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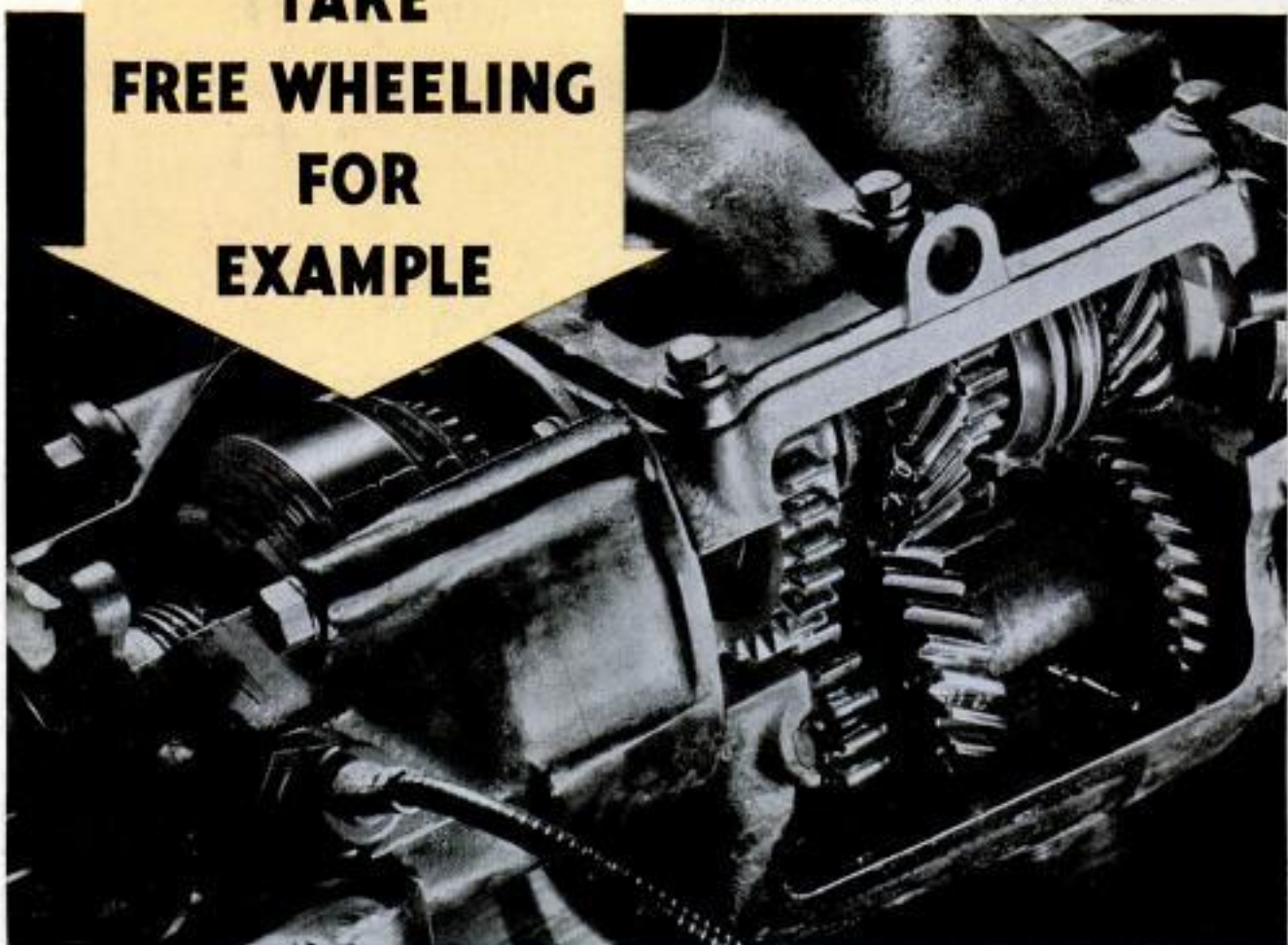
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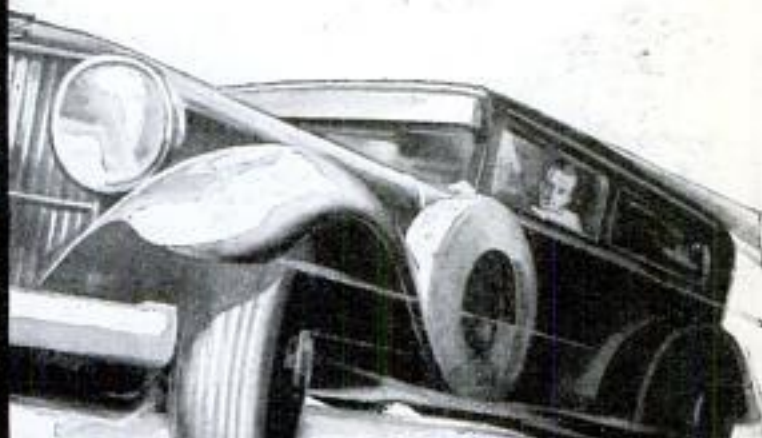
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(Above) Photomicrographs (140 diameters) made by Dr. G. A. Abbott, Head of the Chemistry Department at the University of North Dakota.

(Left) Surface of a piston ring run 20,000 miles with regular lubricating oil, showing pores and abrasions. (Right) An identical ring run 20,000 miles with Pyroil added to regular lubricant. Note the Pyroil breath-like, heat-proof, friction-reducing film build-up into and upon the metal.

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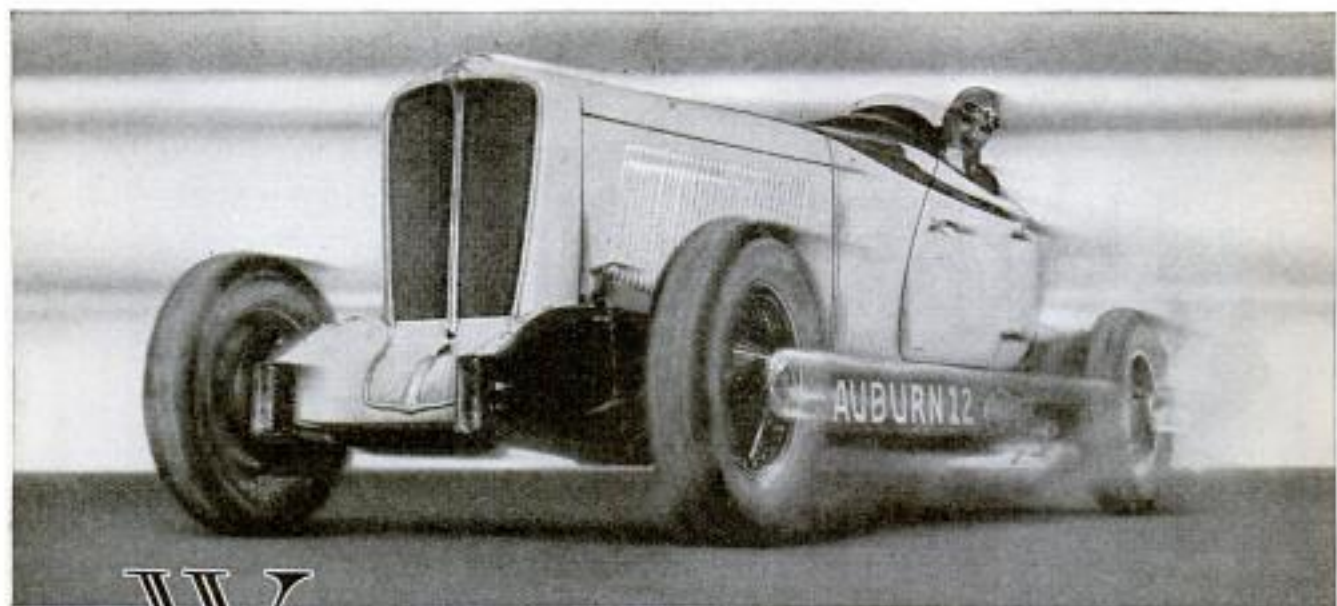


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To the man who is worried about this Depression



THIS isn't the time to waste words or to ignore facts. This depression has already put many men out of work, and threatens the earning power of others who still draw pay. It's useless to shut our eyes to it, so why try?

On the contrary, let's face the facts, calmly and without fear. Let's analyze the situation, as man to man, and find out what *you* can do to escape the depression, and perhaps *even* take advantage of it.

In the first place, even when prosperity returns, many of the now unemployed will not be much better off. It's not the business depression that is beating them—they are working under a depression ALL their lives. For they are trying to wrest a living from a world that asks more than they have to offer.

What business wants today—and will pay any price to get—is RESULTS! And if a man can't deliver—well, it's only a question of time before he is replaced by a man who can.

But if you can accept the challenge—if you are prepared to deliver results, this depression can be a blessing in disguise—an opportunity to climb the ladder, with the way all cleared for you. Never has business been searching more eagerly for ability, knowledge and training.

Maybe it does not appear that way to you, right now. But look around and you will see it. You will see that in this crisis the trained man has suffered far less than others. Indeed, in many cases, he has forged ahead, has even won raises and promotions and is all set for the tremendous opportunities that will inevitably come with returning good times.

But let's get down to cases—letters received during the last few months—so that you may see exactly what we mean—

These Men Are Beating the Depression

J. H. W., Michigan, writes, "I have been promoted—just one week after my superintendent learned I was taking LaSalle training in my spare time. He made a chance for me by letting out a man who was not accurate in his work."

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F. A., Ontario, "About three weeks ago, our superintendent told me the company had a letter from LaSalle about my training. He then told me that the manager had been looking for a man to fill a vacancy and your letter had won the place for me."

E. S., Ohio, "The fact that I have increased my salary and have been promoted to the managership in the face of the depression is, I think, ample proof of the value of my LaSalle training."

J. L., California, "I have just been promoted to Assistant Traffic Manager (thanks to LaSalle). An increase in salary came with the promotion. I consider this pretty good during this period of wage cutting and economy."

What About You?

But enough of talking about others. You are interested, after all, in knowing whether *you* can beat the depression.

It depends on the kind of man you are. Many men prefer to take a licking in silence. They are *waiting* for the return of prosperity. Then, so they think, they will make up the ground they lost.

If you belong to this class of "waiters," this message will not interest you. Conditions will improve, and those content to ride up and down on the business wave will enjoy another temporary period of lessened apprehension and trouble.

But if you belong to the other class—if you are in earnest about winning back whatever reduction in income you have suffered and moving up into the higher salary brackets, if you are determined to get ready for the big jobs that will be *seeking* men, then this is *your day of opportunity*. Not tomorrow—not when business picks up—but *now*.

Times like these call for *action*. Sooner or later prosperity will return. Will you be ready for leadership—or will you be sorry for the "break" you passed up in 1932?

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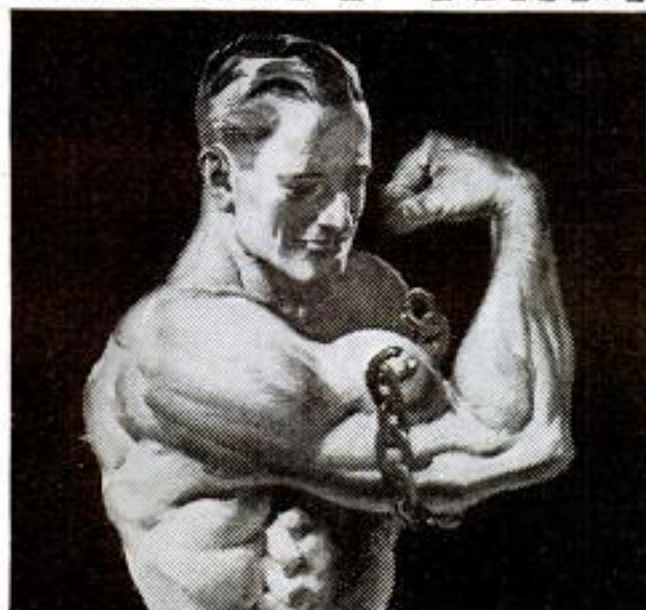
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EXCLUSIVE Permanent district sales organization distributors for combined store and consumer distribution. Two Kleenway lines. One to consumer. One to stores. Fast sellers and repeaters combined with whirlwind sales plan. Local distributors. Direct consumer sales people. Sample 25c. Write Kleenway Magic-Self-Appling Shoe Dressings Dept., Clark-Dunn Mfg. Co., St. Louis, Missouri.

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FOR YEARS, engineers have known that gasoline consumption on any car could be cut by using a lighter, freer-flowing oil. They realized that heavy, sluggish oil wasted power and gasoline. But the problem was to find a light, fast-flowing oil tough enough to give perfect engine protection.

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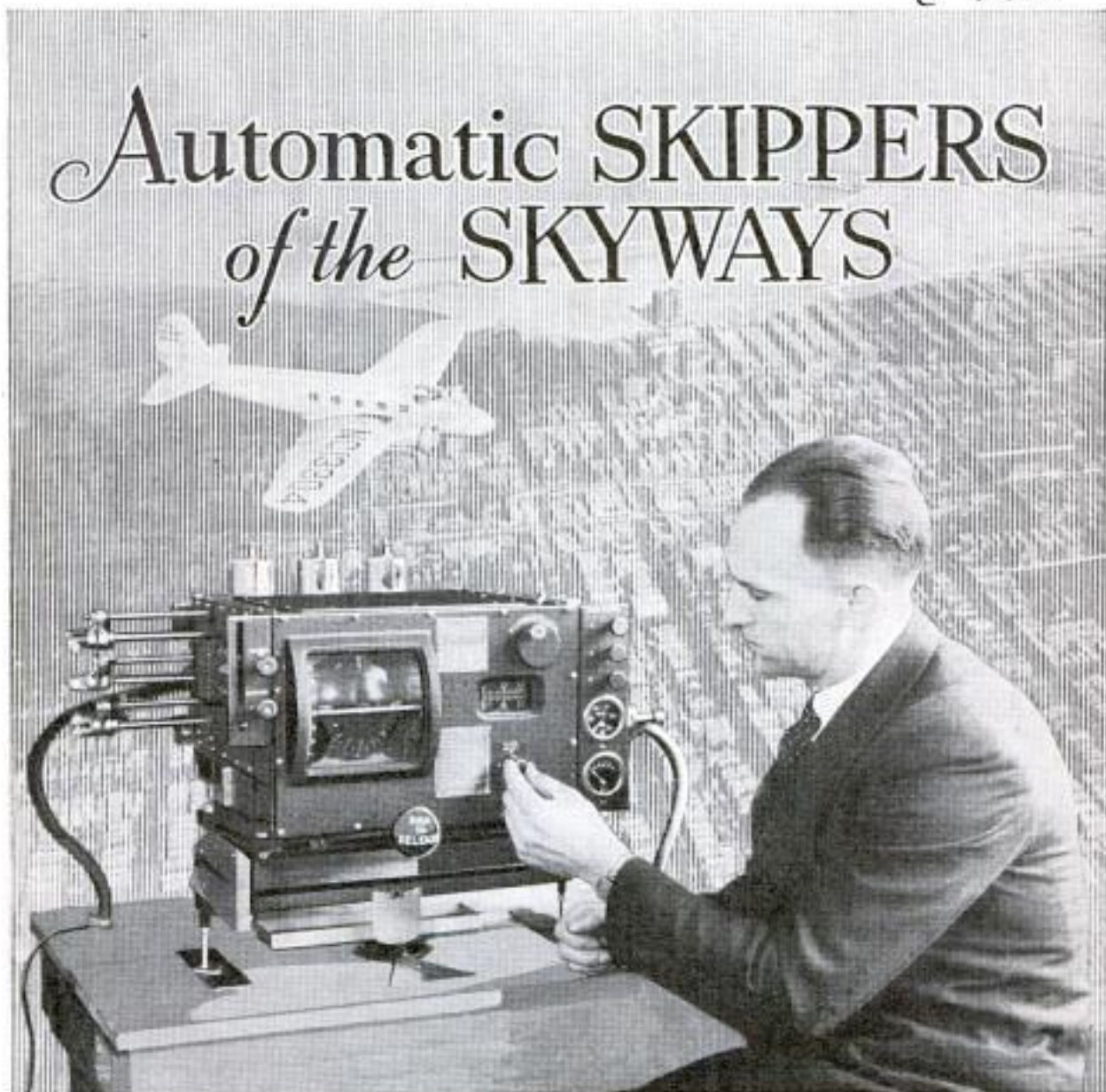
Vol. 60

JULY, 1933

No. 1

C 702.

Automatic SKIPPERS of the SKYWAYS



The Human Pilot and the Automatic Pilot; the Robot Pilot Can Fly the Ship on a Predetermined Course and Manipulates the Controls with a Touch More Sensitive Than Any Human Pilot

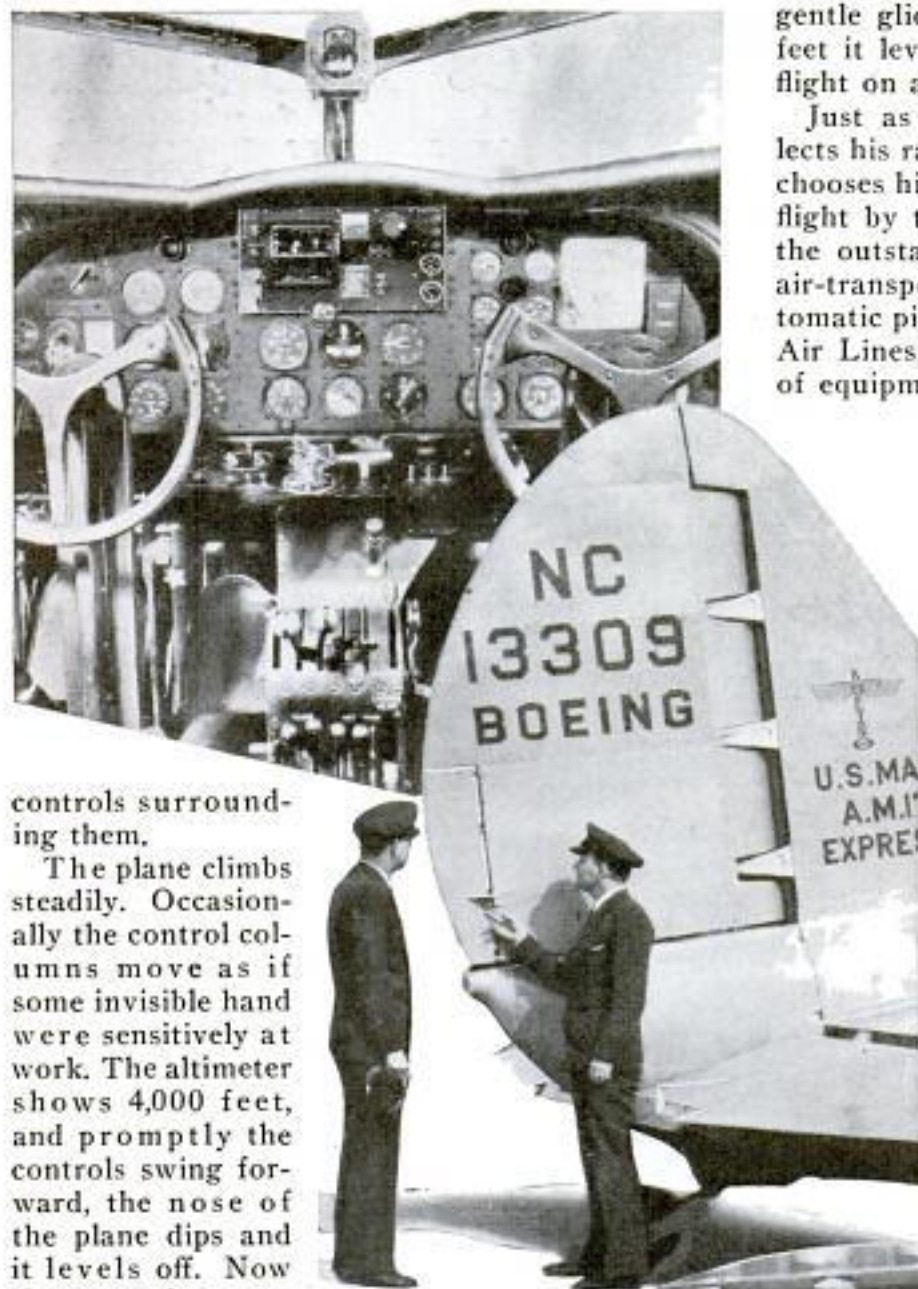
ITS twin supercharged engines opening in a crescendo of power, a sleek metal monoplane speeds along the airport runway and climbs into the blue. In the pilot's compartment, forward of the ten-passenger cabin, the chief pilot manipulates the controls until the altimeter registers 500

feet. Then he turns a dial, pulls a lever and lets a little metal box fly the plane.

Hands and feet off the controls, the pilot and copilot settle back to study the up-to-the-minute weather maps and reports. Both men are for the moment wholly indifferent to the two-score instruments and

Comd. Bob Johnson
400

United Air Lines
S. Michigan Chicago



controls surrounding them.

The plane climbs steadily. Occasionally the control columns move as if some invisible hand were sensitively at work. The altimeter shows 4,000 feet, and promptly the controls swing forward, the nose of the plane dips and it levels off. Now the controls move swiftly and surely. The air liner swings slightly to the left, then straightens out on its predetermined course. It flies smoothly, remaining on an even keel although the air is bumpy.

The copilot picks up his microphone and calls a radio station for more weather information. He learns that at 2,500 feet there is a favoring tail wind, instead of the slight head wind at 4,000 feet.

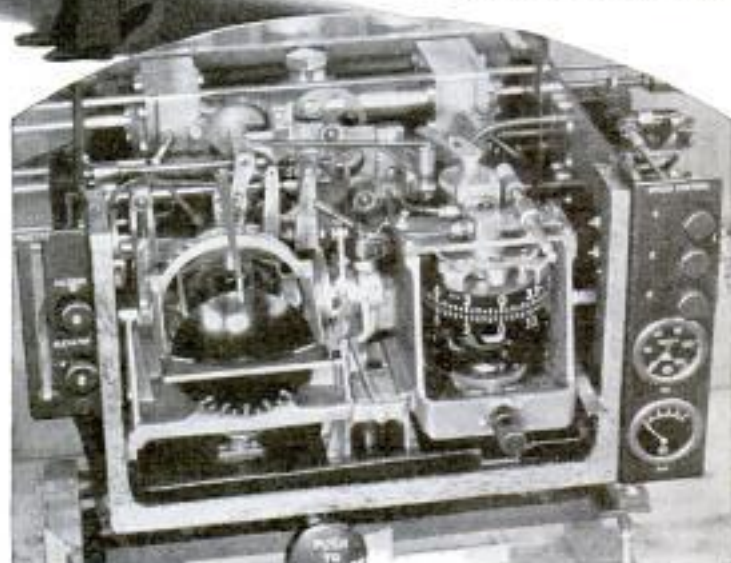
With this information, the pilot figuratively takes his hands out of his pockets and twists the magic dial. Immediately the plane's nose drops and the air liner begins a

gentle glide. Precisely at 2,500 feet it levels off and resumes its flight on an even keel.

Just as easily as a person selects his radio programs, the pilot chooses his course and altitude of flight by turning dials on one of the outstanding contributions to air-transport operations—the automatic pilot developed by United Air Lines, with the co-operation of equipment manufacturers.

Long the goal of aeronautical engineers, the new device is hailed as the first successful automatic pilot to be developed and operated by an air line, since the stabilizing units previously tested did not completely control a plane's flight.

Incased in a small metal box, the apparatus causes the plane to climb to any desired altitude, to level off and to assume a predetermined course as well as to make predetermined turns without the human



Above, Robot Pilot Installed on Top Center Section of Instrument Panel; Center, Some of Plane Controls Operated by Mechanical Pilot; Below, Interior View of Mechanism

C 621, Clark Wood Inlay
Co., Richmond Station
Memphis, Tenn.
13
Photo Plaks

POPULAR MECHANICS

pilot touching the controls. Practically every maneuver that a plane can perform in flight by manual action of the controls may be duplicated by the automatically controlled aircraft.

The robot pilot is gyroscopically controlled and hydraulically operated, and includes automatic climb and descent control, automatic turn control and specific elevation control. It consists of two gyroscopes, one operating on a vertical axis and the other on a horizontal axis. These are the recently developed artificial horizon and the directional gyro.

The gyros are housed in a case integral with the airplane, and they remain stable in their respective planes while the case and the plane move around them. These gyros operate shutters which cause air jets, built into the case, to open or close as the ship begins to deviate from the course of flight fixed by the automatic pilot. Changes of pressure caused by the jets set in motion a mechanism that applies hydraulic pressure to those controls involved in the maneuver necessary to return the plane to the predetermined attitude of flight. The controls operated are the rudder, elevators and ailerons.

