid between them. A number of brass covered rods, long enough to reach through the screw-eyes were obtained, and these rods were slipped into place as the carpet was placed in position. The result was a neat



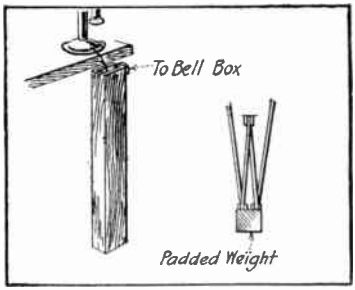
The carpet is easily removed for cleaning

stair carpet, instantly removable for cleaning when necessary.

Contributed by Thos. W. Benson.

Taking Care of the Telephone Cord

Being bothered by the telephone cord sweeping objects off the desk, I devised the simple arrangement shown herewith, and had the satisfaction of seeing it work out admirably. A shallow box some 24 in. long, 2 in. deep and 3 in. wide was constructed and a pulley mounted at the upper end. The telephone cord was



No cord is in your way

then run, as shown, around this pulley and a double pulley, to which a weight weighing half a pound was fastened. The box was then fastened under the edge of the desk near the wall. With this arrangement the cord was kept wound up and out of the way. A light pull brought sufficient cord out to meet the requirements of the user.

Contributed by Thos. W. Benson.

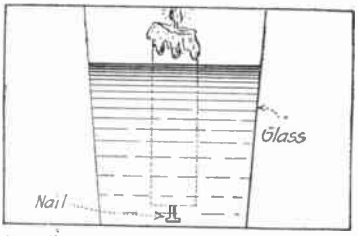
Unconsuming Flames

You may seem to destroy an article, as a bank-note, letter, or a handkerchief, by pouring on it spirits, good brandy, etc. A handkerchief, well soaked in white of egg and alum, is also incombustible.

Contributed by H. G. Frank.

Safety Candle Lamp

Put a nail in the bottom of a candle and place the candle in a glass of water. The nail balances the candle, and the water keeps it cool when lit. The glass keeps the draft away, and the candle will burn evenly until consumed to the water line. As a



A nail in the bottom keeps the candle upright

night light for the sick-room, the improvised lamp is admirable, since it is mild and absolutely safe.

Contributed by Thomas Dean.

Making Small Signs

A simple method for making a number of similar signs for placarding utilizes blueprint paper.

On a sheet of tracing cloth lay out and fill in the lettering and line drawing desired. Then print the required number of signs by the usual blueprint process.

Although the colors are limited, this method was used with excellent success in announcing a small bazaar. The expense is very low and the results pleasing.

To Keep Flowers Fresh

Placing freshly cut flowers in water to which half a teaspoonful of sal ammoniac has been added will keep them fresh looking for from 15 days to three weeks.

A weak solution of camphor water will revive flowers that have become dry or slightly withered.

Contributed by T. W. Benson.

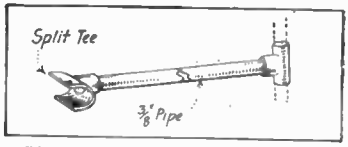
When Filling a Fountain Pen

A good idea when filling a fountain pen is to place a straw in the barrel, thus preventing any air bubbles forming and mussing up of one's fingers.

Contributed by Alfred R. Wagstaff.

Shut-off Rod for Plumbers and Gas Fitters

This is a very handy tool which can be made cheaply and easily in the shop. A ⅜ in. wrought tee



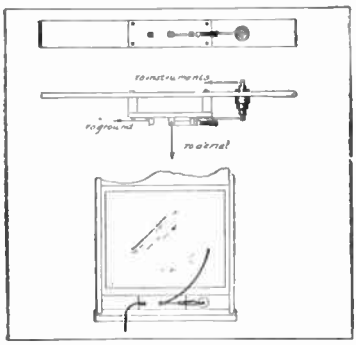
The shut-off rod is made of piping

should be split and spread open, as shown in the illustration. The handle is made of a pipe of convenient length, two 6 in. nipples and one tee.

Contributed by C. H. Thomas.

Aerial Lead-In

In rented apartments where it is difficult to secure permission to drill through the outer wall for a lead-in, the sash board shown overcomes all difficulties. It can be dropped into place or removed with little difficulty, makes of easy access to the light-



How the lead-in may be arranged

ning switch, and has the appearance of businesslike neatness that should characterize the modern amateur's stations.