Possibility of over-controlling is avoided by a checking system, so the actual operation is interrupted by imperceptible pauses, thus making the automatic pilot much more sensitive than a human pilot.

The automatic pilot is not designed to dispense with pilot or copilot of a big transport, but rather to conserve their energy, and enable them to devote more time to analysis of weather conditions. In addition, it will make possible, through the circumvention of the uncertainty of the human element, more accurate navigation during poor weather conditions.

Installation of the robot has started on the United Air Lines. The addition of the apparatus results in a net increase to the plane's weight of only thirty pounds. The addition of directive radio-beam control is also being considered. The automatic pilot will enable planes to fly in weather considered prohibitive a few years ago, and air-transport officials look upon it as a body blow in the fight against bad weather. Not only will it increase the regularity of schedules, but it will reduce the percentage of cancelled trips.



Photo Is Shown Mounted on Wood to Give Inlay Effect; Hydraulic-Pressure Process Is Used

PHOTOGRAPHS INLAID IN WOOD AND MADE MOISTURE-PROOF

Inlaying photographs in wood has been developed commercially by a Tennessee artist. After the photograph is bonded to a varnished panel of hardwood with special cement, it is subjected to hydraulic pressure that produces the effect of inlay. Then a moisture-proof lacquer is applied. While the photograph is not actually inlaid in the wood, it is mounted by a lasting process used in manufacture of wood-inlay table tops. The lacquer gives it a glossy finish like that found on many hardwood pieces of furniture.

FAN BLADES MADE OF RUBBER PREVENT ACCIDENTS



One German manufacturer is turning out an electric fan fitted with rubber blades. A guard around the blades is eliminated since it is claimed no serious injury would result if the blades came in contact with the hand, even at high speed.

Allgemeine Electricitat
Ges A & S, Berlin
No. 6 Sargent
Kram

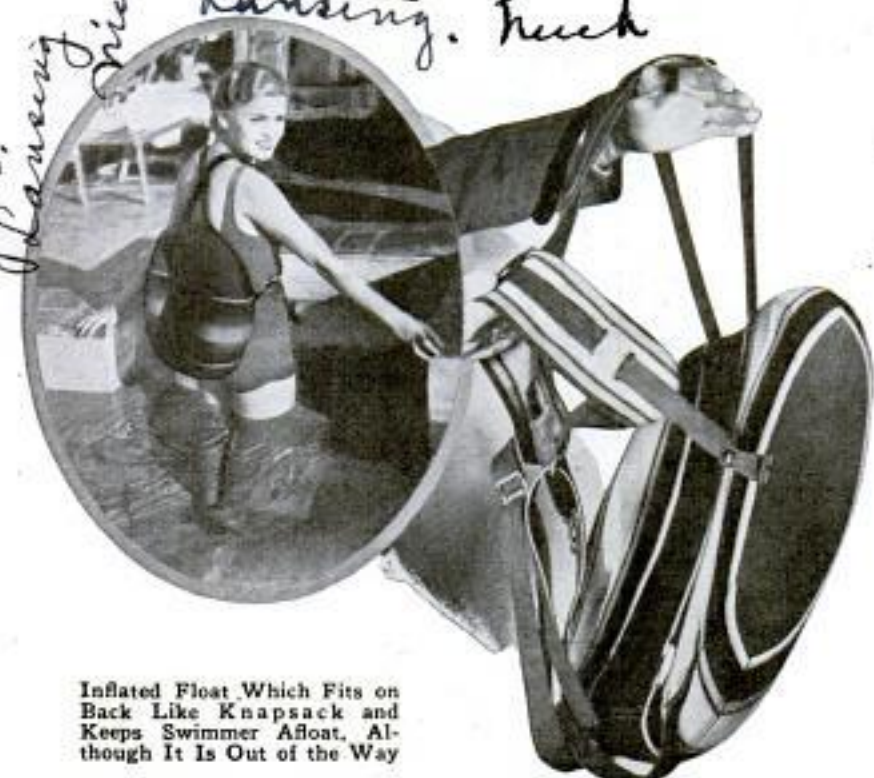
La Fontge Mfg Co
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4
Lansing Mich

POPULAR MECHANICS



Inflated Float Which Fits on Back Like Knapsack and Keeps Swimmer Afloat. Although It Is Out of the Way

SWIMMING FLOAT FITS ON BACK OUT OF WAY OF BATHER

Inflated swimming floats, which can be strapped to the back like a knapsack or parachute pack, have the advantage of being out of the way of the bather, allowing free use of the arms and legs, but at the same time giving protection when needed, since one of them will keep a person afloat indefinitely. As a life preserver, these floats can be equipped with a supply of water and concentrated food and some have been fitted with a small battery and a flashlight worn on the head to attract attention. The float is light in weight, and the harness is adjustable to the size of the wearer.

"WINDOW BANDITS" ARE FOILED BY SMOKE AND SIREN

Designed to rout window-smashing bandits, an automatic device for the protection of store display windows has been produced in England. A flash of red light, clouds of dense, acrid smoke and a police siren give the alarm. A slender glass tube supported across the window by hooks is the vital part of the protective system. The glass rod is broken when the window is smashed, closing contacts that set off the alarm. The dense smoke hides merchan-

disse in the window in the event that the person breaking the window has protection against the gases. The alarm system fits any window.

C 700 MYSTERY RADIO WAVES FROM MILKY WAY

Mysterious radio waves that appear to come from the center of the Milky Way have been detected by Karl G. Jansky of Bell Telephone laboratories. Sensitive apparatus used in research work picked up the waves, which are in the 14.6-meter band, at a frequency of twenty million cycles per second.

C 662 REVOLVING DISK SHOWS PERIL OF CUTTING PRICES

Some of the perils of indiscriminate price cutting are revealed to merchants by a revolving chart which shows what must be charged for goods in order to make a profit. The chart consists of a circular disk revolving on a piece of cardboard, both cardboard and disk containing printed figures. The card-



board piece has two windows through which the figures on the disk show as it is revolved. If a price cut of ten per cent on an article is contemplated, for instance, a turn of the disk shows

the user that, if the normal profit is thirty per cent, he must sell twice the amount at the reduced price in order to offset the reduced income. The chart also indicates how to protect profits.

5/1/33
see Aug. 6934-245

Reported by Trade Com.
Walter B. Hertz, London

Eddy Rucker-Nickel
C 1430
Mass
Cambridge

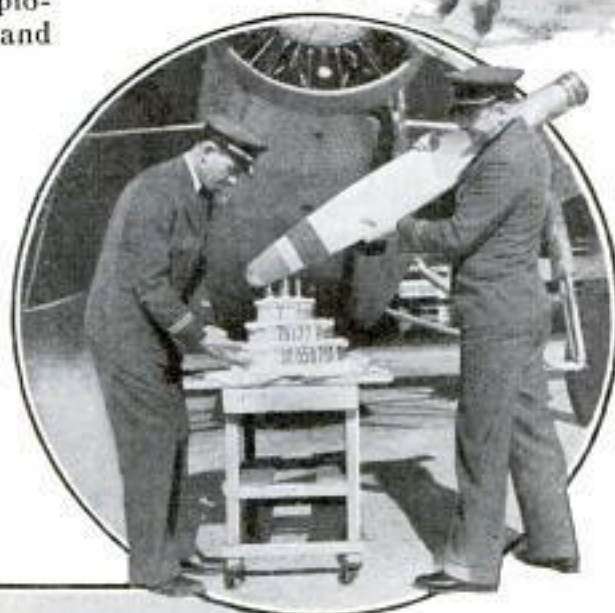
463 West St. New York

First Mail Pilots Fly Old Trail in Big Liners

When Charles N. (Jimmy) James and Fred W. Kelly piloted modern air liners over the Los Angeles-Salt Lake City route recently, they followed the air-mail trail which they blazed in tiny open-cockpit ships seven years before. Their latest flight marked an anniversary of the Western Air Express, rounding out 10,650,206 miles of flight in transporting 79,177 passengers, 3,368,664 pounds of mail and 116,972 pounds of express without serious injury to a single passenger. This is a world's record for commercial air lines. On their pioneering flight, James and Kelly piloted Liberty motor biplanes in which mail bins had been hastily built. Their planes were equipped with one or two instruments of doubtful value and they had no radio-telephone communication with the ground. Emergency landing fields consisted of only a few acres of



Top, Pony-Express Rider Handing Mail to Pilot on First Mail Flight from Los Angeles in 1926; Center, Seven Years Later, Pioneer Mail Pilots Celebrate; Bottom, Bi-plane Flown over the First Mail Line in West



their locations. This year, Kelly roared eastward from Los Angeles and James westward from Salt Lake City in crimson and silver monoplanes, the fastest multi-motored ships in American use. Three motors turned up 1,425 horsepower to whisk a ton of passengers over the 633-mile route in four and one-half



ground scattered here and there across the American desert with canvas marking

hours. Each plane was equipped with \$5,000 worth of two-way radio-telephone apparatus, with which the two pilots talked to the ground stations every twenty minutes. Completely marked and equipped emergency landing fields flashed by below. On each field and sometimes between them were derricklike structures from which flashed powerful beacons. The flights this year were quite different from the first, made when only three other air-mail lines were operating in America, two of which had opened but two days before.

5677
Chicago Lighting

C563. Bridgeport, Conn

6 Institute POPULAR MECHANICS

20 h. Washer Drive



Electric Lights on Each Side of Bed Facilitate Reading; Inset, Panel for Reaching Bulbs

LIGHTS BUILT IN HEAD OF BED FOR NIGHT READING

Concealed lights built into the head of the bed eliminate glare for night reading. Slide panels in the back of the bed may be removed to reach the lights. Baffles direct the light to the center of the bed or to the book while reading.

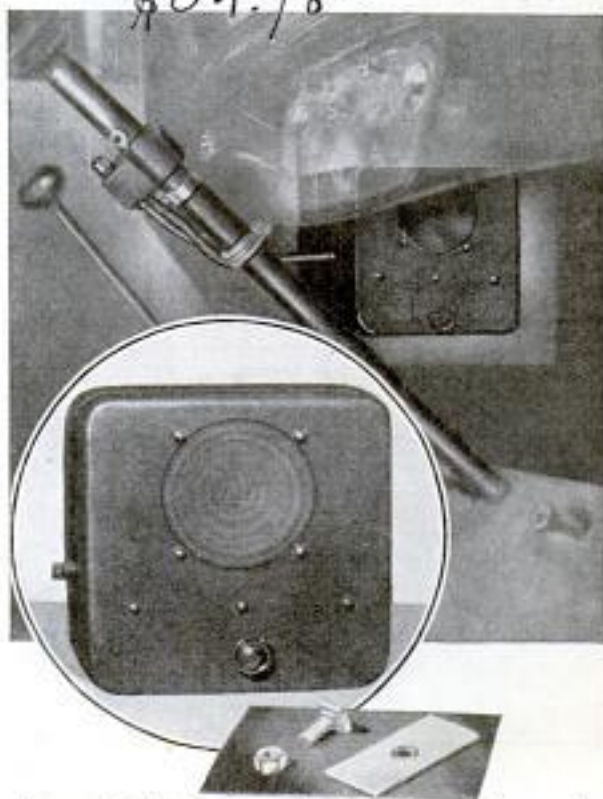
WORM HOLES FREE SOIL OF AIR SO RAIN MAY ENTER

Earthworms have been found valuable for something else besides fish bait. R. E. Horton, noted engineer, points out that earthworms make endless tunnels through the upper soil, coming to the surface occasionally. These tunnels are of great importance when the rain begins to fall because they permit the air to escape from the soil as the water soaks in, thereby making it possible for the ground to take up much water that otherwise would run off the surface.

Licorice is used in candy, fire extinguishers and insulating wallboard.

COMPACT RADIO SET FOR AUTO IS EASY TO INSTALL

Motorists who have been waiting for a simple radio for the automobile will be interested in a compact unit brought out by the General Electric company which is as easy to install as any other car accessory. The chassis, loud speaker and power supply all are housed in a case measuring eight and three-quarters by nine by three and seven-eighths inches. A small remote-control box clamps to steering post or instrument panel and the set is mounted on a single stud and is installed by boring only one one-half-inch hole. Installation requires less than an hour, complete shielding and the use of tone control solve the problem of ignition interference and a doubly shielded vibrator-type of B-battery eliminator is employed. Three of the four tubes are of the new type, and the use of tubes with multiple functions results in seven-tube performance. The set has automatic volume control, two-point tone control and an electrodynamic speaker contained in the same cabinet with the other parts of the unit. The control box has a lock switch, the key being used also to operate the manual-volume control. The set is easily removed for servicing.



Compact Radio Set for Auto No Larger Than a Car Heater; It Is Mounted on a Single Stud

Science News Letter 5/6/33

C921

at meeting of American
Sociological Union

Hotel St. Regis
New York

CHEMICAL BANDS KILL WORMS ON APPLE TREES e724

Chemically treated paper bands are being used to kill thousands of codling-moth worms in apple orchards. When the worms leave the fruit, from the middle of June until the end of the season, they seek the nearest dark, protected place for spinning their cocoons. Loose bark on the trunk and branches or debris on the ground offer suitable quarters. If the trees have been scraped and the orchards cleaned up thoroughly, paper bands about the trunk will attract fifty per cent or more of the worms. A band treated with a mixture of beta naphthol, one pound, and lubricating oil, one and one-half pints, automatically kills practically all the worms that spin their cocoons in contact with it. This mixture is recommended by the United States department of agriculture. Use of the paper band cuts down the worm population of the orchard, reducing the number to be controlled by spraying.

Washington, D.C.
LIGHTER FITS TOP OF FUEL CAN AND MAKES REFILLING EASY



Refilling a spark lighter for stoves is greatly simplified by the use of an elongated lighter unit which fits the top of a fuel container so the assembly looks somewhat like an oilcan. A long wick extends from the can to the flint which is operated by a trigger. When a fuel can is empty it is only necessary to unscrew the lighter and attach it to a fresh can.

C652
"FOG-EYE" GUARDS OCEAN LINER FROM FLOATING OBJECTS

Detection of ships, icebergs and other floating objects in an ocean liner's path during murky weather is said to be possible with an invention called the "fog-eye." It is based on development of the use of



Demonstrating the "Fog-Eye" Which Reveals Obstacles in Ship's Path When Weather Is Murky

the infra-red ray, which detects objects which have an infinitesimal variation from the temperature of the sea water. Even a man floating in the water can be detected by the invention, which consists of a detector and an amplifier, in addition to a small case of batteries. The fog-eye was given its first tests on the liner "Queen of Bermuda." Paul H. MacNeil, the inventor, says the device will make possible the operation of ships at full speed in any kind of weather, since objects floating in the water may be detected for a distance of several miles.

METAL BIRD BATH AND FEEDER EASY TO INSTALL IN YARD e690

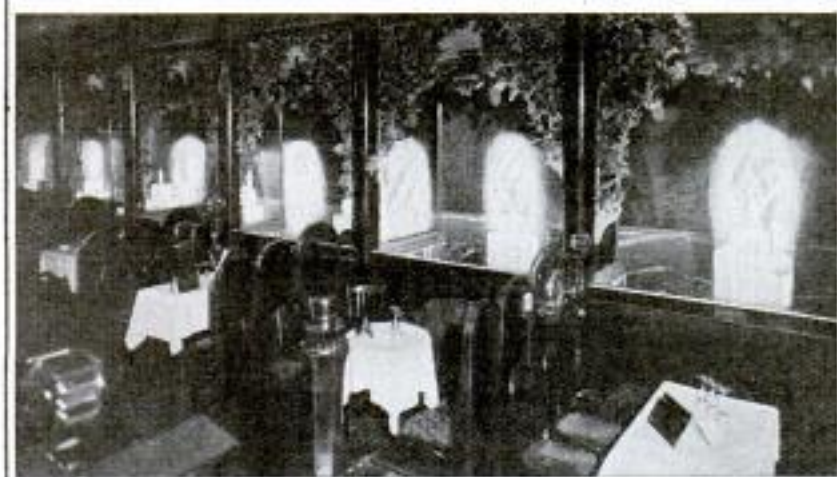
Portable and easy to install in the garden or yard, a combined bird bath and feeder is available for improving the surroundings of the home. The bowl and the raised food receptacle are made of steel, finished in old-ivory enamel and striped with green. The bowl rests on a post of one-inch steel tubing, made in two telescoping sections. The lower section has a spike that may be pressed easily into the ground.



*Chap. Romberg Co. 84
Park St. Worcester, Mass*

*Superior Metal Spring
Copp. Mfg. Co. Patent
406 B 1/2 Birch Road*

*Toledo, Ohio
W. of Miss. \$2.25 W. Tenn. \$2.50*



Three Views Showing How Fountains in Berlin Restaurant May Be Changed in Form to Enhance the Effect; Air Is Refreshed in This Manner

INDOOR FOUNTAINS COOL CAFE AND ADD TO APPEARANCE

Refreshing and cooling the air in a Berlin restaurant is accomplished by several fountains located along the walls. The fountains enhance the appearance of the

cafe's interior, in addition to keeping the temperature at a comfortable level. Pneumatic tubes or posts connecting the tables make it possible for guests on one side of the restaurant to communicate with diners on the other side without leaving their table.

C 70 7

BRAIN "DYNAMOS" PRODUCE MIND DOCTOR SAYS

That mind is solely a product of electricity, manufactured in the brain by a power system of generation and distribution, is the assertion of Dr. George W. Crile, director of the Cleveland clinic. Investigation in the laboratory shows, says Doctor Crile, that the brain of man, or animal, emits short-wave and infra-red radiations; that these radiations cause ejection of electrons from the brain protoplasm, and that these electrons set up the electric current responsible for all our thinking and reasoning processes. The brain's power system, according to Doctor Crile, consists of four quadrillion individual "dynamos," with the adrenal gland as the power station, operating in connection with a distribution system vastly greater than all the lines of communications now in existence. The adrenal

gland collaborates with a hormone in the thyroid gland, located in the neck, Doctor Crile says, in pointing out that the thyroid hormone has been found to be the "power behind the throne," the supreme ruler of the human intellect. If the supply of this hormone diminishes, brain power

Cleveland Ohio
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24 James
4/21/33

c 612

decreases. A few hormones from the thyroid gland of a sheep will restore sub-normal brain activity to normal. Doctor Crile explains that the gray matter of the brain consists of four quadrillion protoplasmic units of energy-transformation, or cells. These are the dynamos furnishing energy for our mental processes. The action of the mind is the action of these brain-cell batteries, and thought is thus a pure electrochemical process, he asserts. The white matter of the brain, however, contains no cells and is not a dynamo. Instead, it is a matrix on which are recorded the patterns of action. It is in this delicate white matter that "physical-conductance paths of microscopic dimensions are established by the electric charges as they pass through the matrix." Thus, when a man thinks, he does it by the passage of electric current through the substance of the white brain. The current is supplied by the dynamos in the gray brain.

PICTURES OF HOTEL ROOMS AID GUESTS MAKE SELECTION



Prospective Hotel Guest Selecting Room by Examining Photographs of Each Type Available

Roosevelt

Guests in a Pittsburgh hotel do not choose their rooms sight unseen as is the case in most hostelrys. The room clerk displays photographs of each type and price class of room to the guest as he registers, so he knows in advance just what kind of room he is to occupy and the advantages or disadvantages it has over another kind. The pictures are shown on a vertical support, offering an opportunity to compare the size and furnishings.

LAWN MOWER PICKS UP GRASS IN SUCTION BASKET

Equipped with a suction arrangement, a lawn mower that picks up the grass as it cuts has been produced in England. A revolving arm carrying a blade at each end cuts the grass by scythe action. The cuttings are drawn into the basket at the back of the machine by suction.

c 640

*no 4 Saigent h...
West. Commerce 5/1/33*



Grass Is Sucked into Basket as It Is Cut; Small Motor Does All the Work

TENNIS BALL CAN BE INFLATED TO RESTORE BUOYANCY

c 711

Tennis balls that may be re-inflated to restore buoyancy after use in several matches, have been introduced in Germany. The new ball has the appearance of an ordinary ball but is constructed so that air may be injected by piercing the outer cover to reach a rubber valve in the inside surface. After air has been pumped through this valve, the rubber mass seals the opening and the ball is ready for use. *shown at Leipzig Fair.*

*vice Consul.
Capt. J. Alvelly
Lutetia, Serenomy*

*The Rotocycle
Slough Island*

Science Short 12/12/33

"TOP LUBES"



Elwood Haynes and the First Auto Ever Seen on the Streets of Chicago, in 1895

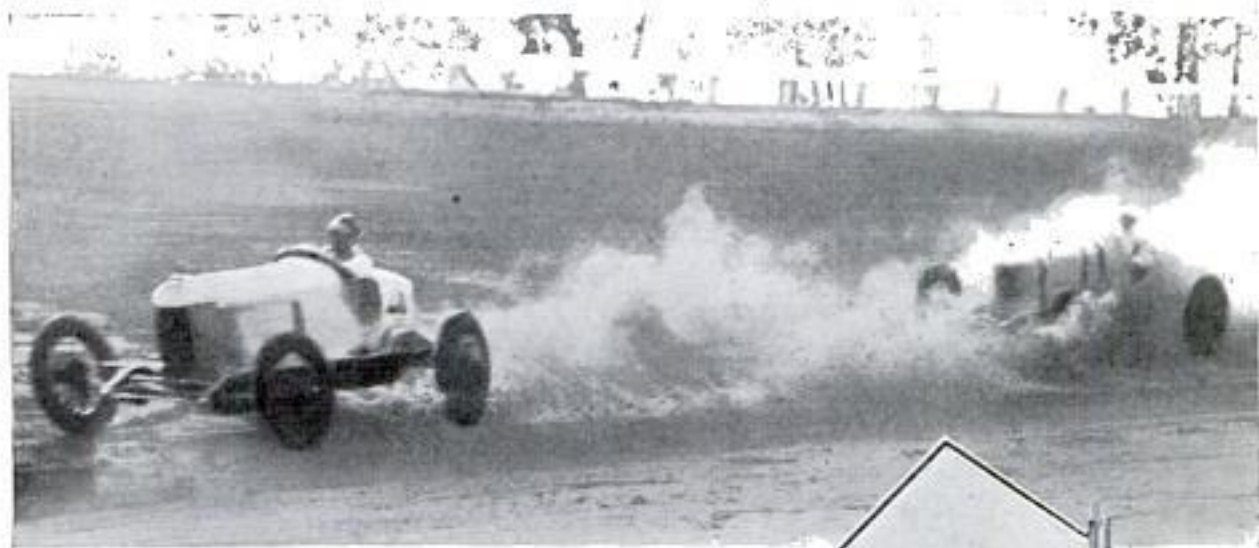
By L. W. LAWRENCE

WHEN airplanes roar through the skies at 400 miles an hour, or speed-boats skim across the water at two miles a minute, they are paying tribute to amazing developments that have been going on during the past year or so in the oil industry.

Back of these speeds lies a little-known story of research, in which chemists have examined oil under the most powerful microscopes, split incredibly thin films into still thinner layers, measured the electric or magnetic forces holding this film to the metal, and finally have taken apart the molecules themselves to learn their structure.

Now they are rearranging atomic building blocks into new patterns, creating new oils that are making possible still more sensational speeds. To airplane pilots and race champions this means spectacular new records.

Latest Aid to Motorists



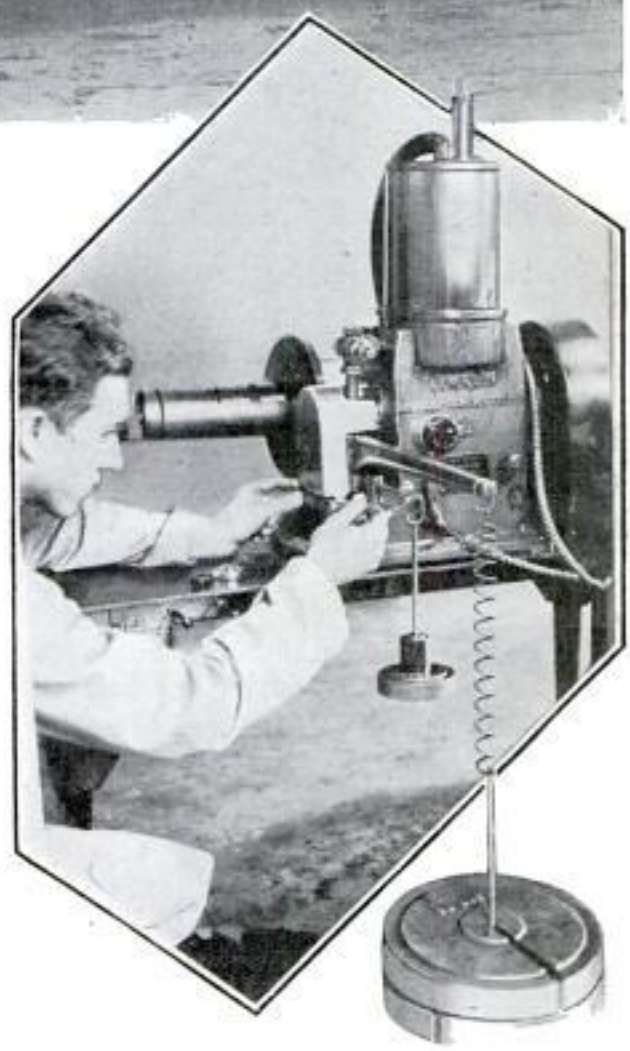
Modern Speed Creations in Which Lubrication Is Put to Final, Fiery Test

To you and to me, it means faster, smoother, and more economical motoring.

Within ten years, ordinary motoring speeds have almost doubled. Pistons flash up and down at 2,000 feet a minute. Oil temperatures and pressures have mounted sharply. A modern make of light car, on a day when the thermometer stands at ninety degrees, will have a crankcase temperature at ordinary speeds of 220 degrees—higher than the boiling point of water. The oil film, meanwhile, is under a pressure of from one to two tons per square inch. At racing speeds, these forces are tremendously increased.

"A relatively recent development," according to Dr. Gustav Egloff, noted research chemist, "is the so-called lubricated gasoline, or top lubricant. It comprises simply the introduction of a fraction of less than one per cent of lubricating oil, oxidized oil, or mixtures thereof to gasoline. A large number of substances have been tried at various times for such top lubrication, including graphite suspensions, mixtures of castor oil and nitrated or chlorinated compounds and mixtures of animal or vegetable oils.

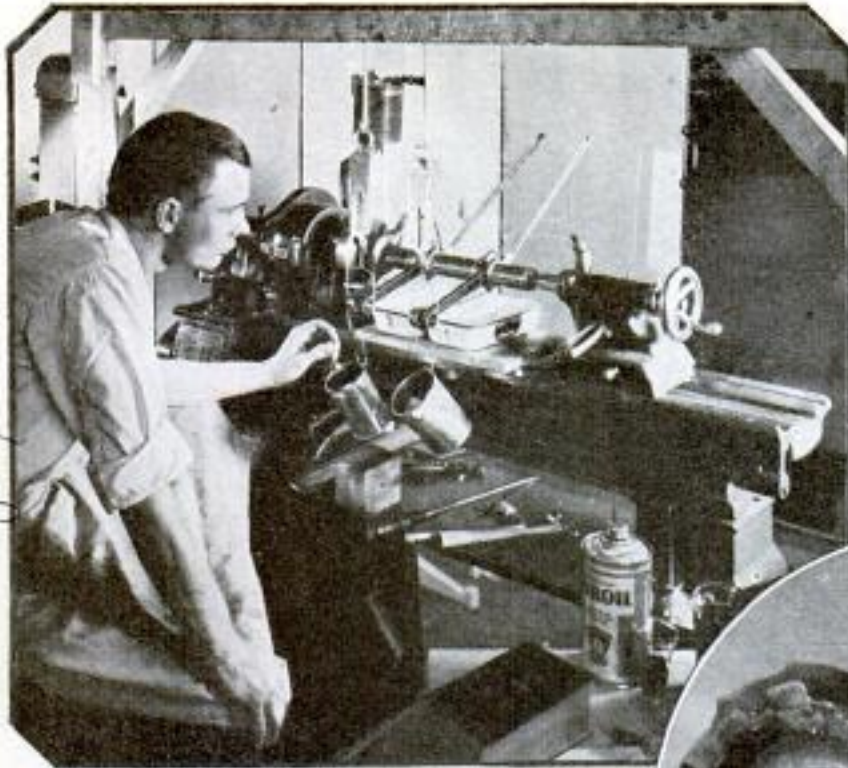
"Some lubricated gasolines have been found," continues Doctor Egloff, "to give noticeable improvement in power with decreased fuel consumption, to the extent of about five per cent, operating the car with



Measuring the Wear Resistance of Oil Designed to Prove Perfection of the Product

open throttle. The non-corrosive and solvent characteristics of the added compounds have no special effect on the quality of the motor fuel. Oxidized hydrocarbons have long been used in railroad lubricants, apparently resulting in low-

*Universal Oil Products Co 310 S
Michigan. Chicago*



Break-Down Test of Electric-Furnace Graphite and Oil Mixture in Popular Mechanics' Laboratory

form. This liquid graphite penetrates any filter, will flow up a lamp wick and never clogs. It fills in the pores of metal, forming a tough skin that is virtually friction-proof and is uninjured by heat, even at 3,000 degrees and more, according to tests made by Clyde A. Crowley, consulting engineer, in Popular Mechanics' laboratory.

Although the value of



The Result of Poor Lubrication—Repairs Are More Costly Than the Best Oil

surface tension or greater oiliness, so that they stand up under heavy-load conditions.

"It is old practice to add lubricating oil to gasoline in the process of tuning-up new motors, usually over the period of the first 1,000 to 3,000 miles. The automotive engineer has emphasized through the years, and has so designed his motors, that except for the brief tuning-up period, a minimum of lubricating oil reaches the combustion cylinders during operation of the motor. At present there is literally a wave running through the oil industry in working out satisfactory substances which can be added to gasoline for the purpose of top lubrication."

In this connection, a striking 10,000,000-mile test of the use of "top lubes" in Greyhound busses is reported as follows: Increases in gasoline mileage of from four to eight per cent; increases in crankcase-oil mileage cumulatively to as much as 100 per cent; reduced carbon formation; prevention of frozen piston rings and sticky valves; reduced valve grinding, and reduced run-in time on engines after overhauls.

One of the best known of these top lubes, a patented product, Pyroil, contains graphite in a colloidal, or almost liquid,

graphite as a lubricant has been known for a long time, the difficulty heretofore has been to keep it in suspension. "It is well to note," says Mr. Crowley, "that the synthetic property of Pyroil graphite is great uniformity of particle size—entire freedom from foreign matter and impurities such as silica and other abrasive substances. The electric-furnace process by which artificial graphite is prepared excludes the possibility of abrasive foreign matter being present. Motorists should never try to mix their own lubricant."

Mr. Crowley said that his tests indicated a reduction in friction losses, less tendency of the bearing to heat, a decided increase in efficiency, and smoother running—all of importance to the motorists in this day when the lowest-priced cars are built for sustained speeds of sixty miles

This is Product "Pyroil" made by J. B. Clark Co. (Cannot locate)
 Co. 295 Niagara St. Buffalo, N.Y. 01111
 Or indiged. does not contain graphite.

Pyroil Co., W. N. Ridder, Pres
 503 Pyroil Bldg
 La Crosse, Wis

C 701

an hour or better. To illustrate the strain of such speeds, another test showed that in a car where the crankcase temperature was 115 degrees, in the bearing it was 235 degrees. A new apparatus built at the United States bureau of standards has found the pressure greatest at certain points on the under side of the bearing, where shaft weight adds to the pressure. To aid in keeping these "hot spots" well lubricated, manufacturers have devised high-pressure pumps to boost the flow. Air cleaners and oil filters aid by removing abrasive dirt and carbon particles. Breathing tubes to ventilate the crankcase help remove corrosive gases.

Still more vicious are the chemical forces that attack motor lubricants. Under motor heat and



Testing Oil from the Motor

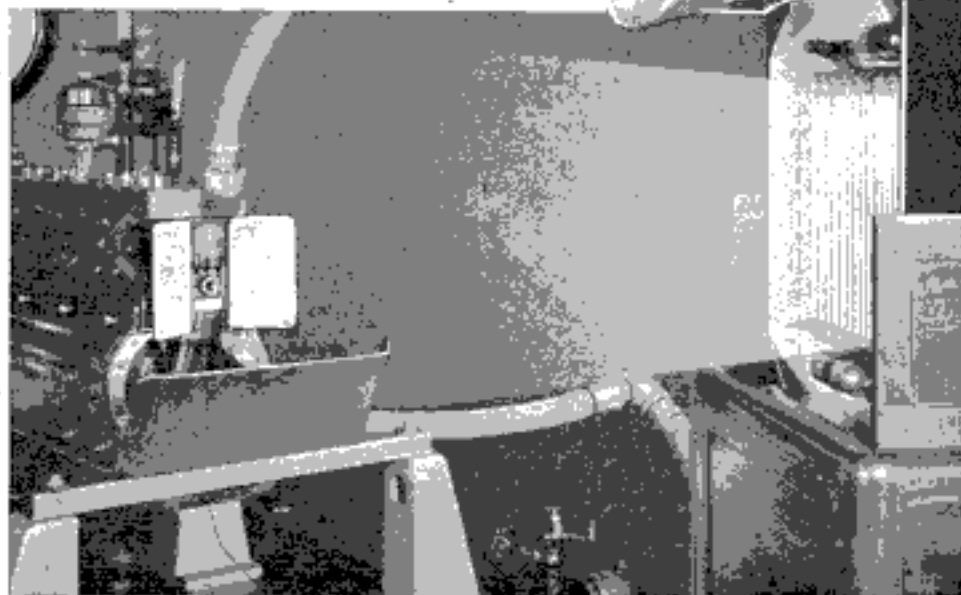
one made also by Standard Oil of New Jersey

Standard Oil of Indiana, 910 St. Michigan

Synthetic

Sold in 5-gal Containers - 50¢ per gal.

drogen to unite with other atoms, to produce a superior oil from cheap crude. Now has appeared a new synthetic motor oil, built in the laboratory, which will pour freely at twenty to twenty-five degrees below zero, yet will withstand the extreme heat of the fastest driving.



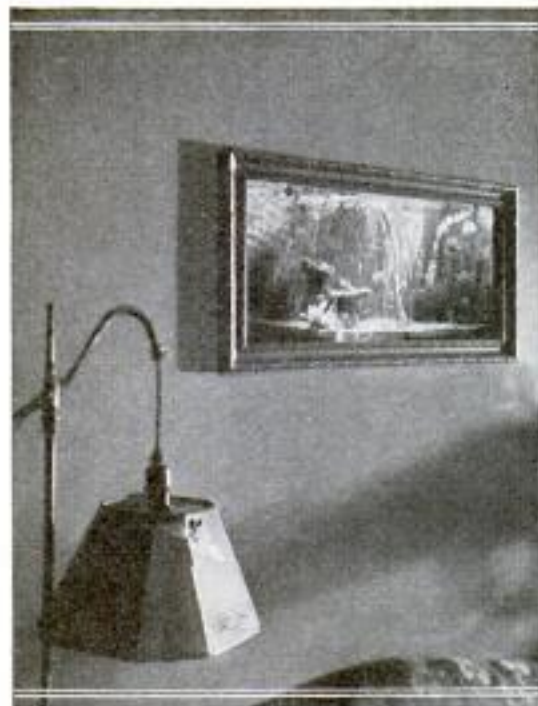
Cut-Out Motor Cylinder Shows Engineers How to Perfect Lubrication and Guard against Wear

pressure, oil gradually becomes chemically changed. Raw gasoline dilutes the crankcase supply, slipping past the piston rings. Gradually the oil becomes weakened. If not changed in time, it will break down, causing expensive motor damage.

In their effort to produce oil of greater strength, chemists are rearranging oil molecules in new patterns that will hold together with greater tenacity, even under the most intense heat. The first step was hydrogenation, which forced atoms of hy-

As a result of these developments, the car owner should realize the cost of the very best oil is his smallest expense and best insurance of motoring satisfaction.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request when accompanied by return postage.



Left, Aquarium Illuminated to Resemble Animated Picture; Below, Cut-Away to Show Installation in Wall



LIGHT IN WALL AQUARIUM GIVES PICTURE EFFECT

Producing the effect of an animated picture, an aquarium built into the wall of the home is provided with lighting equipment. A frame for the aquarium enhances its appearance. When the lights are turned on, the moving fish and gently waving water plants produce a scene of unusual beauty. The aquarium is given any attention from the other side of the wall.

MOISTURE TESTS OF CONCRETE TELL WHEN TO LAY FLOOR

When a wooden floor may be laid safely on concrete can be determined by a small instrument about the size of a fountain pen. If the floor is laid too soon, moisture collects in the space between the concrete and the wood, causing the flooring to swell and buckle and often leaving wide cracks. The wood hygrometer has been adapted to the use of testing the moisture of concrete. If the instrument does not register higher than



eleven per cent moisture, it is considered safe to lay the floor, although this figure may vary under some conditions. The tester, to produce accurate readings, is left on the concrete overnight.

EGGS KEPT FRESH FOR MONTHS BY GAS TREATMENT

Commercial preservation of eggs by gas treatment is being used successfully in Europe. The process is said to keep eggs as fresh as when first laid and is effective for months. In treatment, the eggs are placed on trays in a high compression tank. When the doors are sealed, the air is withdrawn and a mixture of nitrogen gas and carbon dioxide introduced. The effect is to suspend animation, figuratively chloroforming the eggs. Removed from the tank several months later to be placed on the market, the eggs can be boiled or poached. There is no taint or peculiar flavor. It is claimed that fruit and meat can be kept fresh by the same method.

By a recent process, mirrors are being produced which reflect as high as ninety-four per cent of light.

*Dressed Products Laboratory
 Madison, Wis*

*Science Feature 3/6/32
 see note*

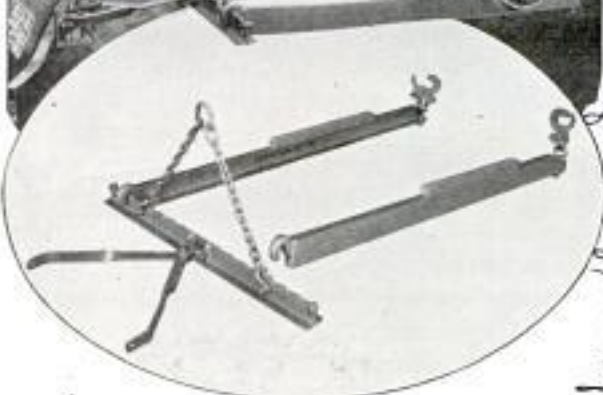
at Chelmsford, Eng

ARCTIC SHIPS IMPROVED BY PROPELLER RESEARCH C 725

Research in chemical laboratories and steel plants is credited with much of the success of ships that navigate polar waters in search of new and shorter trade routes. It was found that ships needed propellers made of special steel to navigate the ice fields because the low water temperatures cause the steels to become brittle. There was considerable breakage. Steel containing three and one-half per cent nickel was found to preserve its toughness at very low temperatures, providing the answer to the propeller problem.

AUTO TOWING MADE EASY BY FLEXIBLE CARRIER C 501

Easier towing of autos and trucks is claimed for an improved carrier with a flexible hookup that allows freedom in turning corners and on uneven surfaces without injury to the carrier or the vehicle being towed. The hook, which is connected directly to the frame or the springs, clamps on securely.



Carrier Shown in Inset Is Easily Attached to Auto or Truck to Facilitate Towing Operations

A. L. Campbell
101 N. 16th St
Portland, Ore.



When Fruit Picker, Inset, Plucks Apple from Tree, as Shown, It Rolls down Cloth Channel into Basket without Bruising

FRUIT PICKER EASY TO HANDLE FROM BENEATH TREE

Gathering fruit is made easy by a simplified picking implement that can be operated from the ground. Use of heavy ladders and breaking of branches are eliminated. The picker consists of a lightweight pole on one end of which is mounted a steel collar with three aluminum self-acting paddles and a cloth bag. As the paddles pluck the fruit, it drops into the twenty-foot bag and is brought to the ground without bruising.

ONE SQUARE INCH OF HOTTER STAR COULD RUN OCEAN LINER C 726

One square inch of the area of the hotter stars could provide enough power to propel a liner across the ocean, says Sir James Jeans, British astronomer. So compressed are the smaller stars that one ton of their matter could be placed in the bowl of a pipe, he continues, and the largest stars are so diffused that their density is one-hundredth that of the air we know. The scientist points out that each color of starlight tells its own story, revealing the size and weight of the stars.

Fisher 800 Collett Ave
Terre Haute, Ind

C. O. R.

San Diego

General Products South Bend
Ind. (H. A. Lane, Sales Director)

230

Haye



Lawn Edger with Cutter Operated by Foot; the Tool Eliminates Stooping and Sweeping Up Cuttings

TRIMMER FOR LAWN BORDERS CUTS BY FOOT PRESSURE

Grass around lawn borders, trees, shrubbery and walks can be kept neat and trim by a lawn edger, operated by foot pressure, which gives a straight line of uniform width. A blade is raised by means of a lever on the handle and released by pressing the foot on the cutter. The edger is then lifted and the cuttings deposited in a basket, thus eliminating back bending or any need for sweeping up afterward.

TINY DISK GUARDS HUGE MOTOR FROM OVERHEATING

Giant electric motors are protected from overheating by a tiny metal disk that shuts off the power when a dangerous temperature is reached.



The disk, which is about the size of a twenty-five cent piece, not only shuts down the motor when it gets too hot, but puts it back to work when cool. Where shutting off the

motor would interfere seriously with production, the thermostatic disk can be arranged to turn on a light or sound a buzzer to warn attendants. Thus, steps might be taken to remedy the overload or other cause of overheating without stopping the motor. The disk consists of two wafer-shaped pieces of unlike metal, fastened face to face. Due to the fact that they expand and contract unequally with changes of temperature, the disk buckles at definite temperatures. This buckling opens or closes a set of contacts in the circuit supplying power to the motor. Bulletlike speed is acquired by these contacts, preventing burning and perhaps destruction of the contacts. The disk guards were developed by the Westinghouse Electric and Manufacturing company.

C 691

FUSE PLUG HAS COLORED DISK TO SHOW BLOWN-OUT WIRE

Revealing a blown-out fuse at a glance, a new electric plug is equipped with a brightly colored disk behind the fuse wire. There is a different-colored disk for each ampere size and the number appears prominently on the face, aiding identification.



Royal Electric Co. Inc. Avon Mass

IRRIGATION SYSTEM OF MAYAS TO BE RESTORED

Constructed hundreds of years ago by Mayan engineers of the ancient Mayas, a storage and irrigation system in the Yucatan area will be restored and put back into service by the Mexican government. The intricate network of underground canals is said to be superior to that of the ancient Egyptians. Reservoirs of the system were lined by the Mayan engineers with waterproofed stone and plaster, as were the aqueducts, branch canals and drainage channels. Thus, enough water was stored during the rainy season for use during the rest of the year.

Christian Science Monitor 6/5/33
Cotton sheeting permeated with a bituminous compound is being used to patch or cover old roofs.

Scum short 12/19/32
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FEW ARE NOT SUPERSTITIOUS UNDER ACTUAL TESTS

Almost everyone is superstitious about something, no matter how intelligent he or she may be. Dr. Otis W. Caldwell, of Columbia University, who has studied this subject for several years, found that ninety-eight per cent of the women among 3,000 persons questioned were strongly influenced by some unfounded belief. Doctor Caldwell tells of seeing salt thrown over very elegant shoulders at very smart dinner parties, of hearing intelligent business men express fear because they had seen the new moon over the wrong shoulder, of looking in vain for the thirteenth floor in New York office buildings and of watching Park Avenue dowagers running from black cats. Most brides are married in "something borrowed and something blue" and few persons can help knocking on wood when they boast of "luck."

New York City



Historic Pennsylvania Church Inclosed in Glass to Permit Inspection but Prevent Vandalism

INFORMATION ROBOT HAS DIAL TO TELL ALL ABOUT TRAINS

Operated like the dial telephone, a robot installed in London disseminates information about subway trains. By dialing, passengers are able to find out for themselves the location of a particular place, the fare required and the number of the platform from which the train starts.

C 636

Charing Cross station



By Operating Dial, Travelers Are Given Information on Subway-Train Schedules and Fares

GLASS CASE OVER OLD CHURCH PREVENTS VANDALISM

In order to prevent vandalism a glass case was constructed to inclose an historic old church in Hershey, Penna. The house of worship, built more than a century ago, attracts many visitors, and since the protective covering was built it is viewed through the glass walls.

Herry Presbyterian

LIGHTWEIGHT DIESEL ENGINE RUNS TRUCK AT LOW COST

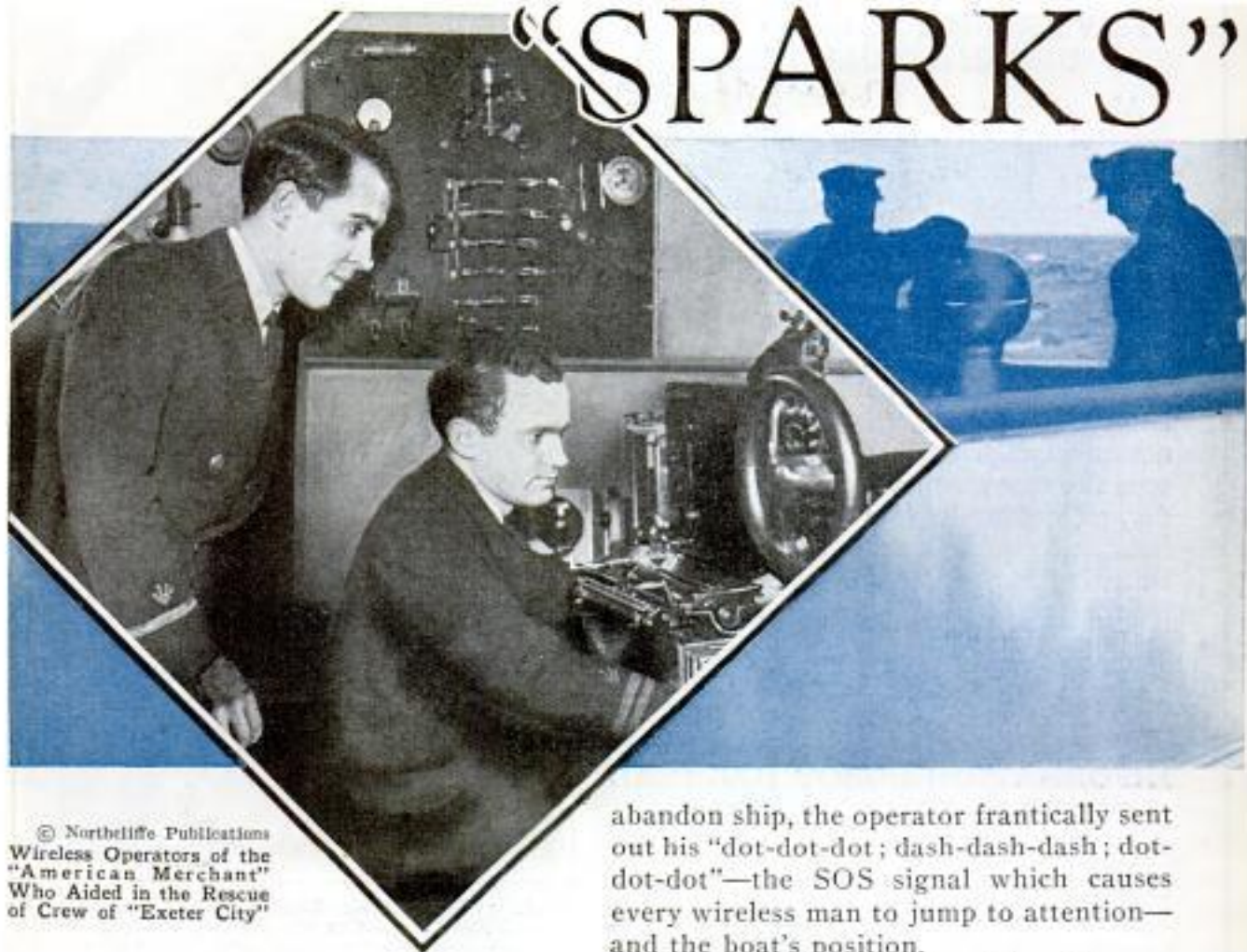
Production of an air-cooled, lightweight Diesel engine for use in trucks has been announced by the Krupp manufacturing interests in Germany. The weight is approximately fourteen pounds per horsepower in the fifty-horsepower engine. Operation costs in a two-ton truck are said to be about three-fifths of a cent per mile. Exceptional power, smokeless combustion and quiet operation are features. Compression ignition is used, but a special starter also is furnished. The four cylinders are provided with cooling ribs.

C 695

Indianapolis Star
4/30/30

at Essen / Friedrich Krupp Akt. Ges. Ordnance of actors

"SPARKS"



© Northcliffe Publications
Wireless Operators of the
"American Merchant"
Who Aided in the Rescue
of Crew of "Exeter City"

By H. W. MAGEE

WHENEVER marine radio operators begin to reminisce, two stories usually are told before they finish.