Contributed by C. H. Biron.

Easing Desk Drawers

To ease the opening of a desk drawer which may contain something quite heavy, put some floor wax on the runners at the bottom. You will be surprised at the ease with which the drawer will open afterward.

Contributed by Alfred R. Wagstaff.

Marble Cleaning Compound

Sodium bicarbonate: 2 parts.

Powdered pumice stone: 1 part.

Powdered chalk: 1 part.

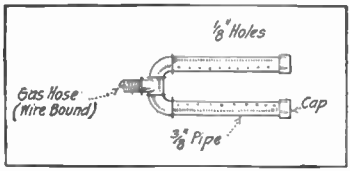
Pass through a fine sieve and mix with sufficient water to make a paste. Rub the paste well over the marble surface, then wash off with soap and water.

By this process weatherstained monuments may be made to look like new.

Contributed by J. C. Gilliland.

Home-made Fire Kindler

The materials needed for a home-made fire kindler are: 2 pieces ⅜ in. pipe 10 in. long, 2 caps, 2 ells with one end having outside threads and the other end inside threads, one tee and a length of wire-bound gas hose. Drill a series of ⅛ in. holes in the 10 in. pieces and assemble



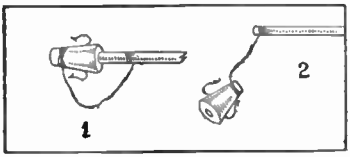
Where hard coal is used, this kindler is very useful

them as is shown in the illustration. By connecting the hose to a gas supply this is very useful in starting a fire, especially where hard coal or coke is used.

Contributed by E. E. Wilson.

A Push Gaff

An excellent push gaff is made by fastening two fish-hooks to the large end of a small wood cone. The small end of the wood cone is attached to the handle by a stout fish line. The large end of the cone has a hole in it to fit over the end of the handle. When fish are gaffed, a quick twist of



The cord is wound around the rod

the handle detaches the cone, which reverses, allowing the fish to be played on the string.

Contributed by Lawrence W. Pedrose.

Sprinkle the Coal

Sprinkle all your coal with water before using in stove or furnace; it will make a hotter fire and burn longer.

Keeping a Knife Sharp

In cutting a substance like meat on a hard surface, tip the knife a little to one side. This will prevent the knife edge from being turned over.

Contributed by Alfred R. Wagstaff.

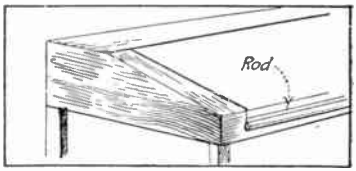
Ground Glass Substitute

The following solution, if poured evenly and quickly over plain glass, will give a surface which has the same appearance and properties as real ground glass: 90 grains of gum sandarac, 20 grains of gum mastic; dissolve in 2 oz. of ether and add 1 oz. of benzole. The benzole should be quite fresh.

Contributed by Geo. W. Greene.

For the Table or Desk

A rod of ½ in. iron sewed in the edge of the oilcloth covering of a desk or table, and allowed to hang so the weight will hold



The rod keeps the surface of the desk smooth

the cloth tight, will keep the surface always smooth.

Contributed by J. Skelton.

To preserve brooms dip them a minute or two in a kettle of boiling suds once a week. This makes them tough and pliable. A carpet wears much longer when swept with a broom treated in this manner.—Emma F. Murray.

A Chat With the Editor

An Acknowledgment to the Reader

YOU, my Reader Friends, have pulled little Everyday through a crisis that came very near being fatal; thanks to your loyal, unselfish, and keenly enthusiastic support our magazine has entered upon a year of what promises to be unprecedented success and growth in the magazine field.

When we were in trouble and up against a hard and uphill fight for existence, I took you into my confidence and *you pulled your little magazine through.* To my appeal you responded so promptly and cordially that Everyday has weathered the storm and is fast getting on its feet.

Thousands of you have written me and I have answered hundreds of letters; some day each one of you will hear from me a personal acknowledgment of my sincere appreciation, but until such time as I can dictate and sign this enormous mass of correspondence, I want you to receive my message through these columns. It is this: Whatever success may come to Everyday in future is due almost entirely to the loyal readers who came forward in its time of need with orders for books, for subscriptions, and with suggestions for the betterment of the publication. I thank you from the bottom of my heart and my greatest wish is that your little magazine may, with each succeeding number, afford a better proof that your confidence and interest have not been misplaced.