One deals with the farewell message of a wireless man on a small vessel lost at sea a few years ago. Half a dozen boats were racing to the aid of the stricken ship, but all realized the race probably was lost before it started, because the vessel was reported foundering.

Suddenly there came a call from the sinking boat and tense operators bent over their sets.

"We're going down," stuttered the wireless. The radio men wiped the perspiration from their foreheads with nervous fingers, then jerked to attention as another call came from the stricken boat.

"What a night to be out without an umbrella!" was the flippant message the operator sent.

The other tale is about the radio operator on an oil tanker which caught fire off the Azores. While the crew prepared to

abandon ship, the operator frantically sent out his "dot-dot-dot; dash-dash-dash; dot-dot-dot"—the SOS signal which causes every wireless man to jump to attention—and the boat's position.

When things got too hot, the radio man leaped overboard to join the crew in life-boats. But a doubt arose in his mind whether a near-by vessel had received his position. So he swam back, boarded the now fiercely burning tanker, and repeated his position, leaving when the flames were all but licking the wireless room. As a result of his return trip, the crew was picked up in a few hours.

Two gestures these, each representing an epic of heroism and courage—the first the fearlessness of a brave man in the face of death, the other the willingness of a man to sacrifice his life to save the lives of his shipmates.

Ships of steel, giant engines with power to spare, and the countless mechanical aids to navigation, have made sailing the seas so safe and so certain that old-time salts are accustomed to scoff at their modern prototypes.

"We used to have wooden ships and men of iron," they sometimes remark sadly, "but today you've got iron ships and wooden men."

to the Rescue



But just about the time these ancient mariners convince themselves the glamour of adventure is gone from the ocean, and that men who go down to the sea in ships have become mollicoddlers, some dramatic disaster threatens—and men of steel step forward to perform some feat of stark, unyielding courage which thrills the world.

More and more often nowadays, these modern epics of heroism at sea involve the deeds of young men, many scarce out of their teens. On the ships' rosters, these men are listed as radio operators and rated as junior officers—but to their mates they are known as "Sparks," an odious

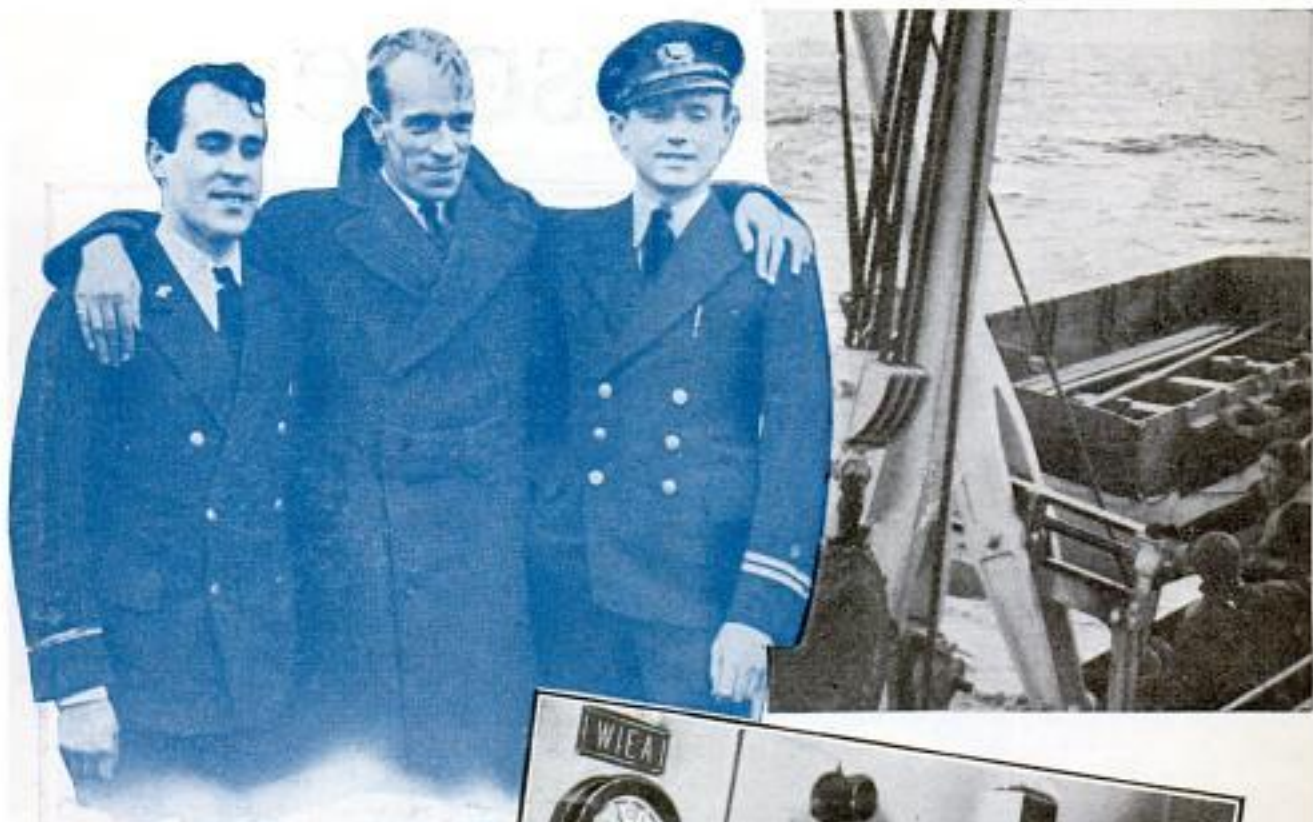
Left, Empty Lifeboat Being Towed to Sinking Boat; Right, Captain Stedman and Men Who Were Saved

nickname bestowed in the early days of wireless when their sets caused the electrical energy to jump a gap and produce a spark.

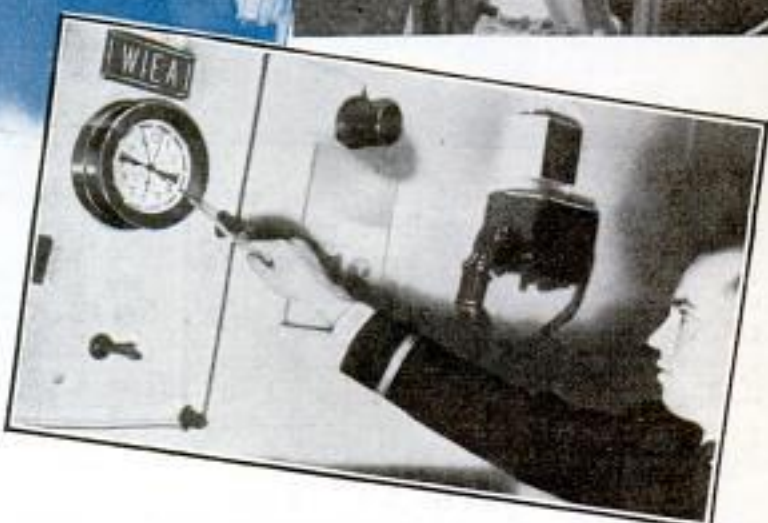


The "American Merchant" Whose Wireless Crew Picked Up Signals Resulting in Saving Twenty-Two Lives

C 366



The courage, energy and resourcefulness of these radio men in an emergency is amazing. A striking instance occurred only a few months ago when the crew of the sinking British freighter, "Exeter City," was rescued in mid-Atlantic by the "American Merchant" of the American Merchant lines, commanded by Capt. Giles Stedman, who thereby participated in his second rescue in recent years.



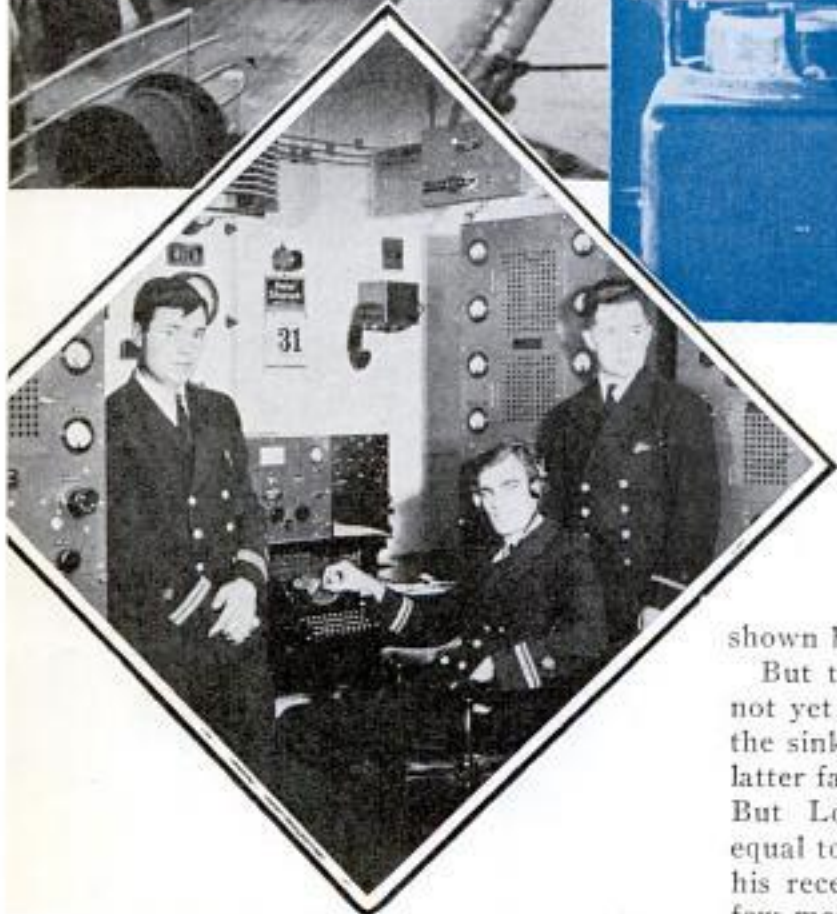
Above, Left, Radio Operators of "American Merchant" and "Exeter City"; Below, Dark Sections on Clock Show Periods of Silence

Battling a terrific storm at night, the "Exeter City" was disabled when heavy seas carried away her superstructure, swept the master and three others overboard, stove in some of her hatches, carried most of the lifeboats away—and damaged the radio equipment. With the radio out of commission, it appeared that the twenty-two persons on board were as much at the mercy of the elements as though the accident had occurred a century ago when there was no wireless.

But Henry Victor Lothian, wireless operator on the "Exeter City," refused to be licked. The life of every person on board depended on his efforts. He found the sea had disabled the antenna, carried away the emergency battery, smashed in the ra-

dio cabin and doused the set with water. Soaked to the skin and standing in water up to his ankles, Lothian worked in the bitter cold with only the aid of a flashlight, making repairs to the equipment, which had been switched to the ship's main current supply, and receiving a shock each time he tried to tinker with any of the wet parts. Every movement of the vessel threatened to dislodge the cabin and equipment from its shaking foundations, but the operator kept at the job.

Near daybreak the set was repaired so it would work temporarily, and out over the ether went the SOS call which galvanizes every wireless man to action. Many vessels picked up the signals, but the "American Merchant" happened to be



Above, Left, Lowering Lifeboat from "American Merchant"; Right, Operating Radio Direction Finder; Below, Radio Room and Crew of S. S. "Manhattan"

nearest. She was only about fifteen miles away—but fifteen miles might as well be 1,500 in a raging storm unless there is some means of locating the vessel needing help. Here again radio men came to the rescue. While Operator Leon M. Athey on the "Merchant" messaged Lothian, his assistant, Walter Adams, mounted to the bridge to operate the direction finder.

The direction finder is actually a radio compass. While the ship in distress sig-

nals, the finder is rotated until the point of minimum reception of these signals is reached, whereupon the indicator points the direction from which the signals come. It is then only a matter of steering the vessel toward the point of the compass shown by the indicator.

But the work of these radio men was not yet over. Before the rescuer reached the sinking ship, the power supply of the latter failed, thus silencing its transmitter. But Lothian, Athey and Adams were equal to this emergency, too. By "keying" his receiver, Lothian was able to send a few messages by controlling the set's oscillations, thus using interruptions of his "squeal" to send code.

Once within hailing distance, the actual rescue work of the radio men was at an end, and it remained for Captain Stedman to transfer the crew of the sinking boat to his ship, a tremendous task in itself because of the heavy seas. But without the radio and its complementary instrument, the direction finder, the rescued crew must almost certainly have perished!

Why do these young men take to the sea? The pay is modest, the hours are

C 266
22

long, and, for the most part, tedious. There are days, weeks and months of doing nothing but "keeping watch," sending and receiving occasional routine messages—then may come the big chance, sometimes an SOS, more likely bad weather as a ship nears port. For the radio man, by working his direction finder, can take a vessel into an open port by keeping in touch with land stations and using the direction finder to set a course. Three minutes each half hour all marine wireless stops while every operator listens for SOS signals from some vessel with a weak or partly disabled set.

Most of these operators are young men—the three participating in the "Exeter City" rescue averaged hardly more than twenty-five years. They usually take up radio as a hobby in boyhood, building and tearing down homemade sets until a desire for more knowledge leads them to a radio school. After obtaining a license, most of them gravitate to the sea as the best and easiest method of obtaining valuable experience. Many have no intention of following the sea for life. Instead they dream of the day when they will help op-

erate a big ground station and will be classed as a radio engineer.

Today all vessels carrying fifty or more persons are equipped with radio if traveling between ports 200 miles or more apart. Most large vessels carry at least two operators, the big liners usually have three or more. It is a tribute to the safety of navigation that these wireless men, for the most part, lead humdrum lives and participation in a rescue is, for them, an event.

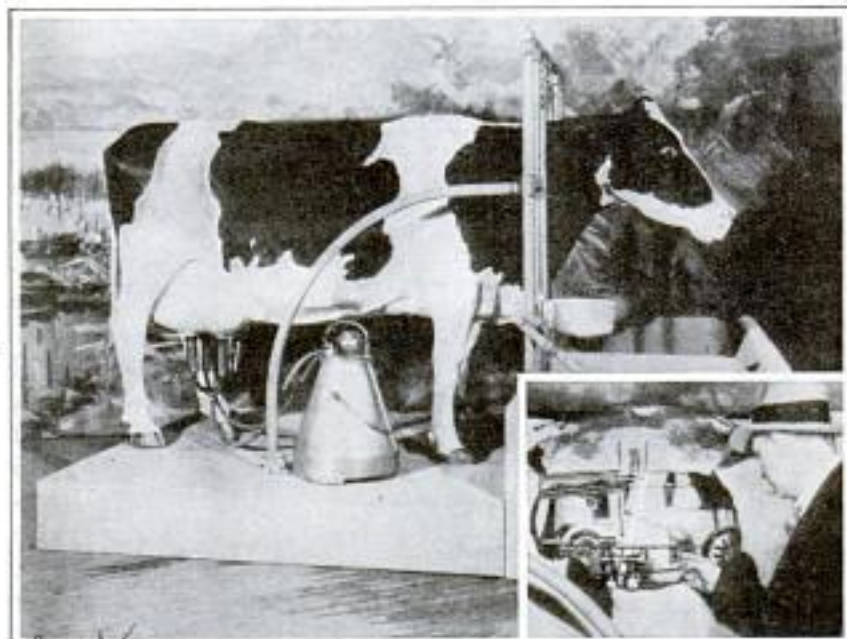
But when an emergency arises, the captain can usually depend on the radio man for an idea. For instance, when the radio shack and all its equipment was washed from the deck of a freighter during a storm, it was natural to assume that the radio man's job was done. But Sparks had a different plan. He climbed a mast and, with the aid of a flashlight as a transmitter, managed to signal the operator of a passing ship with his makeshift "set."

Wireless is known as the guardian angel of the seas, and the men who man the sets might be termed the archangels of the ocean, for on their courage and ingenuity often depend the lives of hundreds of persons on some ship in distress.

C 503
MECHANICAL COW GIVES MILK AND ACTS LIKE LIVE ONE

Visitors to the Chicago World's Fair will find on exhibit a life-size Holstein

cow which is wholly mechanical. This bossy, whose insides are filled with machinery, is able to moo, chew its cud, blink its eyes, move its ears, switch its tail, breathe and, most surprising of all, give milk. The mechanical cow is in a setting of modern dairy equipment, and is milked by a modern milking machine.



Mechanical Cow Which Moos, Chews Its Cud, Blinks Its Eyes, Moves Its Tail and Gives Milk; Insert Shows Part of Operating Mechanism

C 696
PLANE PASSENGERS SUGGEST NEW SERVICES

Comments of passengers on the service are solicited regularly by many of the leading air lines, and the companies give credit to the passengers for some of the comfort features built into modern ships. United Air Lines, for example, supplies a card, inviting the

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400 S. Michigan
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C 618 Aluminum Company
of Pittsburgh

POPULAR MECHANICS

2400 Oliver Bldg²³
Pittsburgh, Pa

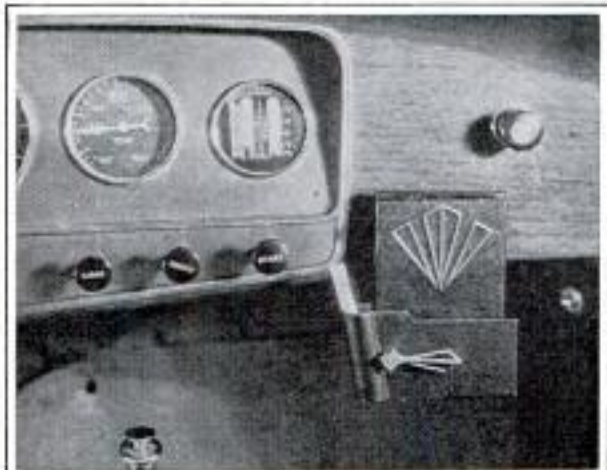
traveler to offer criticism or ideas for improvements or innovations. Faster planes and quieter cabins were two of the most insistent demands, and today air-line schedules are faster than ever before, and new ships have cabins so quiet fellow passengers can converse without raising their voices. Many travelers in the early days complained about the prohibition of smoking, and today most air lines permit passengers to smoke cigarets. Reading lamps which provide light for one passenger without disturbing another who wishes to sleep are also traceable to ideas advanced by passengers, as are the larger seats with more leg room. Some of the comments have not been so easy to carry out. Several travelers have suggested plate-glass floors in the ships so the earth directly below could be observed, and others have asked that air bumps be smoothed out or that pilots fly around them.



The Weight of This Girl Is Being Supported by Three Thin Sheets of Aluminum Foil

CIGARET HOLDER AND LIGHTER CLAMPS ON AUTO DASH

Attached to the instrument panel or other convenient place by one screw or a clamp, an automatic electric lighter and cigaret holder for the automobile delivers a lighted cigaret in a few seconds. It has a storage compartment for ten cigarets and releases one to the lighter when the top is touched. Tilting the cigaret on end



Cigaret Lighter and Holder for Auto Dash: It Delivers a Lighted Cigaret at Touch of Finger

brings it in contact with the lighting cell and at the same time makes the electrical contact. The whole operation can be accomplished without taking the eyes from the road and by using only one hand.

Metropolitan Specialty Corp., 1628-15th St Denver, Colo

SWING TEST SHOWS STRENGTH OF ALUMINUM FOIL

Aluminum foil is unbelievably strong, as was shown in a recent demonstration when a swing was suspended from three sheets of foil, each about six ten-thousandth of an inch thick. The three sheets supported the weight of a girl, and engineers estimated the same sheets would have supported a load of more than 200 pounds without breaking.

PAIRS OF "ISLAND UNIVERSES" OBSERVED IN THE HEAVENS

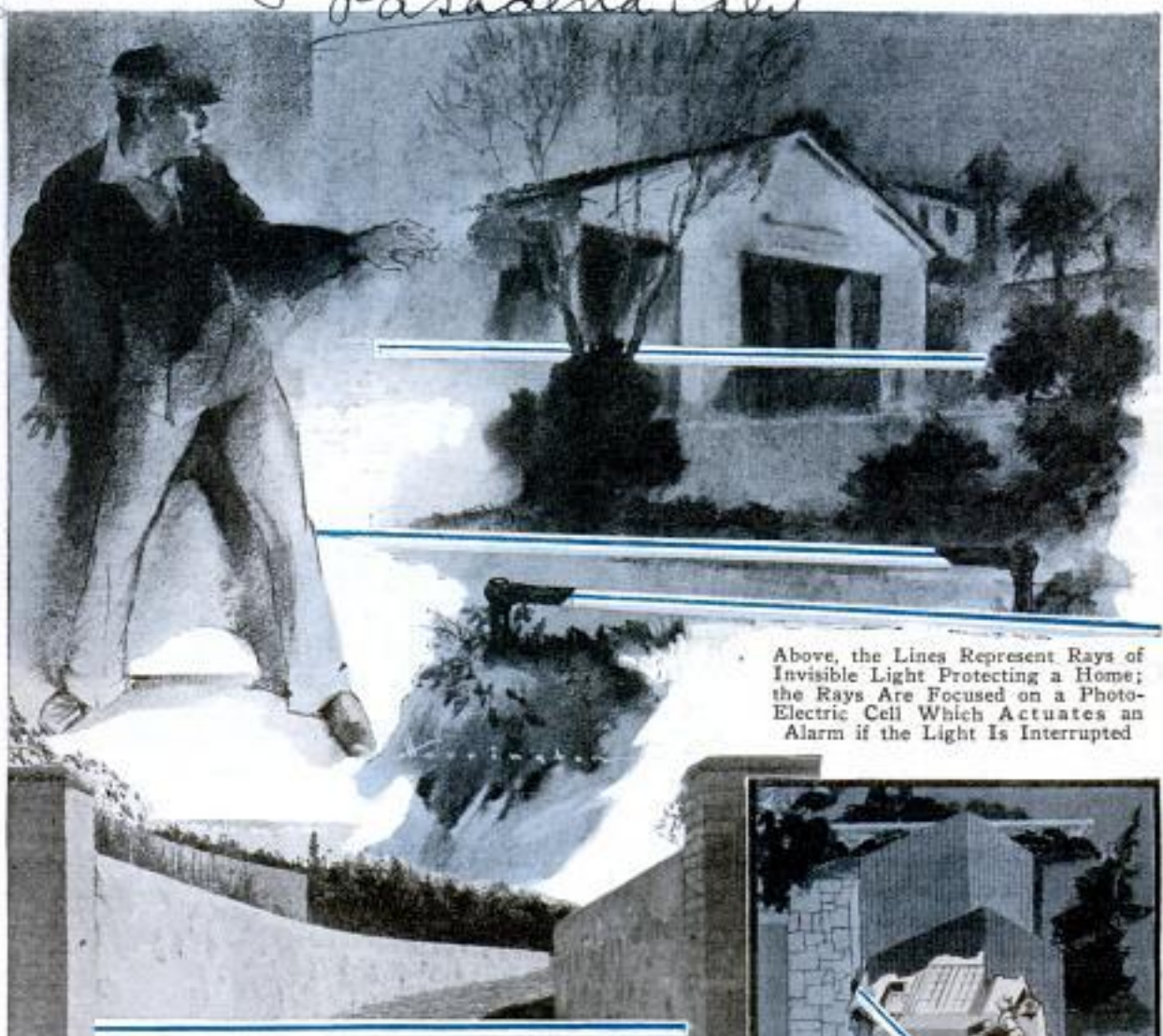
Galaxies, the vast lens-shaped aggregations of stars which have received the popular name of "island universes," are often grouped into super-galaxies which, in the aggregate, contain great numbers of giant suns. Dr. Harlow Shapley of Harvard college observatory, has now discovered that these super-galaxies are often found in pairs. In a recent address, he told of finding such twin universes occasionally, out in the vast reaches of space.