Where Do You Buy Your Goods?

THERE is but one thing lacking now to make Everyday a complete handbook for practical workers—that is a comprehensive advertising section. True, the gain in advertising each month is a good one, but we need more. Our fixed policy which excludes questionable advertising has prevented us from taking copy in certain cases where previous experience has shown us that the advertiser was unworthy; we needed the money that this class of business would bring, but we could not consistently take it and still feel that Everyday was conducted and supported for and by *the reader.*

You, my Friends, can help us once again by supporting the advertisers in Everyday. I am not exhorting you to buy goods that you do not need, but I am asking you to at least give the advertisers

in *your magazine* a chance to supply your needs when you do purchase apparatus, parts, or materials. The concerns represented in EVERYDAY now number the very best and most reliable ones in the field and the *moneyback guarantee* of Everyday Mechanics Company, Inc., insures the reader absolute satisfaction or the immediate refund of his money if he deals with our advertisers.

Besides purchasing your supplies from our advertisers, you can also help your magazine by helping us to secure new advertising from reliable firms of your acquaintance. If you buy goods from a house not represented in our columns and have found them satisfactory in your dealings, why not write them suggesting that they try a page in EVERYDAY?

I consider you, every one of you, a stockholder in this little magazine of ours. It is your money which supports the magazine. My job is to give you what you want, editorially, and in asking you to get busy in the advertising direction, I feel that we all have a common goal in view—the ultimate success of EVERYDAY. By success I mean a constant improvement in the quality of the material presented, a broadening of the work we are doing in the *Experiment Station*, the addition of new departments through the addition of more pages—not through the elimination of any of the present sections. All of this will come just as fast as the Company is in a position to make the increased expenditures. Let's all get together and make that time come soon!

Sincerely,

Thomas Stanley Curtis

Your Editor.

THE TECHNICAL ADVISER

The object of this department is to answer the questions of readers who may experience difficulty in the construction or use of apparatus described in the magazine. The columns are free to all readers whether they are subscribers or not, and questions pertaining to matters electrical or mechanical will be answered in the order in which they are received. If the reader cannot wait for an answer to be published he may secure an immediate answer by mail at a cost of 25 cents for each question.

In order to insure prompt attention, readers should adhere closely to the following rules which have been formulated with a view to expediting the handling of the mass of correspondence. Questions should be written on one side of the paper, enclosed in an envelope addressed to The Technical Adviser, care of Everyday Mechanics, Æolian Hall, New York City. The letter should state plainly whether answer is to be published or sent by mail; in the latter case the fee of 25 cents per question should be enclosed in coin, one-cent stamps, check or money-order. The envelope enclosing questions should not contain matter intended for any other department of the magazine.

41. W. J. B., Jr., Greenwich, Ct., asks (1) which we consider the more efficient, a one-step audion amplifier or a one-step multi-audi-fone; (2) if the super-sensitive audion set described in the October issue will receive undamped waves; (3) what the principle of the multi-audi-fone is; and (4) if we have ever heard of a certain type of searchlight the rays of which are invisible when close at hand but when viewed from a distance of 20 miles are plainly visible. Ans. —Your question is so broad as to be difficult of an answer. The term "efficient" is ambiguous and our answer must be based upon certain assumptions as to your meaning. The opinion we express is based solely upon our own experience in tests with these two instruments, both of which are masterpieces in their respective fields. We do not wish to take sides with either manufacturer and must insist that you form your own conclusions from the report we give.

The audion amplifier will make audible and readable signals that are below the point of audibility, *i. e.*, signals that cannot be heard at all will be found and brought out by the audion. The multi-audi-fone, on the other hand, will not catch a signal that is not audible; that is, it must have an *audible* signal to work on. Given an audible signal, the multi-audi-fone will amplify it to a considerably greater extent than the audion; that is, it will bring it out loud and strong where the audion may not increase the sound to so great an extent. To offset this pronounced advantage of the multi-audi-fone over the audion, the former also amplifies and reproduces every extraneous sound to an astonishing degree. Therefore, while the radio signal may be much louder, the fone will also bring out every conceivable noise in the room unless great precautions are taken to muffle all sounds. Then again, the audion stays in adjustment while the multi-audi-fone requires frequent adjustment.

Summing it up, the audion is

the more conservative instrument of the two; it locates signals inaudible otherwise, it holds its adjustment, it does its work quietly and does not amplify or even record extraneous sounds that have no bearing upon the radio. The multi-audi-fone is spectacular and a bit startling; it increases audible signals enormously so that they may be heard through a horn or loud-speaking telephone, it reproduces extraneous sounds, it requires frequent adjustment but is not difficult to adjust. Each has its advantages and either will give great satisfaction in its particular sphere.

Ans. (2) Yes. (3) The multi-audi-fone is a marvellously sensitive microphone with a tiny diaphragm. The amplification is accomplished through the duplex means of microphonic contact and a balanced magnetic field which is extremely sensitive to the slightest change in the established equilibrium. (4) We have never heard of this type of light but are referring your inquiry to an eminent authority on the subject and will report the result in a later issue.

42. **N. J. K., Dubuque, Ia.** This correspondent's question relative to his experience with a home-made lighting plant appeared in the September issue under No. 29. We have received answers and suggestions from all parts of the world and we publish herewith two of the ones that seemed to size up the situation and solve the problem. We have confirmed, as well as we could in the short time available, the dependability of both the processes suggested and offer them to our correspondent with full assurance that his troubles are near an end if he will follow the directions given. The answers follow:

Ans. (1) From S. D. Dimond, 105 West 4th St., Duluth, Minn.

I have read with interest the questions asked by N. J. K., Dubuque, Ia., in the September number of EVERYDAY MECHANICS. Perhaps what I have learned during the five years that testing, repairing, building and inspecting storage bateries has been the greater part of my daily work will enable me to answer the questions to some extent, at least.

He says among other things, "Surely manufacturers cannot experience all this trouble. There certainly must be some way of doing it." (This referring to his troubles with positive plates). No, the manufacturers do not now have all this trouble, but they have had to overcome them and many others to bring the battery to its present stage of development, and any user of storage batteries knows how much room there still is for improvement. But to answer his questions:

The positive plates should not be pasted a second time (after they have been used and the active material removed) as the coating of oxide on them makes it impossible to get good contact between the active material and the grid. They can, however, be melted and cast for use again.

To make a good hard paste for the positive plates which will stand up in service, follow the formulas given closely. Make up a quantity of powdered sulphate of ammonia by thoroughly crushing (with a glass bottle for a roller) some commercially pure sulphate of ammonia. Mix this with red lead in the proportions of 100 parts red lead, by weight, to 11 parts sulphate of ammonia. Make a paste by mixing this mix-

ture with 26 degrees ammonia, the paste to be thick enough so as not to run. Mix paste enough for only one or two plates at one time, as the paste hardens rapidly. Place the grid to be pasted flat down on a piece of paper placed on a glass, marble or smooth flat stone surface. Working rapidly, pack the grid with a flat wooden paddle, being sure to leave no air holes. Use enough paste so that it will be a sixteenth of an inch or more thicker than the grid itself. Place several pieces of blotting paper over the plate and over this a smooth hardwood board. Pressure is now to be applied. A letter press is just the thing for this or use weights of three or four hundred pounds. In half an hour the surplus liquid will be pressed out and the weights and paper can be removed. Care must be taken in removing the paper or the paste will come with it. The plate can now be dried on a flat smooth hardwood board, thick enough so as not to warp. The plate can be turned at intervals through the day, and kept in the warm sun. Twenty-four hours at least will be needed to dry them properly. You will now have what is known as an unformed or green plate. The color, however, will be bright red. Using a sharp straight edge of some kind, such as the back of a stiff saw blade, scrape the material off even with the ribs of the grid. The plates are now ready for sulphation. Dip for an instant in 1.100 Sp. Gr. sulphuric acid. Do this quickly at first, then hold the plates in the air an interval and dip again, but leave the plates in twice as long this time, remove from the acid again for a short interval and then place in the acid for twenty hours. At the end of this immersion the plates are to be washed for two hours in running water. Factory plates are now brushed with a stiff bristle brush and are ready for the forming charge. The plates will have to be worked up with long charges at a low rate to thoroughly form them, and their capacity will be low at first. It will increase in a most gratifying manner as the plates are used and the life of the plates will be as great as any except the very best factory made. If I can furnish any further "dope" on batteries will be glad to do so.

Ans. (2) from Philip M. Haffcke, 47 Locust St., Danvers, Mass.