Cambridge, Mass

C 667
News news letter
4/29/37
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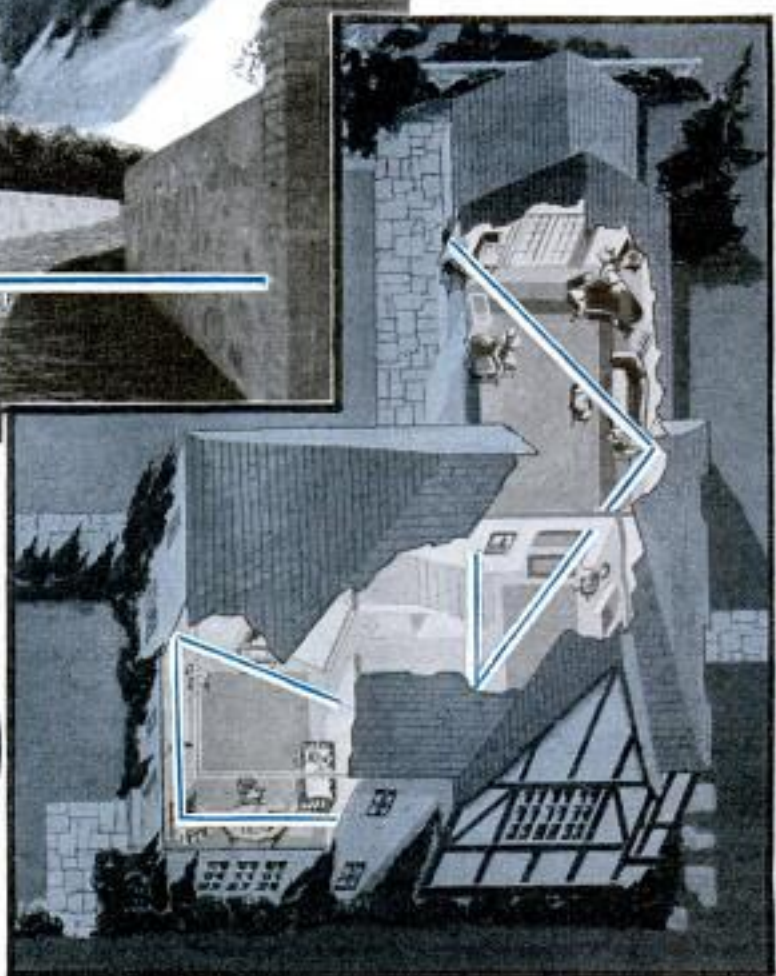
Singer Bldg.
Homes Protected by "Bars" of Invisible Light
Paradise Calif

*Taken over by Western Electronics Co. Pasadena
696 E Colorado St. Calif*



Above, the Lines Represent Rays of Invisible Light Protecting a Home; the Rays Are Focused on a Photo-Electric Cell Which Actuates an Alarm if the Light Is Interrupted

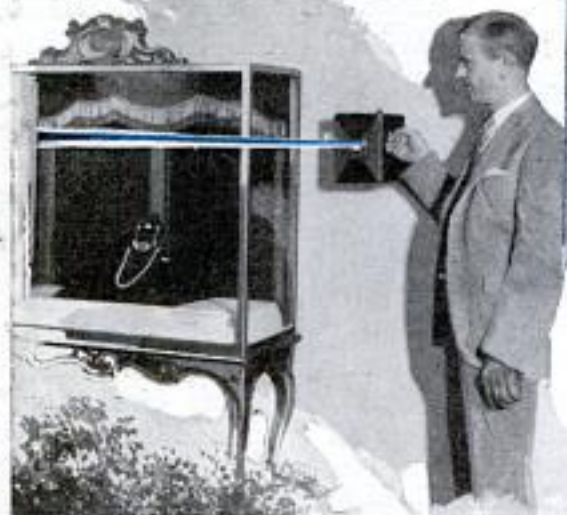
Above, Entrance Court Protected by Invisible Rays; Right, Showing How Single Ray Protects Entire Floor of Home by Use of Reflectors; Below, Component Parts of the Robot-Watchman System



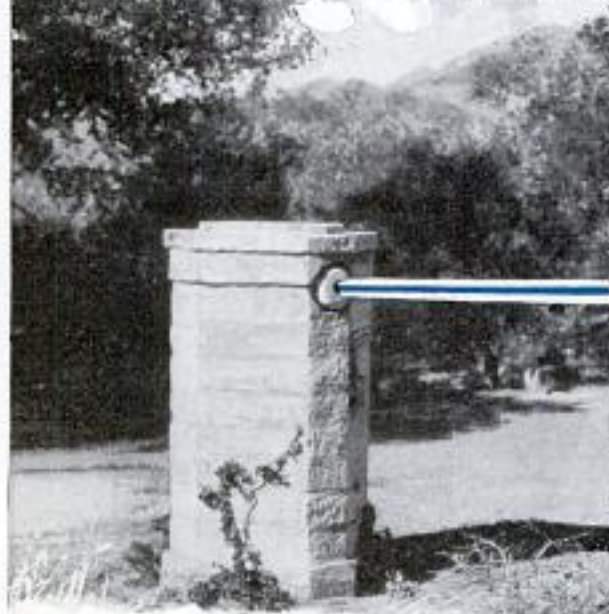
Electric Eye Is Night Watchman and Servant



Approaching Auto Headlights Fall on a Photo-Electric Cell Which Actuates a Mechanism Illuminating Sign; When Car Passes, Lights Go Out



Left, Jewel Case Guarded by Electric "Eye" and Invisible Rays; Above, Night Prowlers Have No Way of Knowing When They May Set Off an Alarm or Cause Home to Be Flooded with Light, Since Rays Are Invisible



Below, This Innocent-Appearing Vase Conceals the Light Source for the Invisible Rays Which Are Projected to a Photo-Cell Forty Feet Distant



Above, Projector for the Invisible Rays Concealed in Sun Dial; If Someone Were to Interrupt the Beam of Light, an Alarm Would Sound

C 336

James Stokley, Franklin Institute
at University

Club, Philadelphia

(Capt. Eckhardt) - suggest
Perfected Co. 145 72 70th. N.Y.
Reflector of Illuminating Co.



How a Spotlight, Like Those Used in Theaters, May Be Adapted for Home Reading

SPOTLIGHT FOR HOME READING TAKES NO FLOOR SPACE

Spotlights, like those used in show windows and the theater, can be used for reading in the home. Since they are mounted near the ceiling, all floor space is left free for other purposes. The light can be focused on a book or newspaper, leaving the rest of the room in semi-darkness. One sixty-watt bulb gives ample light.

AIRPLANE BURNS FURNACE OIL IN GASOLINE ENGINE

Furnace oil may some day become a practical fuel for airplanes. A device by which a high-compression gasoline engine can be made to perform efficiently on ordinary furnace oil was recently demonstrated successfully on a plane. In the test, the ship was started on gasoline, but just before the take-off, a switch to fuel oil was made and the craft circled an airport twice on the oil fuel. The same device has been used even more successfully

4-cyl. Duffing gas engine.
- with biplane.

Wing Aircraft Corp
675 120th roadway, N.Y.

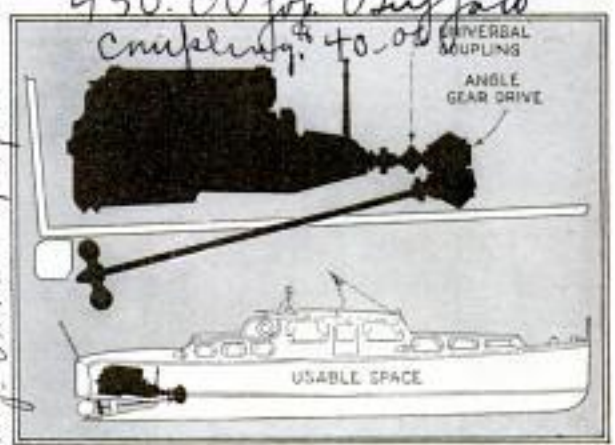
on automobiles. It consists of a small metal tube or chamber screwed into the cylinder head between spark plug and cylinder. This brings about a double ignition, doing away with knocks and, according to the inventor, making it possible to obtain high efficiency with low-grade gasolines. The spark sets fire to the fuel which the compression stroke of the piston drives up into the little chamber. This little conflagration spreads down into the compressed fuel just as the piston reaches dead center, the high-compression point, and ignites the gas evenly and completely throughout the chamber, thus delivering a much more powerful force.

C 624

ANGLE DRIVE FOR BOAT ENGINE GIVES MORE CABIN SPACE

More space for the owner's use is provided in large cruisers and yachts by a silent angle-drive gear for the craft's engines. The drive, produced by the Sterling Engine company, permits placing motors aft with all vibration and operating sounds insulated from the forward section. It reduces the length of exhaust line and propeller shaft, effecting a saving on tubing, and eliminating the problem of running exhaust pipes under floors and berths. By also locating the galley aft, as featured in the latest designs by Fellows and Stewart, approximately three-fourths of the boat is left to the owner for cabin space. Fellows and Stewart have designed a streamlined forty-foot cruiser whose speed is expected to be increased through lessened wind resistance and delivery of power at twenty-five per cent lower revolutions.

Washington, Calif.



Top, Angle-Drive Hookup for Boat Engine; Bottom, Drawing Showing Reduction of Waste Space

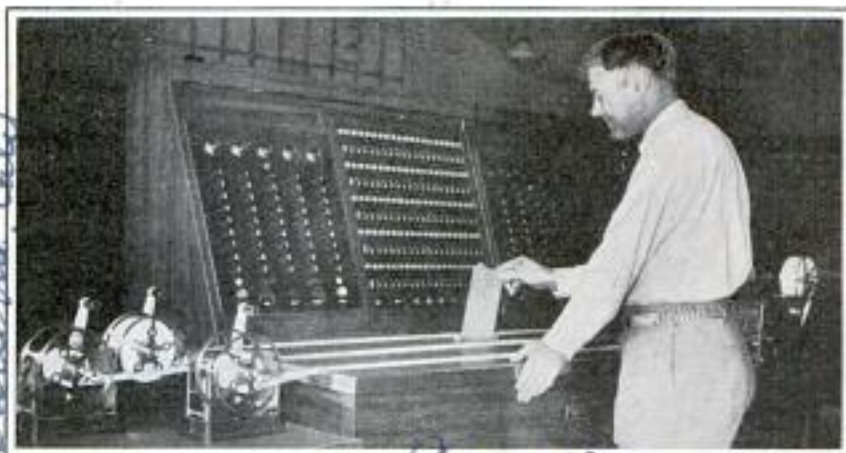
Dr. Alfred Schwarz, Jersey City, N.J.
Sterling Engine Co. 1250
Niagara, Buffalo, N.Y.

Science News Letter 4/29/33

COSMIC-RAY FORCE IN STRATOSPHERE MEASURED

Cosmic rays have been measured as they plunge through the earth's stratosphere more than eleven miles above sea level. Three successful flights of pilot balloons bearing cosmic-ray measuring devices were described recently by Prof. Robert A. Millikan of the California Institute of Technology.

At this great height, the cosmic-ray intensities are approximately 100 times greater than at sea level. In other experiments, platforms were carried up mountain heights to elevations as great as 29,000 feet, and observations were made of the penetrating power of the rays through lead shields. The tests showed a rapid "softening" with altitude about the same for temperate as for equatorial latitudes.



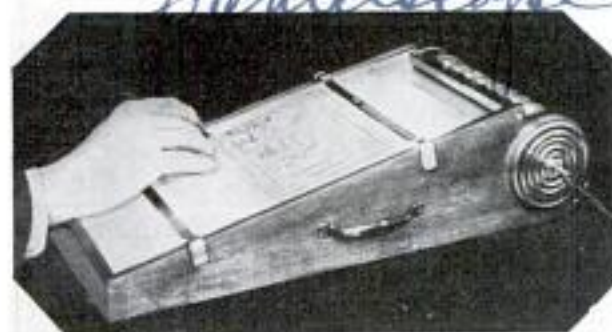
Apparatus for Making Accurate Records of Fire Alarm Is Shown in Operation; Completed Card Automatically Rings Station to Answer Call

FIRE ALARM RECORDED ON TAPE TO INCREASE ACCURACY

By recording fire alarms on moving tape, the Los Angeles department has made more accurate the process of locating fires. When a call comes from an alarm box, the mechanical system prints the number of the box on the tape. The attendant takes from a box a card perforated with the address of the fire and drops it into a slot. This card then passes through an electrical apparatus which automatically rings the station to answer the call, and gives the address of the box near the fire.

LIGHT INSIDE TRACING CABINET KEEPS HEAT FROM STENCIL

Heating of stencils is prevented by using a fully inclosed tracing box with an



Tracing Box with an Inside Light Which Shines through a Glass Top to Illuminate Paper

inside light which shines through a glass top to illuminate paper being traced. The writing surface is plain glass. Below is an air chamber, then a sheet of ground glass which diffuses the light evenly. This double glass with an air space between prevents heating the stencils. The light source is a bulb fitted into the upper end of the box so an indirect light is given, and this light is reflected by a ground-metal mirror through the two sheets of glass.

GLASS-JAR FIRE EXTINGUISHER KEEPS CONTENTS VISIBLE

Its contents always visible, a fire extinguisher with a glass container for the liquid has been produced for protection of the home, machine shop, public conveyances, autos, garages and filling stations. The container is a standard fruit jar. Pint or quart sizes are available, with re-charge packages containing sufficient liquid to fill the extinguisher twice. Operation is by pump. Simplified construction makes it possible to disassemble the entire extinguisher without tools, with the exception of the screw plug in the pump handle. The liquid is non-freezing.



W. S. Smith
1014 62nd St.
Brooklyn N.Y.

Star Sprinkler Corp.
Copyrighted material
Westmoreland + Collier

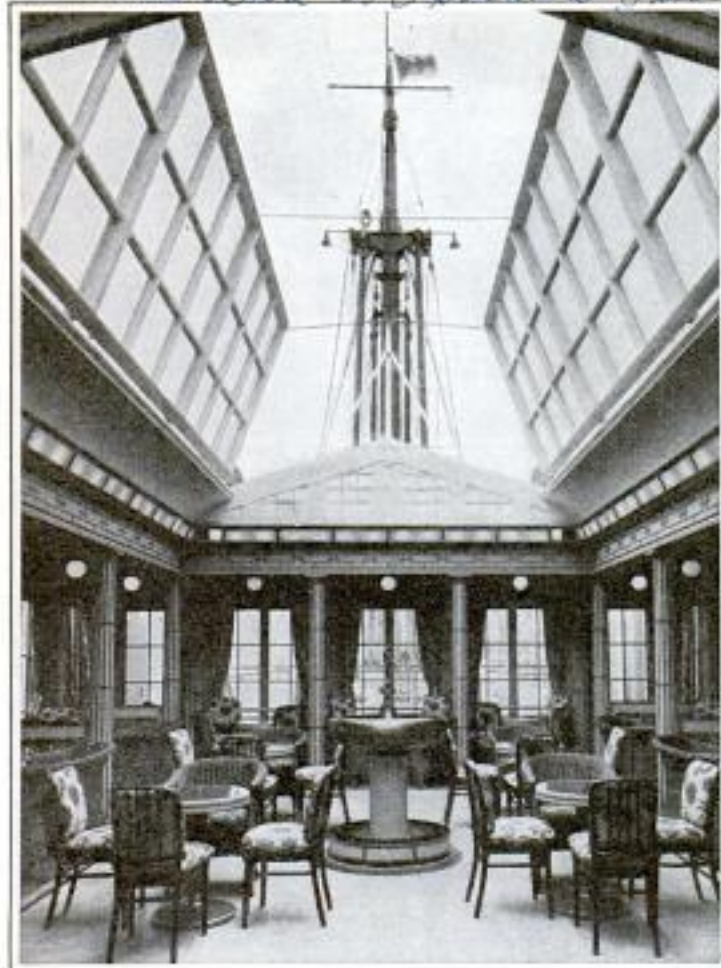
Philadelphia

C 460

Hamburg, American Line

39 Broadway New York

Bertha E. Tucker, Publisher



Roof of Pavilion on Ship Designed for Service in Tropics Is Shown Open to Admit Air; Walls Also Are Movable

ROOF OF SHIP PAVILION OPENS TO ADMIT AIR AND LIGHT

Walls and ceilings of public rooms in the latest ships designed for service in the tropics can be moved to admit air and light. The roof of the tea pavilion on the motorship "Caribia" opens upward, instead of sliding back, as has been the practice on other vessels. Walls of the pavilion also can be opened, and this room, the balcony of the dining salon and the drawing room can be combined to form one large room for entertainment purposes. A marble dance floor is another feature of the "Caribia's" pavilion.

TREATED WOOD RESISTS FIRE ROT AND TERMITES

Wood treated with a new chemical solution resists fire, rot and termites. Soft woods are made hard enough to take a finish like mahogany. The chemical also may be used for spraying foundations of

see Aug. 192
Mrs. S. H. Hodnefeld
Los Angeles, Cal.

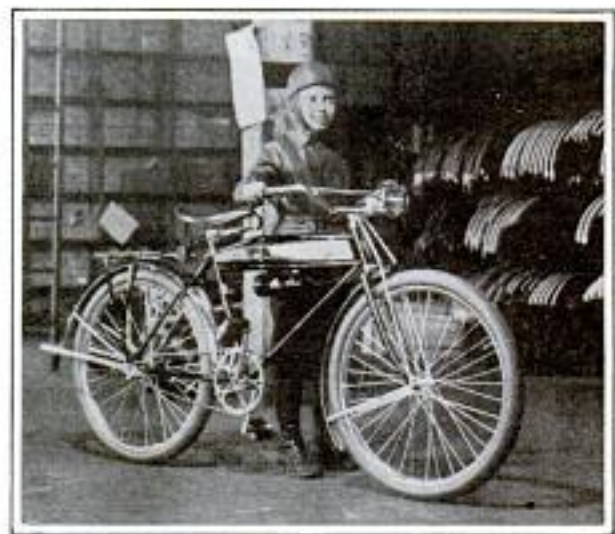
Pr. Field Chemical Co
335 S Raymond Ave
Pasadena, Calif

buildings to eradicate destructive insects without destroying plant life near by. Fabrics, tentings, awnings, brake linings, cloth and materials used in covering the wings of aircraft can be made non-inflammable by treatment with this solution. Treated cloth held over a lighted match will not carry fire, the flame going out when the match is removed.

BALLOON TIRES ADAPTED TO BICYCLE FOR EASY RIDING

C 536

More comfort for the rider is produced by low-pressure balloon tires with which an American manufacturer is equipping his latest-model bicycles. Built like the automobile tire, these cord balloons are straight-sided, with an inner tube, and are fitted on a wheel with a deep drop-center rim. Eighteen to twenty-two pounds of air are carried. The new tire is two and one-eighth inches in diameter. The balloon tires have been in use in Europe for several years, probably being the reason for the bicycle's popularity in Germany and other countries. Study of cycling in Europe resulted in a decision by Arnold, Schwinn and company to introduce the bicycle with balloon tires to the United States. It has a wider frame.



Note Increased Size of Tires on This Bicycle; Balloon Construction Makes Riding Easier

Arnold Schwinn Co
1718 N. Kildare
Chicago

c 593 Carl E. R. Edwards
Box 1356, Denver
Colo



Colorado's Runaway Mountain

A NATURAL phenomenon in the form of a disintegrating mountain near Durango in southwestern Colorado is perplexing scientists and appalling local inhabitants. For several months this huge mass of rock and earth, apparently loosened by some mysterious, subterranean disturbance, has been crunching and grinding its way down the slopes of Carbon mountain toward the Animas river.

Accompanied by volcanolike explosions deep underground, giving off dense clouds of black dust or smoke and pervaded by a strong odor of gas fumes, this immense slide is unlike any other such earth movement known to scientists who have visited it. If it continues its present rate of progress, the material eventually will dam up Animas river, so it becomes both a scientific problem and a local crisis.

The region southeast of Du-



Top, Investigators Standing on the Surface of the Slide on Carbon Mountain; Below, Approaching the Moving Mountain Which Threatens to Block a River

near Durango



Two Views of the Fault, the Top One Showing the Mirrorlike Foot Wall Which Has Been Polished Like Glass.

this mountain to a depth of about 100 feet, a width of a quarter mile, and extending the entire length of the slope, or a little more than a mile, began sliding. With slight interruptions from time to time the action has continued. The ravine between Carbon mountain and its next neighbor has been filled with rock and debris to a depth of 300 feet. Under im-

mense pressure from above, this material has moved down that ravine toward the Animas river until less than 500 feet of unobstructed distance remains between the oncoming slide and the bed of the stream below it.

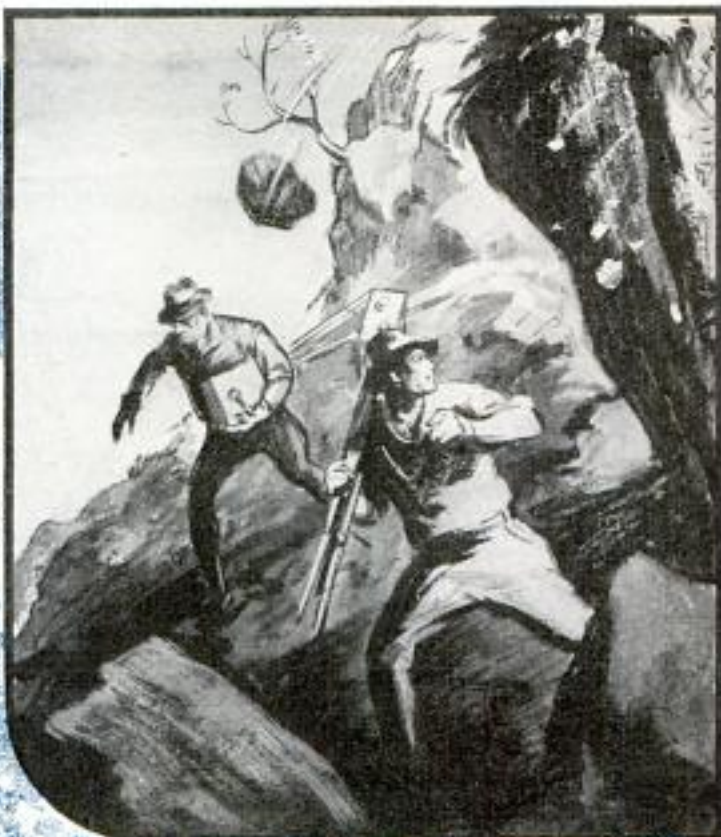
massive pressure from above, this material has moved down that ravine toward the Animas river until less than 500 feet of unobstructed distance remains between the oncoming slide and the bed of the stream below it.

The apex of what was Carbon mountain in descending the slope naturally caught behind the jutting features of the old fault and was sent hurtling in deafening avalanches down the north face of the mountain more than 1,000 feet into the valley. The main body of the slide has traveled approximately half a mile, and the whole mass has been churned and ground into an indiscriminate mixture of boulders, dirt, clay, trees and brush.

Cutting across these strata at right angles is a huge fault extending about fifty miles in each direction. To an observer looking along this line the whole area on one side is faulted up above that on the other about 1,500 feet. This leaves one side of the fault and the steep sides of the tilted beds exposed on two sides. The corners of these jutting features stand out like a succession of Rocks of Gibraltar.

The second of these protuberances southeast of Durango is Carbon mountain. It is about three miles distant from that town. Last fall the whole surface of

Last March visitors reported a great explosion deep under the mountain and saw a dense cloud of black dust or smoke emitted from the upper portion of the slide. Gas fumes were sensed several miles away



DURANGO

Diagram of the Moving Mountain, and Drawing Showing How Visitors Have Narrowly Escaped an Avalanche

from the mountain. Some scientists claim gas pockets in the coal seams are the cause of the movement. Others say it is merely an adjustment of the old fault, but most of the investigators agree it is caused by some pressure from beneath.

While scientific investigation goes on, citizens of the region are discussing possible methods of getting the waters of Animas river past the sliding material if it reaches the stream. The bulk of the debris is too great to be handled by a steam shovel and a tunnel for the river seems to be the only solution. The river is small but carries a large body of snow water in the spring months.

An interesting feature of the slide is the wall of the new movement, subjected with great pressure that the clay and are polished smooth. The material slope separated into grotesque

forms as the mountain moved. Huge blocks of solid rock stand out like houses with sometimes a lone tree on top. Observers who venture onto the slide see and hear appalling sights and sounds. Sections break up and tumble over as one watches, and deep-buried rocks and trees snap or grind under foot.

One sightseer advanced too near the rim of a crumbling mass and was carried with it more than 1,000 feet below. He managed to keep abreast the racing rocks and suffered only minor scratches. There has not been an hour in the past few months when the crackle of plunging boulders and the booming of the breaking strata could not be heard by residents of Durango, three miles away. Recently a crevice appeared in a sister peak, and it is feared the second mountain is beginning to disintegrate.

c 596

Jimmy Campana, Los Angeles Calif



Human Arrow Being Catapulted from a Mechanically Operated Crossbow into a Life Net; He Is Hurlled by a Spring Pressure of 28,000 Pounds

MAN IS SHOT FROM CROSSBOW LIKE A HUMAN ARROW

From a mechanically operated crossbow, eight feet wide and twenty feet long, a man is shot like a human arrow in an exhibition intended to thrill onlookers. He is catapulted for a distance of forty feet and lands in a life net if the "aim" is right. The human arrow is hurled from the bow by a spring pressure of 28,000 pounds, and the man who plays the part of the arrow took special exercises with heavy weights attached to his legs to enable him to withstand this strain.