I have bought EVERYDAY MECHANICS from the news stand for several months and in your September, 1916, number, I took no small interest in the troubles of N. J. K., of Dubuque, Ia., about storage battery making.

He and I are both "stickers" I guess and like him I will always be a regular kid when it comes to experimenting.

My troubles started in the making of storage battery plates, the same as with him, until finally I simply stumbled upon a formula radically different from those in the text books.

At the risk of becoming the laughing stock of all concerned, I will say that the man who started publishing the method of using a paste of "red lead" or "litharge" mixed to a paste with *sulphuric acid*, surely didn't know the least of what he was talking about. It's either he never tried it, or he had tried it and wanted to play a practical joke on some innocent experimenter, and it was passed along until it finally ended in print.

Now I shall give you what has

always been guarded as a trade secret, by a man in the business. I tried it and want you to try it also.

POSITIVE PLATE.

Red lead (pure) 100 parts by weight Sulphate of Ammonia, 11 parts by weight. Mix together and make into a thick paste with Ammonia 26°.

Don't mix more than enough than is needed immediately (within 5 minutes) as it won't adhere properly if you do. The paste is applied *freely* to the grid and then pressed between blotting papers under heavy weights or better still in an old letter press, for 15 to 20 minutes. Allow to dry face down *in the sun* for 24 hours, turning often. Scrape clean with scraper and then it is ready for "sulphating." Sulphating is necessary for the *positive plates only*.

SULPHATING.

Make solution of sulphuric acid (C. P.) 1.00° (which is equal to water 86 per cent. and acid 14 per cent. at 60° F) and immerse plate "quite" in solution, withdraw and wait a few seconds till the gassing stops and then dip again for 3 to 5 seconds and withdraw. Immerse a third time and leave in solution for 20 hours (not more) after which wash in running water for 2 hours and brush with stiff brush, but not too hard. (I used a vegetable brush). Positive plate is now ready for forming, and paste is as hard as Portland cement.

NEGATIVE PLATE.

Litharge 100 parts by weight. Sulphate of Ammonia 6 parts by weight. Mix together and moisten to *thick* paste with Ammonia 26°, 10 parts by weight. Glycerine C. P., 2 parts by weight. (Mix thoroughly by shaking). This paste sets quicker than positive plate and does not need sulphating.

FORMING FOR BOTH PLATES.

After plates are assembled in jar make solution of sulphuric acid 1180° (25 per cent. acid, 75 per cent. water) and connect to low charging current (the plates I mean) and have current turned on before putting in the acid, that is so as to not have the acid touch the negatives *without current* the first time, otherwise if the negatives are not entirely dried out they may "drop" the paste.

Charge at once at 2/3 normal rate for 12 hours. Discharge through resistance for 12 hours and repeat the cycle twice more, after which the plates are formed and electrolyte is discarded.

ASSEMBLING. (Final).

Remove elements and wash thoroughly with brush (10 to 15 minutes) and reassemble in an electrolyte of 1250° and then recharge. Cell is now ready for real work and will stand hard usage and should last for years. Now a word as to the sulphate of ammonia used in the formula. It resembles fine sand and the commercial salt is O. K. I have used this process in making plates and have the envy of all my experimenter friends. The formulæ and process given are carefully guarded and should be carried out to the letter as any alteration in them will shorten the life of the battery. Don't charge or discharge a cell too fast| It won't allow chemical change to go on evenly throughout the thickness of the plate and don't get impatient and try to hurry the making of the plates. Take your time and you will land on top. I will

say though that the pasting on of the paste must be done quickly and be careful when removing the blotting papers so as not to take chunks of the paste off, as it can't be patched up afterwards and made to stay on through the forming.

A positive plate 4¼x6x½ inch thick with a negative on each side has a capacity of 50 A. H.

Hoping this will be of some use to you and our friends in trouble, I await reports.

43. **F. F. C., Brooklyn, N. Y.,** writes as follows: I have a model motor boat of the displacement type with a hollow, wave collecting V bottom. She is 40 in. long, 7 in. deep and of 7 in. beam. She can hold 15 lbs., but I do not believe it would be safe to put over 10 lbs. in her as the boat weighs only 8 lbs. without battery. Could you tell me if you have plans or could design for me a steam turbine which would be efficient and of light weight? I wish to use triple screws, the diameter of the major one being 3 in. and that of the two minor ones being 2 in. Do you think the two smaller ones should be driven faster or slower than the large center screw? Would it be more advisable to install a single screw or twin screws instead of the triple screw installation? If you think any other method of propulsion is better than steam, I would be gratified to have you inform me. I have used electricity but the results are not favorable. At present the boat is powered with a No. 1 K. & D. motor. This swings a single 2¾ in. wheel. I want ten times the power if it is possible to obtain it. I sincerely hope you will be able to help me through your question department.

Ans.—Your problem is a most interesting one and we are grateful to you for presenting it to us. Taking your inquiries in order, we should first of all advise you to use just two screws of 2 or 2½ in. diameter, both revolving at the same rate of speed and in *opposite directions;* this necessitates that one be made with left-hand screw and the other right-hand. The problem of opposite rotation and equal speed is easily solved by gearing both shafts together and driving from one of them.

We have a design for a very fine little turbine for steam or compressed air but it means real tool-making skill to build it. Is your shop fitted with precision tools? There is also a little 25-cent book in the Model Library Series published in England and on sale in this country which gives details of a simpler model of the turbine type. Either of these might answer.

The motor you are using, according to the K. & D. catalog is in the category of a toy, inefficient and not at all representative of the splendid line manufactured by that company. The No. 1 motor has a three-pole, cast iron armature, and a field that might be improved by a shortening of the magnetic circuit and the addition of a little iron in its section. Your experience with this power plant might easily have been unsatisfactory.

Take the other and more modern motors of the same company and you would get ample power for your craft. The No. 17 Juno, the No. 5 Ironclad, or better still, one of the special motors such as the No. 60 or the No. 75, would be ideal. That peculiar property of a well designed and properly constructed electric motor which makes the

machine literally tear itself to pieces before it will stop, renders it ideally adapted to model boat propulsion. As a rule, we require a short, hard run and then we give the motor a rest. A good series motor will start the boat with a spurt and will increase its speed as the hull moves faster through the water. With a substantial storage battery to deliver the necessary current for the few minutes of the run, you could wish for no more efficient and dependable power plant. We would suggest that you write for the new catalog of the Kendrick and Davis Company, Lebanon, N. H., stating your requirements and asking them to check up the suggestions we have made in this answer to your inquiry.

44. **W. R. M., Bangor, Me.,** wishes to know the weight of the wire needed for the construction of the receiving transformer used in the trans-Atlantic receiving set, and whether Nos. 28 and 32 wire may be substituted for the 27 and 31 wire specified. Ans.—The primary of the transformer requires about 1¼ lb., and the secondary ½ lb. of wire. The loading inductances require about ⅝ lb. of wire for each one. You may substitute the smaller sizes of wire you have for those specified.

45. **C. G. B., New York City,** asks questions identical with those of W. R. M. above and inquires also whether he may substitute a storage battery for the flashlight cells specified in the articles. Ans.—See answer to above for your wire inquiries. You may, of course, use storage cells if you wish but they would be inordinately expensive in the large number required and, besides, there is no advantage in their use. The amount of current drawn from the flashlight cells is so very small that they last almost indefinitely. Unless you have twenty or more storage cells on hand that you wish to use for this purpose, we do not advise you to go to the expense of purchasing them.

46. **H. R. E., Winter Hill, Mass.,** asks for the amount of wire used for the receiving transformer and loading coil described in the September issue. Ans.—About a quarter of a pound of each size is required for each coil. If you would know the exact amount to the ounce, count the turns per inch, multiply by average length of turn, and then refer to a wire table such as that given in the back of every handbook published by this company for the inches or feet per pound of the size of wire in question.

47. **H. B. S., Richmond Hill, Ont., Canada,** sends us a diagram of an electric fountain in which the same water is used over and over again. The action starts with a motor-driven pump which sends water into an air-tight reservoir which maintains a column of compressed air over the water, forcing the latter in a steady stream through the fountain. From the bowl of the fountain, the water overflows into a second reservoir from which it is drawn by the pump. Our correspondent wishes to incorporate three colored electric lamps in the bowl and asks our opinion on the installation and our suggestions as to the best way to insulate such a job. Ans.—Your idea is thoroughly practical in our opinion and we do not anticipate any difficulty whatever in its successful operation. We can offer no suggestions on the general design save, possibly, the substitution of a rotary pump for the plunger

type shown. The wiring can be in ordinary galvanized conduit with all joints caretully made with white lead. The outlet may terminate in a standard fitting which incorporates a heavy glass globe hermetically sealed over the lamp bulb. The sealing is accomplished with a rubber gasket inserted between the base of the glass cover and the outlet. Your idea for the programme cylinder is quite satisfactory and we need add no suggestions.