OLD KETTLE REVEALS SECRETS OF EGYPT'S METAL PLATING

c 661

Some of the secrets of metal plating as practiced in Egypt more than 4,000 years ago have been revealed by study of a small copper kettle in the Metropolitan Museum of Art. The kettle and an accompanying basin, made about 2500 B. C., are regarded by Prof. Colin G. Fink, of Columbia University, as the earliest examples of chemically applied metal plating. While cleaning the kettle, smooth patches like silver were found among rougher areas of a typical old copper color. Tests established that the base metal of both kettle and basin was copper and that the silvery plating was a thin coat of metallic anti-

New York City

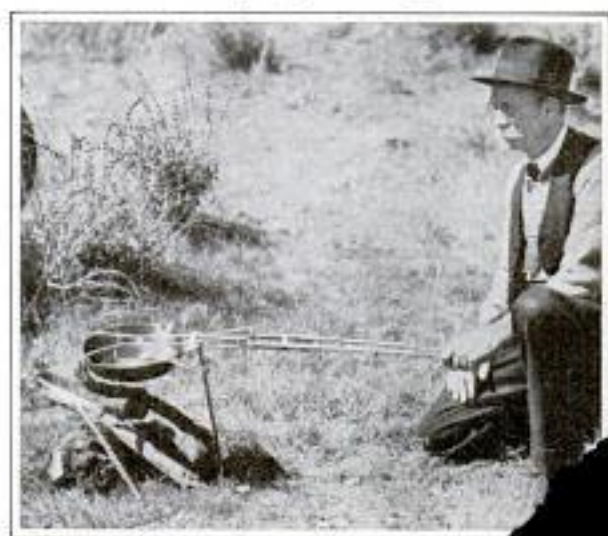
mony, with a small amount of iron as impurity. The principle involved in application is actually electrolytic, but may have been accidentally discovered and applied. Professor Fink says there is reason to believe that pickling baths containing vinegar and salt were used by the ancients for cleaning bronzes after discoloration from heating, and the addition of antimony and contact with iron may have been accidental at first, but was repeated intentionally when the results were observed. That antimony was available in ancient

Egypt is proved by the antimony sulfide found in the eyebrow paint used by Egyptian women. Two methods of application of antimony plating have been found, each requiring only raw materials known to have been available in Egypt.

c 486

CAMP-FIRE FRYING-PAN LIFTER HAS EXTENSION HANDLE

For cooking over a camp fire, a handy pot lifter is provided with an adjustable extension handle. A metal rod with a U-top is pushed in the ground and serves as a support for the holder, which locks and holds firmly any cooking utensil.



Pot Lifter, with Adjustable Extension Handle Simplifies Cooking over a Camp

Brown & Co. Portland Copyrighted material

ELECTRIC BRAKE TO STOP AUTO OR LARGEST TRUCK

Operating from the regular ignition system, an electric-brake system has been developed for use on all kinds of motor vehicles. The brake is said to work automatically. It is put in operation when the driver depresses the brake pedal, closing contact with the "on" motor which pulls the brake on. Releasing the pedal closes contact with the "off" motor, releasing the brakes and switching off the current. The same operation takes place when the emergency brake is pulled back. As a protection against theft, the brakes may be left set by removing the brake switch plug from the socket while the brake pedal is depressed. The device uses no more current than an ordinary tail-light. No electricity is consumed when the pedal is not used. It is adaptable to the smallest automobile or the largest truck.

C 6 9 9
James Conneff and B. McConnelly



This Tray Is Adjustable to Many Sizes of Jigsaw Puzzles; Cover Holds Pieces in Place

TRAY TO HOLD JIGSAW PUZZLE HAS SLIDING COVER

Fitted with a sliding cover that holds the pieces in place, a tray for jigsaw puzzles has been produced. The cover fits so closely that the tray may be stood on end without loosening puzzle pieces already in place. Inside the tray is a set of four sliding pieces of thin wood, placed so that the tray may be adjusted to any-size puzzle from one inch square to twenty-six by twenty-six inches. A strip at one end closes the tray tightly when the cover is in place. The tray is made of stained wood, with a puzzle bed in ivory tint.

LATEST ELECTRIC-OUTLET UNIT DISCARDS METAL BOX



Eliminating the use of a metal box, porcelain knobs, loom and many screws, the latest electric outlet is easily installed. This simplified wall socket is complete in itself, assuring safety and economy. The plate is fastened directly to the surface on which the socket is mounted without the danger of short circuits.

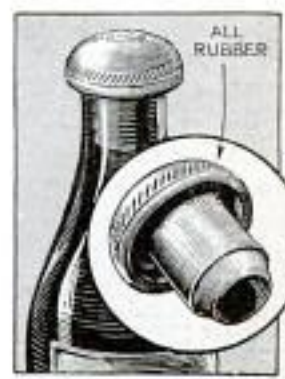
SOLUTION CLEANS OFF GREASE WITH AID OF COLD WATER

Oil and grease can be removed easily by a cleaning material that can be used with cold water. The material, when mixed with kerosene or light distillate, is capable of absorbing forty times its own volume of mineral oils and greases, converting them into a water soluble emulsion. It is especially adapted for use in tank cleaning of parts, dispensing with steam, gas and other fuels for keeping a boiling-hot solution and eliminating the danger of strong alkalis and caustic solutions.

Natural Chemical Co. Research G. 452 Lexington, Mass. New York

RUBBER STOPPER FOR BOTTLES KEEPS CONTENTS FRESH

Carbonated beverages and other liquids in bottled form are kept fresh after being opened by using rubber stoppers to replace the crown caps. The rubber cork is inserted after wetting and holds under great pressure, but is easy to remove, since it is loosened by pushing side-wise on the top.



Chemicals and oils are resisted by a new kind of rubber belting.

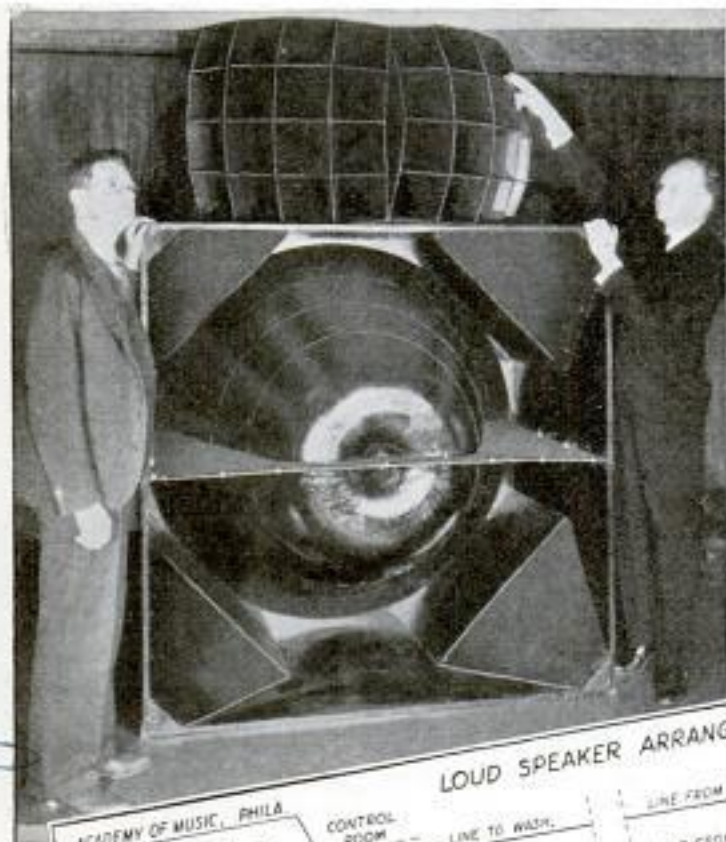
Tribble-Ralston Co 403 W. Reed St. Moberly, Mo

60 E 45th St. New York

Artero Associates, 69 Long Wharf Boston, Mass

E. J. Tite Rubber Co 307 Occidental Ave. Seattle, Wash.

New Tone Quality Given Music Sent by Wire



manipulated dials from the hall in Washington, the volume and quality of the music coming from Philadelphia were changed at will, from a whispering pianissimo to a thunderous crescendo. This merging of music and telephone science has introduced jointly three factors in the electrical reproduction of orchestral music—auditory perspective, tone and overtone control, and volume control. Three loud speakers on the empty stage, each connected to a microphone before the actual performers, give perspective to the music and sounds, enabling the



Above, Low and High-Frequency Loud Speakers for Transmission System, and Diagram of Speaker Arrangement; Right, Doctor Stokowski at Control Board

Musical effects never before heard by human ears have been made possible by a new method of transmitting sound by wire, recently demonstrated by the Bell Telephone laboratories. Members of the National Academy of Sciences faced an empty stage in Washington for this demonstration and listened to the music of the Philadelphia symphony orchestra in that city. To the scientists it seemed that the music actually came from the vacant stage, and moreover, the sound of each separate instrument appeared to emanate from its proper place on the stage. But that was not all. As Leopold Stokowski, conductor of the orchestra,



ears to tell where violins or horns are placed. In one demonstration a singer walked back and forth across the distant stage and the sound of her voice likewise appeared to move back and forth across the vacant stage like that of a singing ghost. In the matter of volume, it is pos-

463 West St New York

C 655 Plans Presto
Pak Co.

POPULAR MECHANICS

416 Escondido Bldg. ³⁵

sible to make a 100-piece orchestra seem to be one of 2,000 musicians. To anyone who has turned up his radio until the windows rattled, all this may seem merely a matter of amplification. Actually much more is involved. The system has been dubbed the ceno-orchestra, and if the term is mispronounced, "see-no-orchestra," it begins to describe what one hears. To explain what ceno-orchestra production is, we have only to imagine musicians playing behind a curtain. If their music is permitted to pass through one hole of the curtain, we have the equivalent of what one hears from a single loud speaker. Two holes give better results, and if there were several hundred holes, the effect would be almost the same as if the curtain were raised. That is what the system accomplishes. There are not several hundred loud speakers—only three—but it seems like the orchestra is actually before you and you can place each sound and instrument in its own relative position—giving you auditory perspective. The loud speakers and microphones are extraordinary instruments for they do not distort, thus making it possible to listen to the lowest and highest notes the human ear can hear. Thus the system gives a third dimension to reproduced music—it not only reproduces the sound faithfully, it also reproduces the space, in a sense, in which the distant music is played. The ceno-orchestra system's amplification is different than that with which radio listeners are familiar. Radio listeners are accustomed to a power range that may vary from one to a thousand. A symphony orchestra has a range of 10,000,000 to one. The ceno-orchestra system has a range of one to a billion, making it possible to regulate volume from a whisper to a din no ear could endure. Practical application of the equipment is foreseen by engineers. A symphony orchestra may render its concerts and they may be heard in a thousand distant halls with volume even greater than the orchestra is able to give. Or it may be possible to spread music from high towers so 100,000 persons may enjoy it in large parks. Bell laboratories engineers explain that it is largely up to musicians to take advantage of this equipment, which provides a mechanism for greatly broadening the field of music.



Cigarette Is Extracted Easily with One Hand from This Case While Driving Automobile

CIGARET CASE OPENS AT TOUCH OF FINGER AND THUMB

Operated by slight pressure of finger and thumb, a new cigarette case gives complete protection against crushing, perspiration and exposure. It is made of aluminum, finished in lacquer or covered in leather. Though wearing heavy gloves, the smoker can extract one cigarette at a time.

OLD AUTO BODY IS 'SUN PARLOR' OF WOODS COTTAGE ^{C 588}

Discarded by its owner, the sedan body of an old automobile has been added to a woods cabin of a Rhode Island man as the "sun parlor." Besides serving as an extra room in which the resident spends much of his time, the body helps in growing flowers and vegetables.



Extra "Room" Is Made from Discarded Sedan Body of Auto; It Serves as Sun Parlor

Claver-Cranston Hammond
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Chasing WEATHER

By JULIAN LEGGETT

IN the quiet just before dawn, while a great city still sleeps, an airplane's motor sputters as the prop is twisted, then breaks into a roar. As it warms up, it begins to purr like a giant cat. Into the cockpit climbs the pilot, snapping, buttoning and tying himself into great coat, helmet and goggles. As he settles to the controls and adjusts his radio headphones, a small boxlike instrument is clipped into a frame out on one wing and the latest weather report is handed into the cockpit.

Turning into the wind, the plane skims off the ground into the darkness and starts climbing into the sky. Three hundred feet a minute the ship soars, leveling off every 3,000, while the air begins to thin out. Five, ten and fifteen thousand feet are registered on the altimeter, then 16,500, but still the pilot isn't satisfied. Steadily the plane batters its way upward until it reaches 20,000 feet, nearly four miles high and the airman presses a button.

That records the peak of his flight and the ship points its nose toward the ground to descend in a long spiral. Ten minutes later, the plane stops on the runway, almost on the exact spot it left nearly two



Top, Left, Ready for Flight into the Clouds; Right, Weather Record Made by the Aerograph; Bottom, How Strong Wind May Drive Plane Backward

hours ago. That instrument out on the wing is an aerograph, which records temperature, altitude and humidity. Now it is removed from shock cords within its rack, an arrangement that prevents vibration from disturbing its delicate mechanism, and the pilot steps from the cockpit to make out his report. Perhaps an hour later, valuable information is speeding over the wires to the United States weather bureau at Washington, D. C. Compiled in relation to facts collected in other parts of the nation, this information comes flashing back in the form of a twenty-four-hour forecast. Meanwhile, the weather bureau of this particular city has pre-

2545



in the SKY

Top, Placing Aerograph in Rack; Right, Weather Pilot's Report Telling Cloud Conditions

pared and issued its local forecast and bulletins on flying conditions.

The pilot with whom you have been chasing weather in the night sky is Ray Colton, who makes this same flight every day that any plane is permitted to leave the ground. Flying for Clarence W. Helm, who holds the contract for taking observations for the Chicago airways division of the United States department of agriculture, Colton is one of five civilian flyers who make early morning trips into the clouds. They might be called a peace-time dawn patrol, since they keep watch on elements that affect the farmer, shipper, business man and the airman.

Helm's contract calls for the pilot to reach 16,500 feet, but the peak depends on flying conditions. Some days, Colton is unable to leave the ground, but usually he climbs to 16,000. Unless the ship attains 3,000, it doesn't count. At that point, the government starts paying for the flight, increasing the amount with each 1,500 feet until the full amount is earned. Colton has made all these early morn-

U. S. DEPARTMENT OF AGRICULTURE, BUREAU OF WEATHER SERVICE

RECORD OF FLIGHT

Chicago, Ill. Aerograph No. 3

Observer at Post: A. T. ... Date: MAR 23 1933

Time	Altitude	Temp	Wind	Clouds	Remarks
Pass By	4,350	10-22	35-10	Y	10,000-100
Take-off	10,375	10-22	35-40	Y	10,000-100
Heading	4,175	10-22	35-40	Y	10,000-100
Pass By	4,175	10-22	35-40	Y	10,000-100

Pilot's Report:
 Released 0500 ...
 left the ...
 clouds, reached 16,000 feet at 5:00am, and returned the ...

A. Colton Pilot

ing flights under the present contract, but in case of illness or other emergency, Helm could be counted on to take up the plane, which is used for teaching "blind flying," as well as for collecting information about the weather.

Elgin Airways, Inc. Chicago

e 545



Last-Minute Report on Weather Conditions Is Handed Pilot Before He Begins His Daily Three-Mile Climb for More Weather Information

Both men can tell you of times when real danger stared them in the face, but they are inclined to minimize such incidents, because they're all in the day's work. For instance, there was the morning when Colton's motor sputtered, then stopped, as his ship was soaring at 18,000 feet in forty-below zero weather. Under ordinary conditions, that would have meant nothing more than gliding to a landing. But this time, the wind was blowing more than eighty-five miles an hour, and even with his motor going, the pilot could have made no headway. Here's what he says: "At times when I would head into that wind, the plane would just hang still in the air. I couldn't make any forward movement at all, and without the motor, it was sort of a delicate job to get the ship back into a smooth downward glide. But he did get down, unhurt, although one wing of the ship crumpled as it struck the ground after clipping telegraph wires. The wind blew the plane away from the airport and the landing was made in a city street.

Although the ship has a speed of ninety

miles per hour, it climbs at only sixty to sixty-five. As it goes higher, its speed is reduced to perhaps fifty miles an hour. If the pilot encounters an eighty or ninety-mile wind, the plane actually will be blown backward twenty or thirty miles an hour, even with the engine racing. In such cases, the pilot calls into play all his tricks of flying to save himself and the plane.

Helm tells of that morning when he lost consciousness while his ship soared at 15,000 feet. Whether it was due to oil and gas fumes or to the unusual warmth of the layer of air in which he

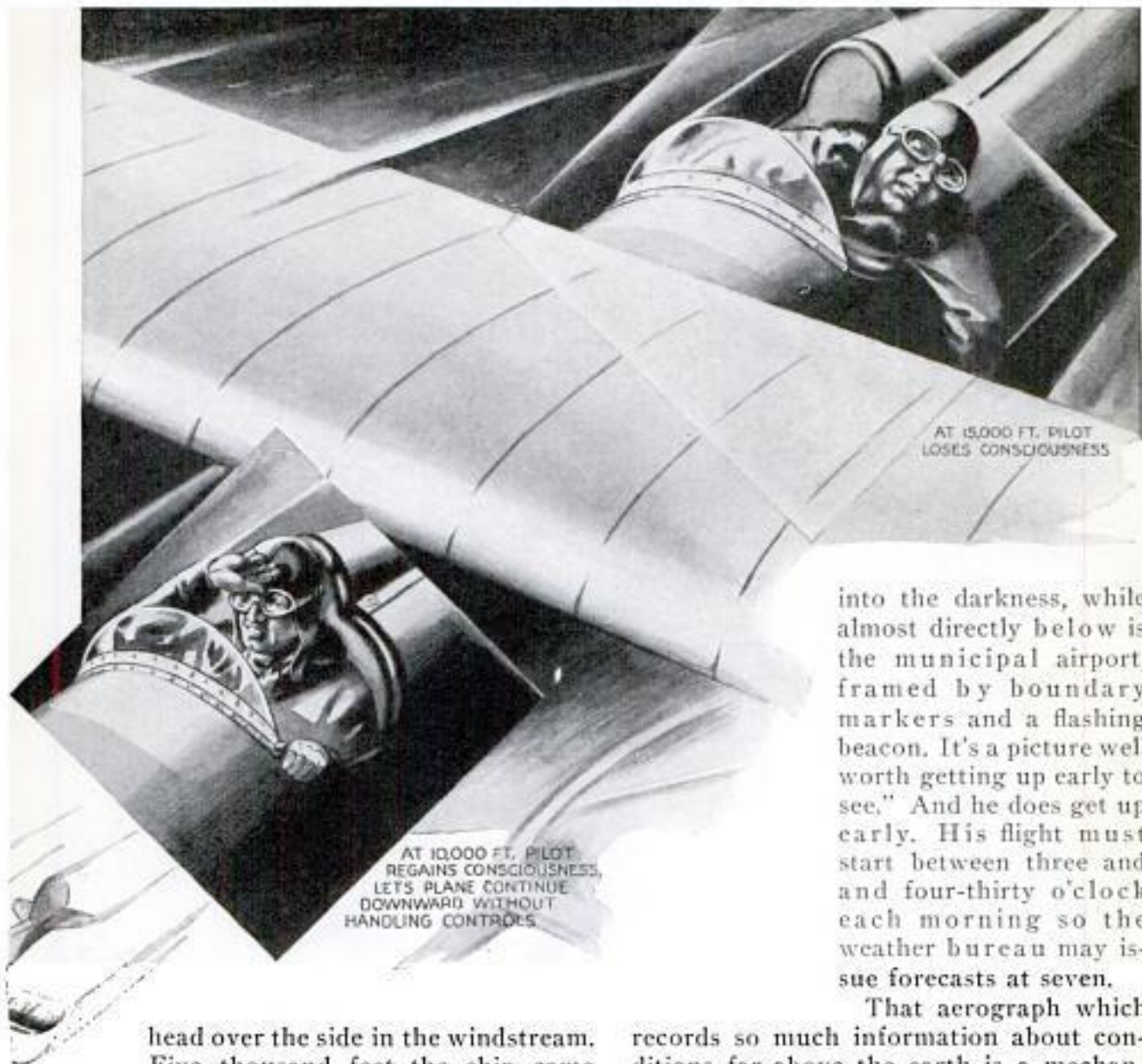
was flying, he began to feel faint. Realizing that falling on the stick would send the plane plunging to earth, he set the controls for a long, slow glide and, with his last ounce of strength, threw his hands out across the cockpit and dropped his

Artist's Representation of Pilot Losing Consciousness at 15,000 Feet and Then Landing Plane Safely Is Shown in Drawings from Upper Right to Lower Left



WHEN NEAR GROUND, PILOT TAKES CONTROL AND SAFELY LANDS PLANE





AT 15,000 FT. PILOT LOSES CONSCIOUSNESS

AT 10,000 FT. PILOT REGAINS CONSCIOUSNESS, LETS PLANE CONTINUE DOWNWARD WITHOUT HANDLING CONTROLS

into the darkness, while almost directly below is the municipal airport, framed by boundary markers and a flashing beacon. It's a picture well worth getting up early to see." And he does get up early. His flight must start between three and and four-thirty o'clock each morning so the weather bureau may issue forecasts at seven.

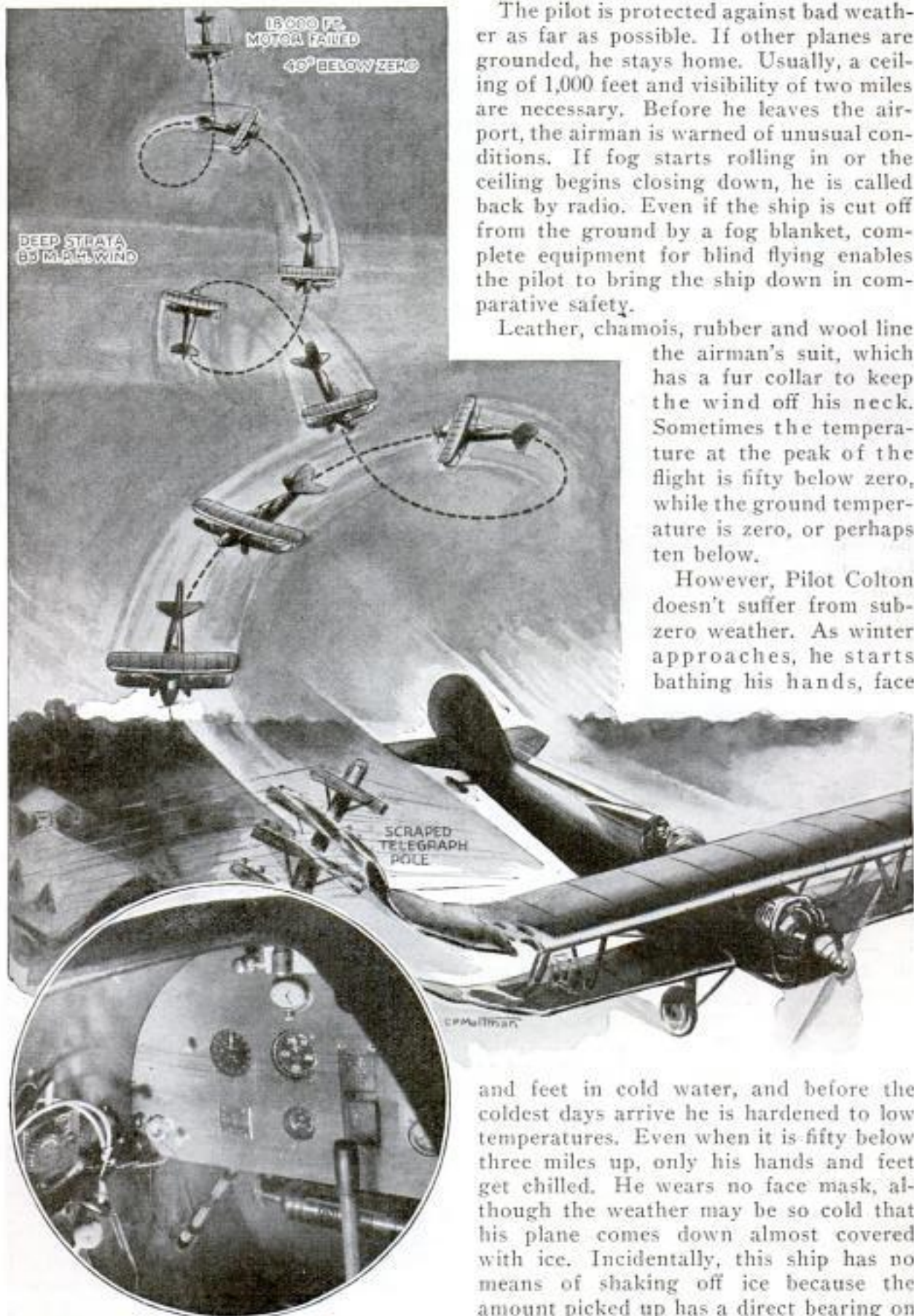
That aerograph which records so much information about conditions far above the earth is a mechanical and electrical marvel. Moving pens record on paper every change. As the pilot leaves the ground, he presses a button that sets the pens in operation. Upon entering and leaving cloud banks, their depth and height from the ground are registered by pressing this same electric button. When the top of the flight is attained, the airman touches the button again. Thus, this small instrument gives a complete picture of all the weather between the airport runway and an invisible point 16,000 to 20,000 feet in the sky.