Books New and Interesting

Reviewed by the Editor of Everyday

Exporting to Latin America by Ernst B. Filsinger, 565 pp. 5½x8½, Cloth. D. Appleton & Co., New York. $3.00 net.

When this volume was placed upon my desk, the question of a review of it in Everyday did not occur to me. I could not see, from the title, why the book should be of any particular interest to our readers. Now that I have read the book, I have changed my mind.

From the correspondence that comes into this office, I assume our readers to be essentially practical men. They are men, both young and old, who do things, and I am inclined to believe that among the vast number there are many who would welcome the opportunity to gain an insight into the trade conditions prevailing in South America with a view to entering this great field either in behalf of their employers or perhaps for themselves.

Mr. Filsinger has tackled his problem from the standpoint of a practical business man rather than from that of a theorist or a statistician. He deals solely with the practical side of the question. In other words, his book is a handbook that tells the enterprising manufacturer (either large or small) or the sales agent, how to enter the Latin American trade. He deals with the question of credits, collections, discounts, peculiarities of the class, etc., in a straightforward way that gives the reader a feeling of confidence in his ability to handle such business after having read the book.

Construction of a Transatlantic Receiving Set by Louis Gerard Pacent, 48pp., 5¼x7½, Paper 25c, Cloth 50c, Everyday Mechanics Co., Inc., New York.

Mr. Pacent is well known for his able and energetic work in the radio field, and particularly in connection with regenerative audion circuits advocated by Armstrong of Columbia University. The contents of this little book first appeared as a series of articles in Everyday and so great was the demand for back numbers containing the series that the supply was quickly exhausted. The present book was the natural result.

Mr. Pacent has covered the construction of a modern undamped wave receiving set in logical order, describing every detail of the construction, installation and operation in such manner that the amateur who reads his book will have no difficulty in building and using the apparatus.

The interest in long wave receivers is at a high pitch at this time owing to the possibility of receiving war news direct from the transatlantic station at Nauen, Germany. Many amateurs who have built this set report the reception of these messages in German and the accomplishment, great as it seems, is an actual fact.

Mr. Pacent has added materially to the value of his contribution by including a list of all of the great long wave stations in every part of the world, giving the wavelength, time of operation, system used, and valuable notes in connection therewith.

RADIODYNAMICS by B. F. Meissner, 200pp. 5¼x7¾. Cloth, D. Van Nostrand Company, New York. $2.00 net.

In these days of remote control and the wireless direction of torpedoes, submarines, etc., this book is of timely interest and importance. It deals with the development, design, and operation of devices for the radio control of vessels and vehicles. In view of our recent work on the EVERYDAY Model Submarine, during which we have had to proceed by the experimental path exclusively, I am most strongly impressed with the unique value of this book to those who propose to conduct experiments along a similar line. Half the battle in such experimental work is the speedy elimination of ground that has been covered before by other workers.

Mr. Meissner has covered the whole field of radio control in a comprehensive and practical manner. He tells of the work of practical investigators in this direction, giving diagrams and illustrations to assist his already clear text. His description of the John Hays Hammond, Jr., models is complete and understandable. Mr. Hammond's work is now so famous that this one feature alone should justify the purchase of the book by those interested in Radiodynamics—" the art of controlling distant mechanisms without artificial connecting means" as the author defines it.

DYKE'S AUTO AND GASOLINE ENGINE ENCYCLOPEDIA by A. L. Dyke, 824pp. 6¾x9¾. Cloth. A. L. Dyke, St. Louis, Mo., $3.32 net postpaid.

I have not read the new edition of this famous book; I have read merely the additions to its already complete text in former editions. What I have read tells me that Mr. Dyke still maintains his former standard which I have frequently described as the most complete, up-to-the-minute encyclopedia of modern automobile operation and repair that I have on the shelves of my library. It is difficult to conceive of a point that is not covered in a satisfying manner in the eight hundred pages of this volume; I have tried to find one and cannot.

Mr. Dyke has contributed to the field of automobile literature a work that is at once a book of convenient and ready reference, a guide for amateur or professional, a handbook that should be in the library and tool-kit of every motorist.