Then, with this aerograph record and with the pilot's personal report on cloud formations and wind velocity at certain altitudes, the weather bureau is able to issue an accurate statement of conditions and to make forecasts.

head over the side in the windstream. Five thousand feet the ship came down, its pilot helpless. Then he began to regain consciousness, probably revived by the rush of air in his face. Just to see what would happen, Helm left the controls as they were and the ship flew itself for almost twenty minutes. Finally, the pilot brought it around for a landing at the airport.

Just what does the ground look like when you're three or four miles high?

Colton answers the question in this way: "On nights when the sky is clear and visibility is at its best, I can see 100 miles or more. Each city and community has a light pattern of its own. There is Chicago with its boulevards, and over here is Gary, its steel furnaces glaring. On either side of me for miles, the airways beacons are sending great fingers of light



The pilot is protected against bad weather as far as possible. If other planes are grounded, he stays home. Usually, a ceiling of 1,000 feet and visibility of two miles are necessary. Before he leaves the airport, the airman is warned of unusual conditions. If fog starts rolling in or the ceiling begins closing down, he is called back by radio. Even if the ship is cut off from the ground by a fog blanket, complete equipment for blind flying enables the pilot to bring the ship down in comparative safety.

Leather, chamois, rubber and wool line the airman's suit, which has a fur collar to keep the wind off his neck. Sometimes the temperature at the peak of the flight is fifty below zero, while the ground temperature is zero, or perhaps ten below.

However, Pilot Colton doesn't suffer from sub-zero weather. As winter approaches, he starts bathing his hands, face

and feet in cold water, and before the coldest days arrive he is hardened to low temperatures. Even when it is fifty below three miles up, only his hands and feet get chilled. He wears no face mask, although the weather may be so cold that his plane comes down almost covered with ice. Incidentally, this ship has no means of shaking off ice because the amount picked up has a direct bearing on whether transport and mail planes will be able to get through on schedule.

Top, Bringing Down Ship in Spite of Dead Motor and High Wind; Bottom, Instrument Panel

C 615 d w l seorg
Schutkowski

Berlin, Germany

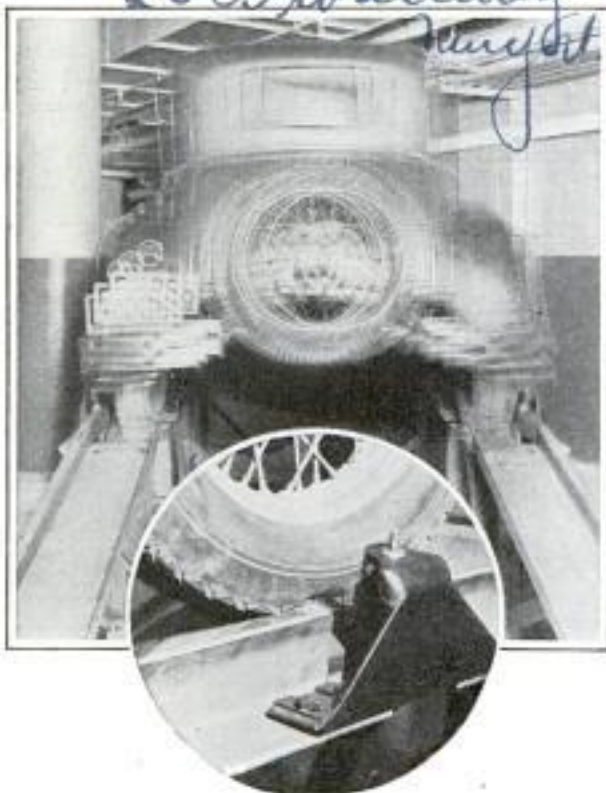
About the only effect the rarefied air at 15,000 to 18,000 feet has on Colton is that it makes him feel lazy. No oxygen tank is used and the plane carries no super-charger for high-altitude flying.

To hear these weather-chasing pilots tell it, this early morning flight is little more than a "hop," but it is of vast importance to you and me because it enables the weather man to be more accurate when he forecasts: "Fair and warmer" or "Cloudy and colder."

**SQUEAK DETECTOR FOR AUTOS
AIDS IN SERVICING** C 349

As an aid to the man who tightens and greases automobiles, a squeak detector has been installed by the Standard Oil company of New Jersey in a Washington, D. C., service station. This detector shakes the auto, revealing rattles and squeaks that may not be found by other methods. The auto is placed on a rack, its rear wheels resting on drums that are mounted off center on their shafts. When the car's wheels are turned, the off-center drums jolt and bounce the auto, disclosing the location of squeaks that the owner may have had trouble in eliminating.

26 Broadway



Auto Is Shaken Violently to Reveal Squeaks; Inset, Device for Vibrating Car on Service Platform



This Apparatus Can Read Your Newspaper to You; It Changes Printed Writing into Sound

**PRINTING CHANGED INTO SOUND
BY AUTOMATIC READER**

Printed writing is changed into sound by an automatic reader, known as the "optic congruence," the invention of a German. It is possible to set this machine to work reading your newspaper to you, and the invention is expected to be of special aid to the blind.

Adalberto - 76
Berlin D.C. 36.

**EARTH LIKE SUN HAS CORONA
EXTENDING FAR INTO SPACE** C 723

That the earth has a corona, a luminous, gaseous envelope extending far into space, is revealed by Prof. Lars Vegard, of the University of Oslo, Norway, after long study. The earth's corona, however, shows some marked differences from that of the sun. The sun's corona, as far as scientists know, is generated by the sun's own power, while the earth's is a product of the action of the sun on gases in the earth's outer atmosphere. Furthermore, the earth's corona is decidedly eccentric, being far more extensive on the side nearest the sun than it is anywhere else. Displays of the aurora borealis have been measured at heights of from forty-three to 550 miles above the surface of the earth, Professor Vegard says. Spectroscopic studies of their light indicate that the glow is due mostly to electrically excited nitrogen gas, which apparently exists at considerable density, even at those great heights.

before American
Meteorological
Society

Science News Letter

3/6/33

C 587

Carl E. C. Schürmacher
22 E. 69 St
useful

Dr. James Clarke
Es. Navy Lieut

Developed by Dr. W. Hart, Boston engineer
and acquired from U.S. Naval Bureau
and Navy War Dept.



Scientist Is Shown with Three Models of Insects; Enlarged 50,000 Times, These Models Aid in the Study of Ways to Exterminate Garden Pests

GIANT MODELS OF TINY INSECTS AID IN FIGHT ON PESTS

Models 50,000 times larger than the insects which they represent have been produced to help science fight garden and field pests. The models of the tomato worm, potato bug and the aphid, or plant louse, were constructed from microscopic examinations made by Dr. George E. Sanders, New York entomologist. Close study of the huge man-made insects may result in the discovery of methods of extermination of the pests, which cause over a billion dollars damage each year. Chewing insects, represented by the tomato worm and potato bug, can be destroyed by stomach poisons, but the aphid, which sucks the sap of plants, should have contact poisons, which act on the bug's skin or which cause suffocation.

"SOS" SETS OFF ALARM ON SHIP RECEIVING THE SIGNAL

Automatically setting off alarms on any ship receiving an SOS, a new device prevents the distress signal of the sea to go unheeded. It consists of a special type of radio receiver which picks up the signal, causing a gong to ring in the radio operator's quarters and a light to flash on

the ship's bridge to warn officers on duty. The gong rings, and the light flashes as long as distress signals come in, or until a radio operator answers the call. A tuned, vibrating reed distinguishes the signal from hundreds of others in the air. Outside interference will not set off the alarm. This special SOS receiver is operated in conjunction with a signal-sending device on the ship in distress. Turning a knob on the sender starts a vibrator governing a quick-operating relay. This relay opens and closes the radio-transmitter circuit and causes a peculiar note to be emitted. The receiving operator will recognize the unusual note while on duty and the warning bell will arouse him off duty. The light on the bridge provides a third way of getting the distress call through

MODEL OF STEAM FIRE ENGINE HAS WORKING PARTS

Even the steam gauge of a model fire engine in the Franklin Institute at Philadelphia works, so well did the builder do his work. The model represents the first practical hand-drawn fire engine made in America, between 1855 and 1860.



This Model of America's First Practical Hand-Drawn Fire Engine Has Working Parts

Eckhardt

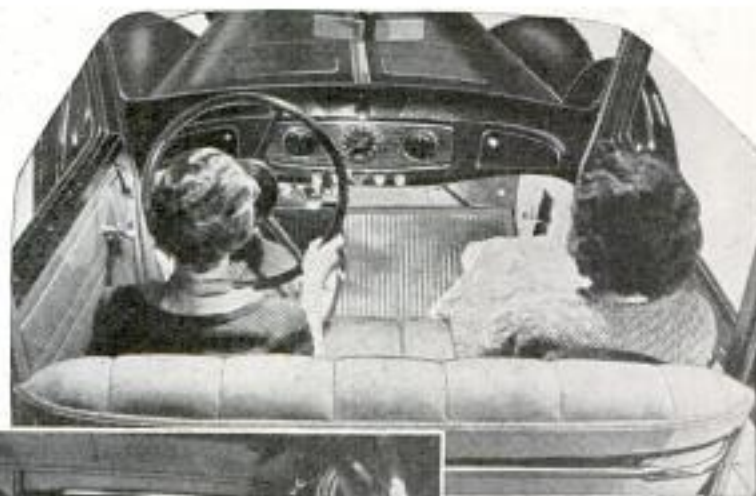
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104 E. 93rd (9)

Submarine Signal Co
160 State St.
Boston, Mass

Automatic Gear Shift Simplifies Auto Driving

Gear shifting is accomplished automatically and the conventional shift lever is eliminated in Reo cars equipped with a recently developed self-shifter which selects the gear ratio best suited to road condition, speed and grade. A change in gears is accomplished without touching clutch pedal or lifting the foot from the accelerator, once the car is in motion. When the car is standing, a gear selector on the instrument panel is placed in neutral position. After the engine is started, the clutch pedal is depressed and the selector is pushed forward. The clutch is then engaged as usual in starting, and once under way, there is nothing else to do. The automatic control selects and engages the higher ratios as speed picks up and engine load warrants. In decelerating or climbing a hill, the reverse action takes place, the selector picking lower ratios as the car slows down or the pull increases. For momentary



Automatic Gear-Shift Transmission and Views of Driver's Compartment, Showing Increased Room

stops in traffic the clutch is used, so once in motion there are few occasions for manipulating the control handle on the dash.

It is pulled to the neutral position if the motor is to be allowed to idle or if the engine is to be left running with the car motionless. For very steep grades, or deep mud or sand, two extra low gears are provided. They are engaged by pulling the control handle entirely back, engagement of the higher of the two low ratios taking place automatically as speed increases. For reverse, the selector is turned and pulled back, the clutch being operated in the conventional manner. Except for starting, backing or heavy going, the selector on the dash is not used. The automatic device is incorporated in the transmission assembly and its operation is said to be similar to a gravity and centrifugal-force governor. The speed of the moving car determines the position of the gears in the transmission. It is claimed the automatic feature provides greater safety as well as simplifying driving, since it tends to prevent stalling. Elimination of the shift lever and location of the emergency brake at the extreme left leave the driver's compartment open and provide more seat room.

No information as to inventor.

c 203 M. W. Petersen
422 E. Wash St.

Shenan, Wyoming



Model of Seven-Room Log Cabin Constructed of Poles, Small Stones, Cement and Shingles

MODEL OF LOG CABIN CONTAINS SEVEN TINY ROOMS

After several weeks' work, a Wyoming man recently finished a model of a log house on a scale of one inch to a foot. The dimensions are twenty-eight by thirty-eight inches and it contains seven rooms. Poles were used for logs, and window and door frames were rabbeted in the same manner as for a full-size dwelling. The chimney, fireplace, porch and steps are built of small stones cemented together. The model contains 240 logs, and nearly 5,000 shingles were used for the roof.

NERVE CURRENT IS MEASURED TO AID MEDICAL STUDY

Electrical apparatus of extreme sensitivity has been devised by Dr. Edmund Jacobson, of the University of Chicago, to measure nerve currents in man. The method promises to throw new light on nervousness, irritability and other types of tension. This apparatus records, over a period, the fluctuations of the "action potential," or electrical charge, in the nerves of living humans. Thus far, experiments have been limited to the ulnar nerve

which controls movements of the hand. Doctor Jacobson has found that individuals in an advanced stage of relaxation produce less than one-millionth of a volt while individuals in a state of excitement may generate as much as one-hundredth of a volt in this nerve. Recording electrodes are inserted directly into the nerves, or simultaneously, on two sets of apparatus, into both the nerves and the muscles which these nerves control. Half-hour tests on a number of students revealed that one-half of them could not relax thoroughly. When one subject spoke or counted out loud, no current was noted in his ulnar nerve. But when he was requested to relate about the recent death of his father, a great increase in the electrical charge occurred.

ROTARY FILES IN MANY SHAPES C 62 MAKE CARVING EASY

Carving or engraving which is difficult by ordinary methods can be done easily with rotary files operated at high speed by a flexible shaft or portable electric drill. The files are made in a variety of shapes and can be used for carving designs in wood or metal, engraving panels or tools, removing irregularities from furniture parts, making molds and dies and many other purposes. Usually the files are made of high-speed steel, specially heat-treated, so they can be used with equal ease in working metal or wood. Some of the forms are so delicate or intricate that the teeth must be cut by hand.



Using Rotary File to Shape Hammer Handle, and Various Types Employed for Carving or Engraving

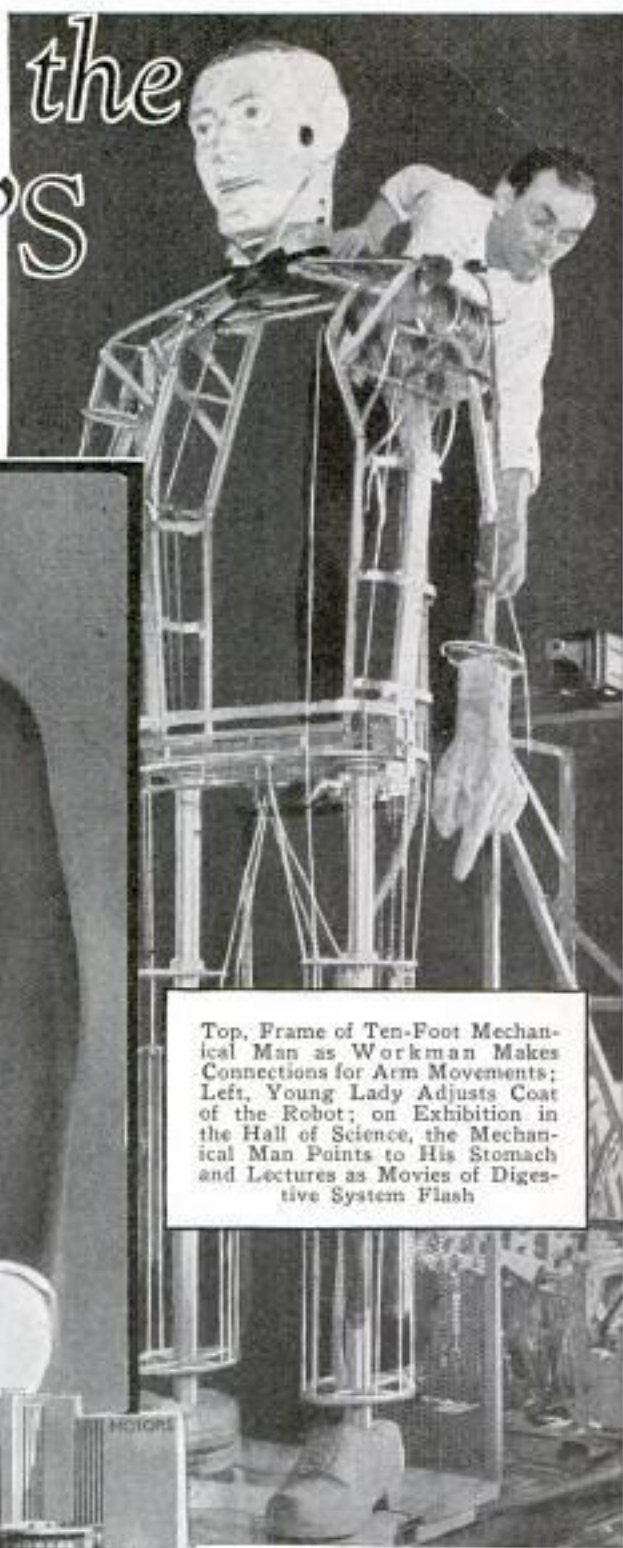
Ud. C. Dept. of Public Relations

associate prof. physiology

*R. K. Specialties Co
1258 Florida Ave
Akron, Ohio*

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Glimpses of the WORLD'S FAIR



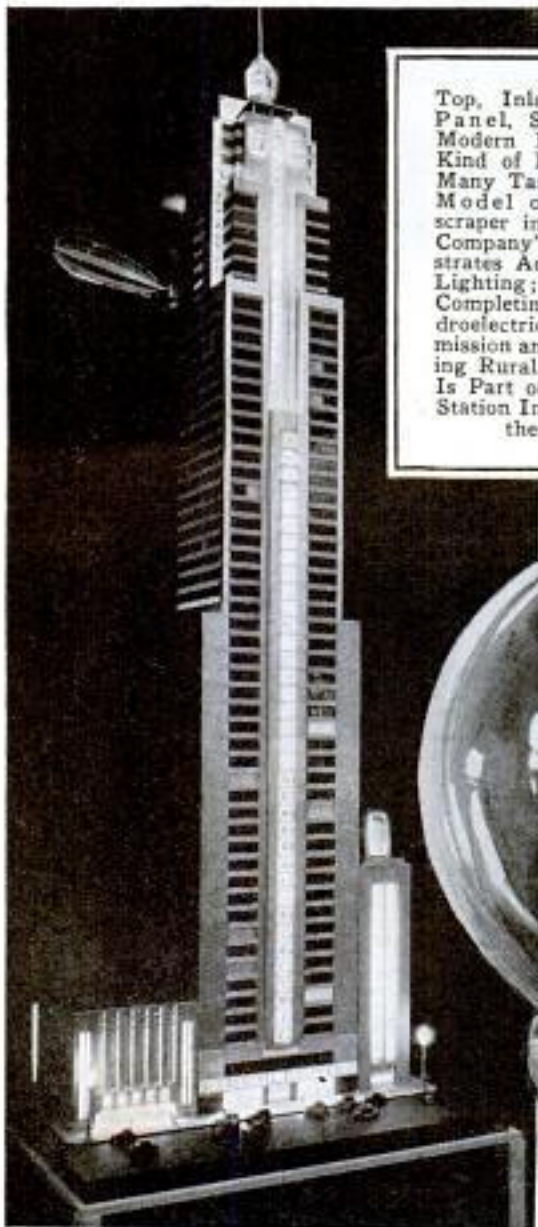
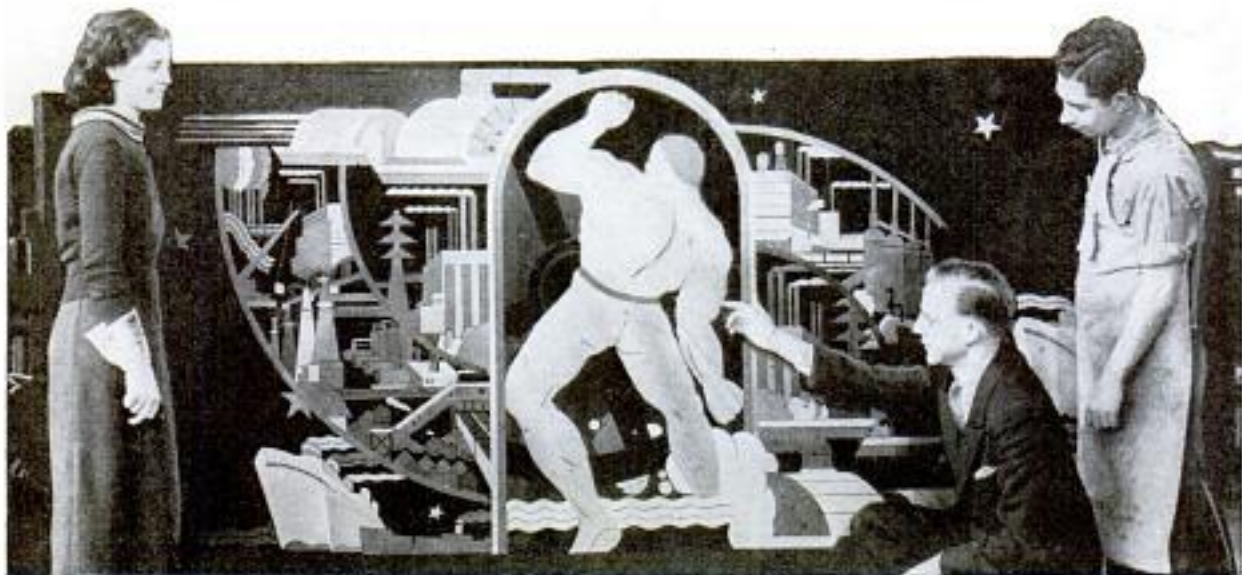
Top, Frame of Ten-Foot Mechanical Man as Workman Makes Connections for Arm Movements; Left, Young Lady Adjusts Coat of the Robot; on Exhibition in the Hall of Science, the Mechanical Man Points to His Stomach and Lectures as Movies of Digestive System Flash



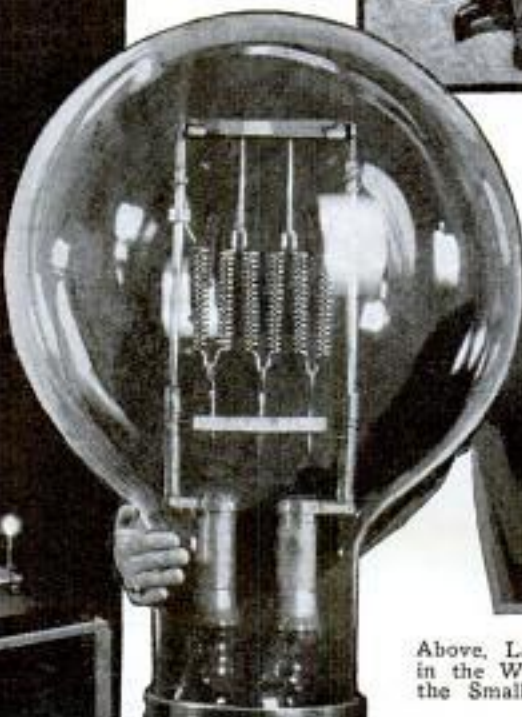
Bottom, Left, Motor Company's Exhibition Buildings at the World's Fair; Note the Ultra-Modern Architecture; Bottom, Right, Quarter-Mile Hard-Surface Track on Which Automobiles Are Demonstrated Daily; Racing Drivers Subject the Cars to Unusual Tests on the Track

C689

Electrical Wizards Present Latest Marvels



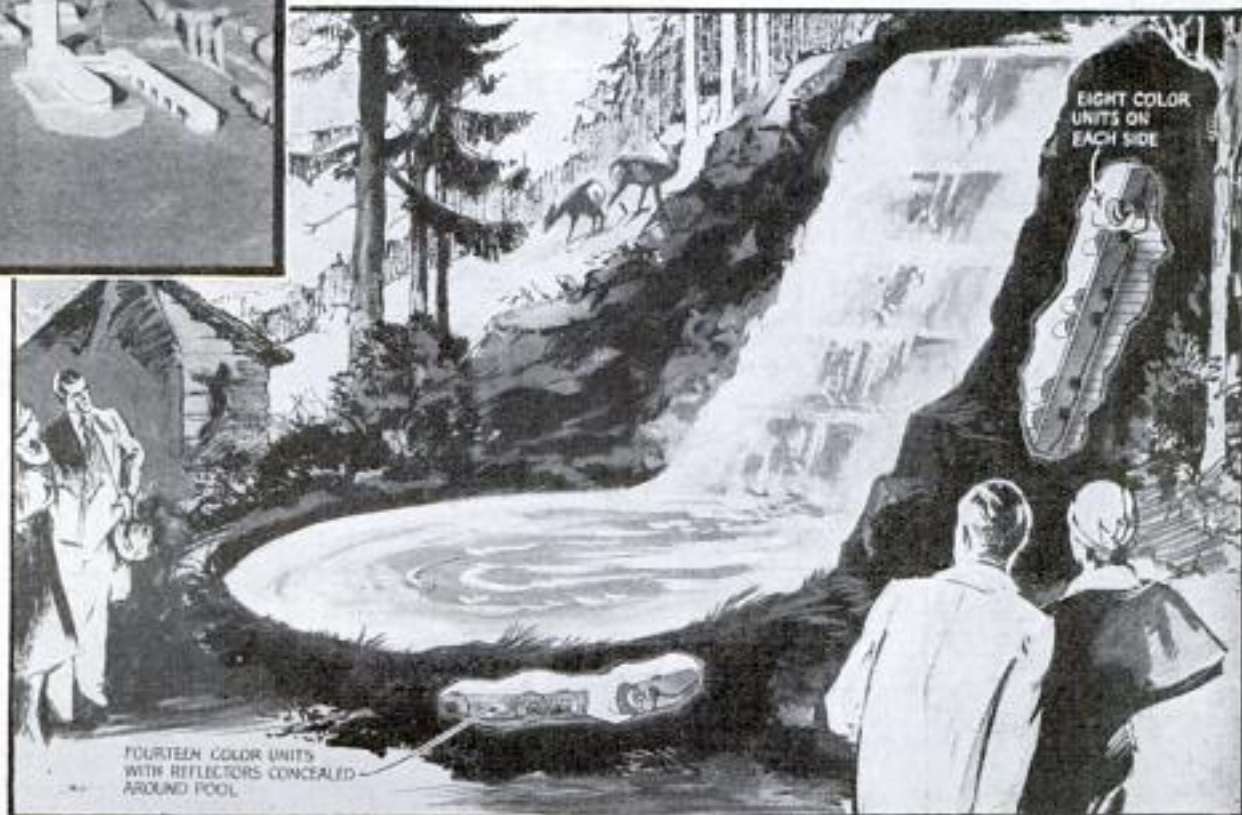
Top, Inlaid Micarta Wall Panel, Showing in Ultra-Modern Design How One Kind of Electricity Performs Many Tasks; Left, Ten-Foot Model of Fifty-Story Skyscraper in General Electric Company's Exhibit Demonstrates Advanced Methods of Lighting; Right, Workmen Completing Low-Head Hydroelectric Station with Transmission and Distribution Serving Rural Communities; This Is Part of Electrical Central-Station Industry's Diorama at the World's Fair



Above, Largest Incandescent Lamp in the World, Fifty Kilowatts, and the Smallest, About the Size of a Grain of Wheat

Man-Made Wonders Rival Those of Nature

Right, Heat Engine Consisting of Bimetal Disks on the End of a Lever; Disks Fall Alternately on Hot and Cold Plates and Consequently Jump from One to the Other Incessantly; Engine Is Exhibited by Westinghouse



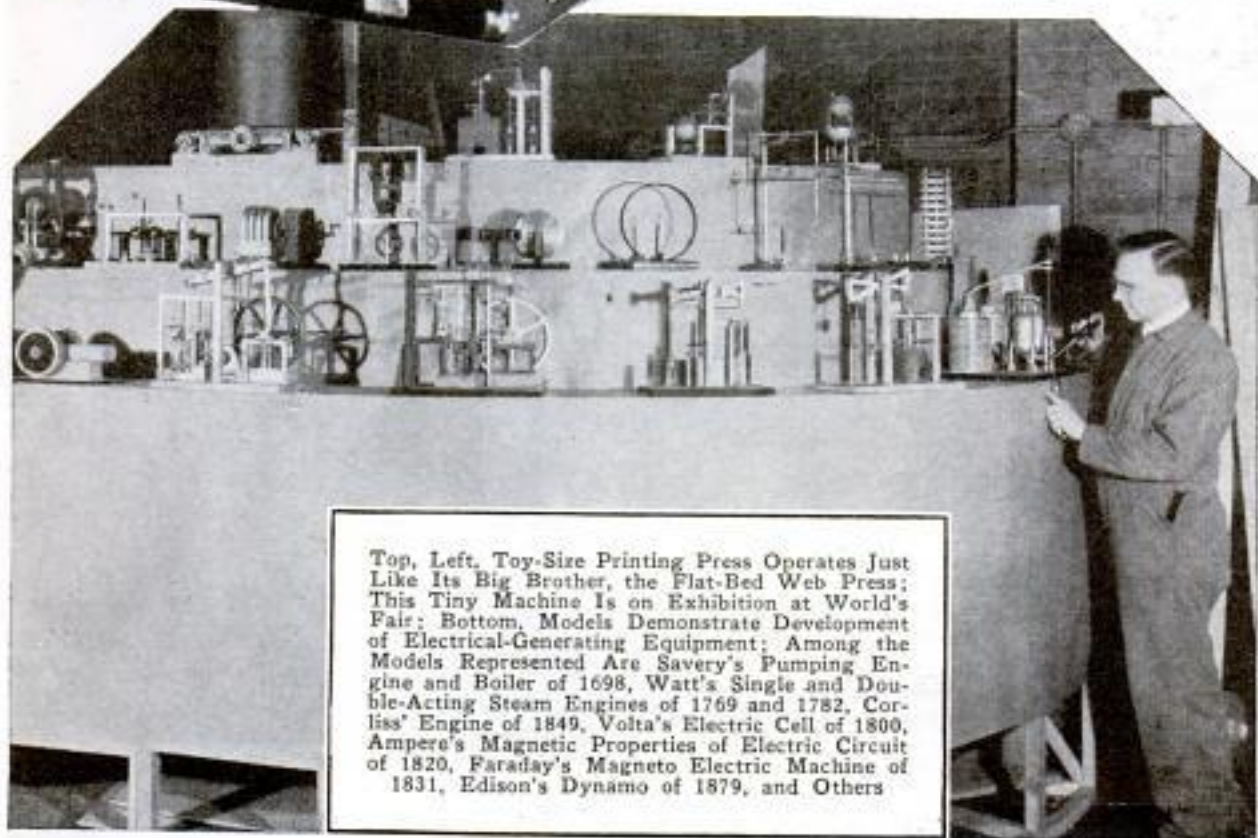
Bottom, Man-Made Waterfall, a Feature of the Minnesota State Exhibit, Is Shown Surrounded by Natural Scenery; Artist's Drawing Reveals Method by Which Hidden Lights Illuminate the Seven-Foot Falls

C689

Story of Industrial Progress Told by Models



Top, "Clock of the Ages" Shows Periods of Earth's Development; Twelve-Foot Rim of Glass Is Illuminated as Hour Hand Passes; Revolution of Hand on Small Dial Represents 100,000 Years; Pictures in Frame Above Dial Show Earth's Condition



Top, Left. Toy-Size Printing Press Operates Just Like Its Big Brother, the Flat-Bed Web Press; This Tiny Machine Is on Exhibition at World's Fair; Bottom, Models Demonstrate Development of Electrical-Generating Equipment; Among the Models Represented Are Savery's Pumping Engine and Boiler of 1698, Watt's Single and Double-Acting Steam Engines of 1769 and 1782, Corliss' Engine of 1849, Volta's Electric Cell of 1800, Ampere's Magnetic Properties of Electric Circuit of 1820, Faraday's Magneto Electric Machine of 1831, Edison's Dynamo of 1879, and Others

Apex Photos

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Dept of Commerce Press Trend 4/15/33

C637

POPULAR MECHANICS
Washington, D.C.

DRIFT BOTTLE MAKES RECORD FROM U. S. TO NORWAY

To help determine how the drift of ocean currents affects certain species of commercial fish, a bottle was set adrift by the U. S. department of commerce bureau of fisheries on April 21, 1931. The bottle recently was returned to Washington by a fisherman who picked it up near Hammerfest, Norway, about 4,550 miles from the point of release. While it is impossible to determine the route the bottle may have covered, this is believed to be a record distance for a drift bottle set out in the interest of science. A record kept on returned bottles indicates a drift schedule of 515 days from the New England coast to Ireland, 562 days to Scotland and 582 days to the Shetland islands. Bottles returned from such great distances have but little value. They merely show that some of the eggs spawned on this side of the Atlantic drift out into the Gulf Stream and perhaps hatch far at sea where no food is available for little fish.

MOVING POINTER FOR RAIL CAR SHOWS NEXT STATION *C441*

Passengers traveling Diesel rail coaches in England are kept advised constantly not only of the speed of the coach but of its location as well by gauges mounted in the front of the car. The position is indicated by a moving pointer which travels over a graduated scale, indicating on what section of the line the car is moving and showing the next station.



Indicator in Railway Coach Which Shows Passengers the Next Station as Train Approaches It

London, Midland and Scottish R.R.

C597 Herman A. De Vry, Inc. 1111 Center St Chicago

25 cents roll



Top, Looking at Film Pictures in Simplified Stereoscope; Bottom, Lever Controls Film

FILM IS USED IN STEREOSCOPE THAT FITS POCKET

Small enough to fit in the pocket or handbag, an improved stereoscope uses movie film instead of the large pictures of several decades ago. When you look through the double lenses, flat photos appear to have depth, height and width, giving the effect of distance between objects. Pushing a lever shifts the film to another picture. The stereoscope is made of polished bakelite with two crown lenses. Thirty-five millimeter film is used, with ten to twelve views in each roll.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by postage.

C 558
Cmt. Boyden Sparkes
102. 40th St
New York

The ARMY



Left. Sound Locator
for Determining Position
of Hidden Plane;
in Circle. Two Boeings
Used by Army
Lower Photo Courtesy
U. S. Army Air Corps



By MAJOR GEN. DAVID C. SHANKS
United States Army, Retired

THE First United States cavalry paraded for the last time as a mounted organization on December 14, 1932, at Marfa, Tex. At the conclusion of the ceremony its commanding officer barked an ultimate command to this oldest and best-known regiment of horsemen in America. "Dismount!"

The troopers stepped down from their horses, grasped their bridles and soon afterward were leading the animals to the stables to be surrendered to caretakers. Then selected personnel of the regiment boarded trains for Fort Knox, Ky., there to be revamped, trained and molded into our first regiment of "mechanized cavalry." This event has great significance for millions of Americans.

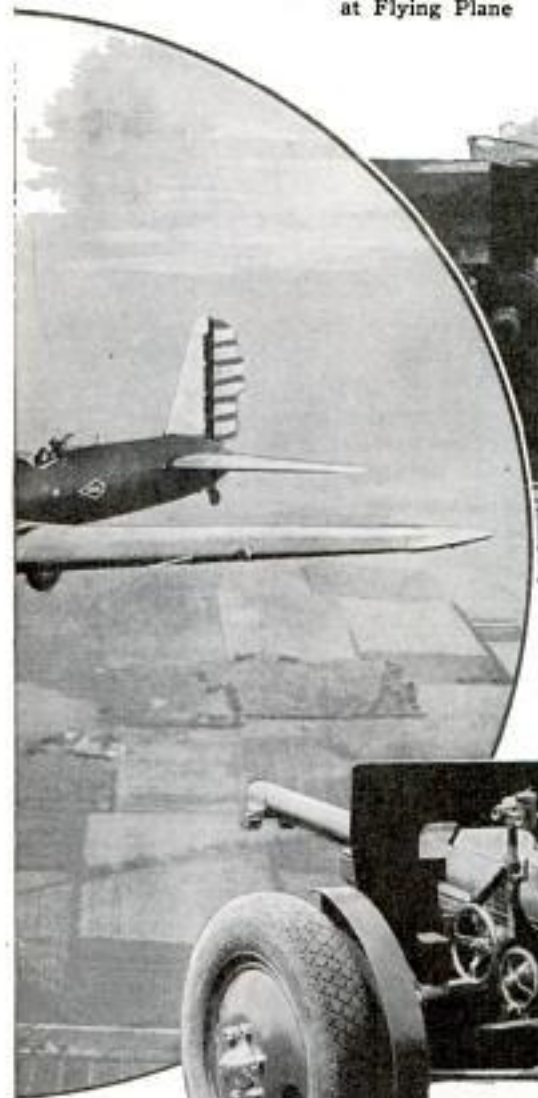
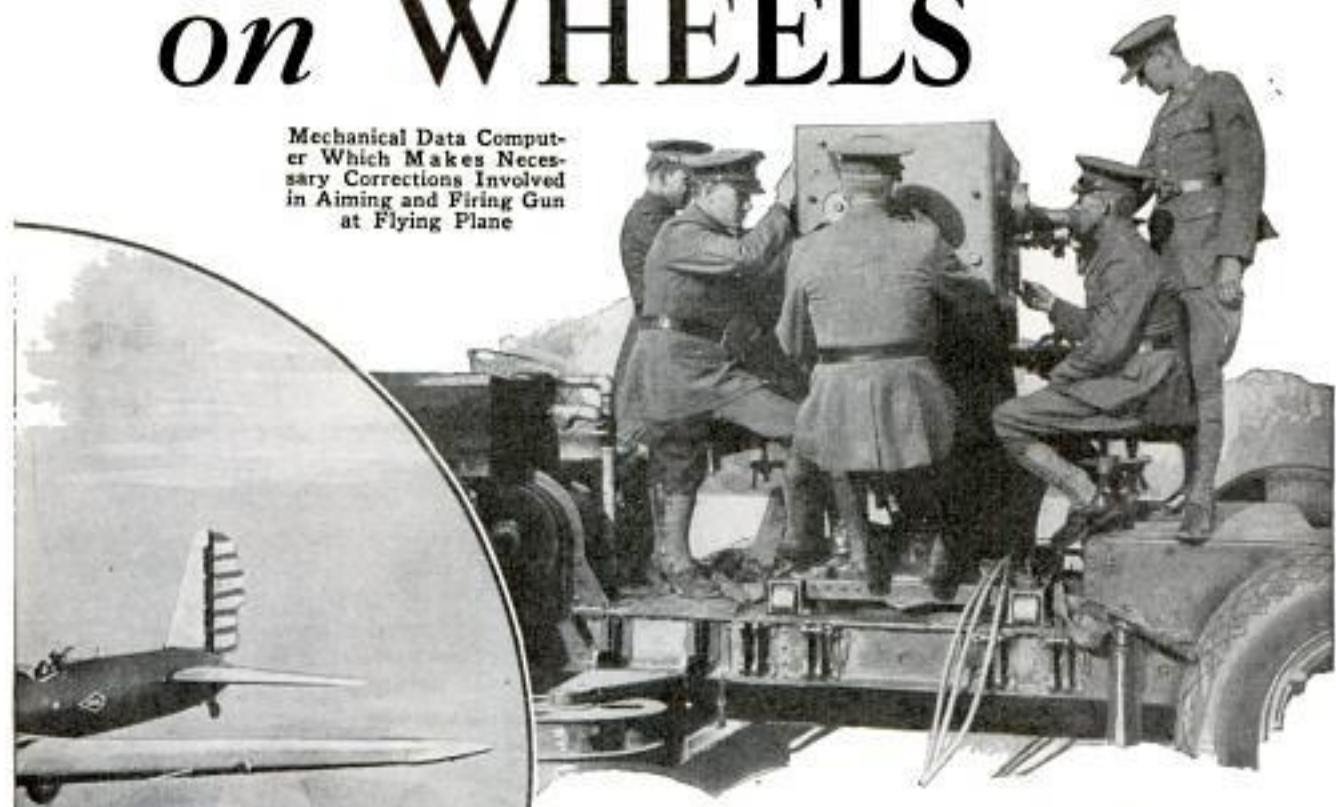
It means that whoever in America can drive an automobile is already partially trained for service in the next war. After more than forty-four years on the active list of our army, I know enough about war to hope there won't be another; but my common sense tells me it is a vain hope. Likewise my common sense tells me that the better we are prepared, the

more we are likely to have years of peace. What I want to discuss here are certain aspects of that preparation for—peace. The proposed system of the war department contemplates, under a general plan, the mobilization of six field armies and supporting troops, approximately 4,000,000 men. Many a lad who now is driving a delivery wagon or a farm tractor, myriads who are driving pleasure cars, are possibly unaware that their skill at this work is something which has been taken carefully into account by the professional defenders of the nation.

Ours is a mechanized genius, and the war department's mobilization plan is a scheme more cunning than ever before existed in the United States for the appli-

on WHEELS

Mechanical Data Computer Which Makes Necessary Corrections Involved in Aiming and Firing Gun at Flying Plane



new organization of the First Cavalry. Just think of it! A regiment of cavalry with not a horse in it. It was organized nearly a century ago as the First Dragoons for service in the Black Hawk War, and thereafter it hunted the enemies of its country on horseback. Nowadays it has a covering squadron which is transported in seventeen armored cars; a scout troop transported in seven light, fast tanks, and the main part of its offensive force consists of a combat squadron of two



The French Seventy-Five Millimeter Gun on Its New High-Speed Carriage

cation of our native skill to its defense. A young man who gayly drives his automobile on some peaceful errand, at sixty miles or more an hour, is better equipped to become an effective member of a modern army than one of those rough-riding cowboys who hastened to "join up" in '98. To show how true this is, consider the

troops, each of which is transported in thirteen light, fast tanks. Other automotive equipment has been provided to carry thirty-two machine guns and fifty riflemen.

The essential military purpose as expounded years ago by the Confederate cavalry leader, Gen. Nathan Bedford Forrest, to get there "furthest with the most-



Above, This Instrument Measures the Height of Plane from Ground

In Circle, One of the Fast Martin Bombers Now Used by the Army; at Bottom of Page, the Light Truck-drawn Battery of the Army
Courtesy U. S. Army Air Corps



est men," is here met by having in the regiment three or four score men who know how to drive automobiles. That is much simpler than training every man in a regiment to be comfortable and capable on horseback!

This new cavalry regiment can go farther, faster and strike a harder blow than the old-fashioned regiments of horsemen. It could harry an enemy in retreat until that enemy had lost all semblance to a military organization.

Of course, cavalry is no longer expected to serve as "the eyes of the army." That is what it used to be. In May, 1862, Gen. George B. McClellan was operating near Richmond, Va., against the Confederate army under Gen. Joseph E. Johnston. On May 31, General Johnston was severely wounded. He was succeeded by Gen. Robert E. Lee, the ablest soldier America has yet produced. Lee sought at once to launch an offensive campaign. To do this he needed positive, accurate information as to the disposition of McClellan's forces. By reason of its speed, the cavalry was relied upon to gather information about the enemy's movements.

On June 12, Lee started out his fa-

mous cavalry leader, J. E. B. Stuart. On June 15, Stuart returned. With the loss of one man he had ridden nearly 150 miles, entirely around McClellan's army. With the 1,000 troopers who accompanied him, Stuart had destroyed large quantities of federal supplies, had taken many prisoners, and had alarmed McClellan for the safety of his communications. Most important of all, he had brought back to Lee definite information about the dispositions of the union army, which resulted not long afterward in McClellan's enforced abandonment of his Peninsular campaign and his return to Washington by water transport.

This reference to Stuart's reconnaissance is made for the purpose of illustrating the use of cavalry as it existed during the Civil War and all prior wars. Cavalry operating in large masses under such leaders as Murat, de Kellermann, Sheridan, Stuart and Forrest has played a tremendously



Six-Wheeled Armored Car, a Cavalry
Weapon for High-Speed Travel on
Roads and for Reasonably Rapid
Movement over Rough Terrain



Above, Light Tank Climbing
Steep Slope; Right,
Convertible Tank Which
Runs on Wheels or Track



of all times, yet a single machine-gun company, judiciously placed, could have annihilated all of his horsemen. Times change, and methods must change with the times.

In efficiency and in fighting force the

important part. Its mission was to keep contact with the enemy, to gain information as to his movements, and to screen the movements of its own army. By sudden attacks, usually upon the flanks, cavalry has many times turned the tide of battle. In following up and harassing a defeated foe, the cavalry was simply invaluable.

Today, within an hour, an airplane could make the reconnaissance which required of Stuart four days of strenuous marching. The airplane, the tank, the machine gun and the automatic rifle are new factors which would make the use of horsemen in large masses sheer folly. Hannibal's terrible Numidian cavalry made of the retreat of the Romans one of the most disastrous routs

mechanized cavalry regiment will far exceed the old mounted regiment. It is capable of greater endurance and far greater marching power. If our first regiment of mechanized cavalry proves the success its sponsors anticipate, it is not too much to say that nearly all of our mounted regiments will be reorganized—without horses.

An analogous change is under way in our field artillery. Until a few months ago all of our batteries were horse-drawn. But the doom of the horse seems no less certain in our field artillery than in our cav-



Above, Seventy-Five Millimeter Gun Section of Future; Bottom of Page, Gun Carriage with Pneumatic Tires Towed by a Truck

alry. Our first regiment of "motorized field artillery" has now been under way sufficiently long to promise a great success.

On November 9, 1931, the war department approved an expenditure of \$12,000 for the purchase of eleven one and one-half-ton trucks of commercial type and five station wagons, including the necessary vehicular accessories, equipment and modifications. With the exception of the four "gun trucks," the remainder of the convoy arrived at the Holabird depot, Baltimore, Md., to receive special body modifications. The four gun trucks were sent to the arsenal, Rock Island, Ill. Each truck had transportation facilities for its own gun crew of six men and a driver, including their equipment and fifty rounds of ammunition. In addition, each truck towed a seventy-five millimeter gun, mounted on a specially modified carriage, with stout pneumatic tires and high-speed bearings.

The value of any attempt at improvement lies in performance. Let the facts speak for themselves. The four gun trucks left Rock Island arsenal on April 4, and



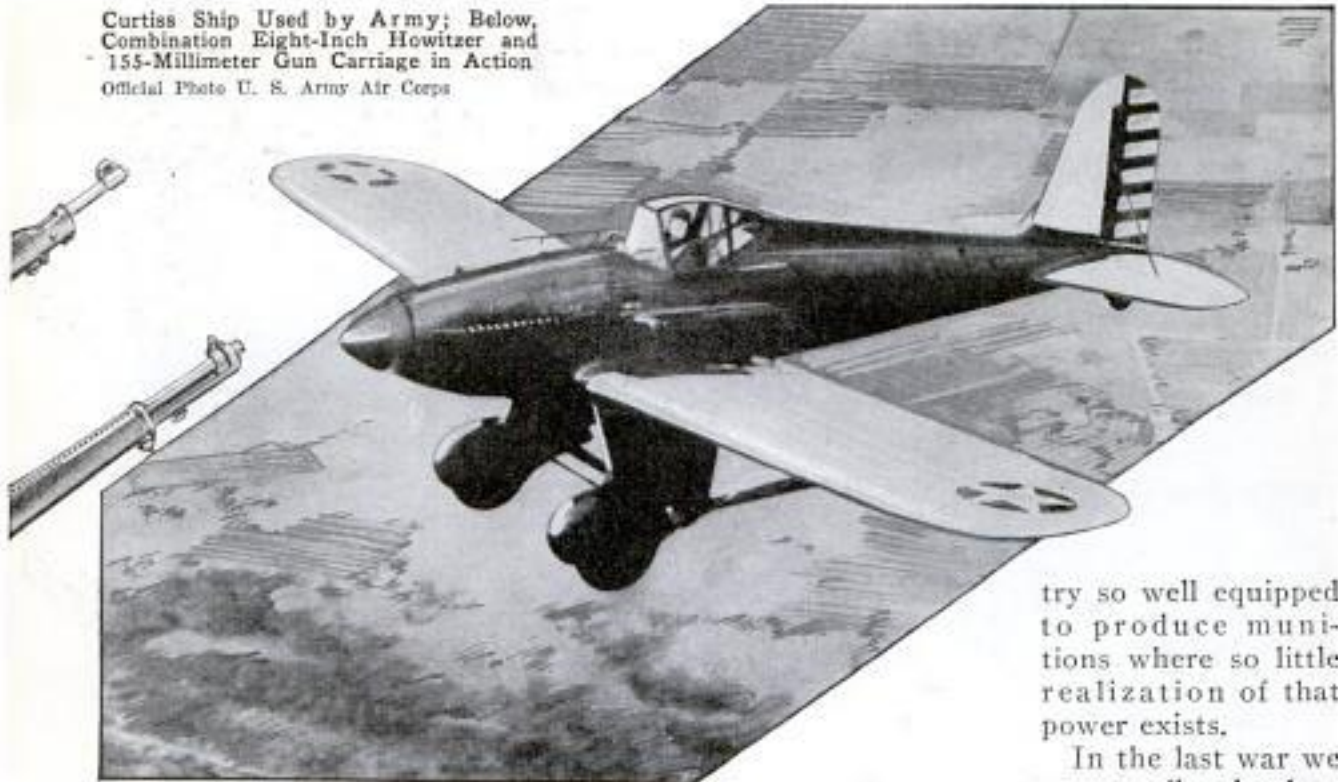
Springfield Service Rifle, Above, Compared with the Garand Semi-Automatic Recently Adopted for Service Use

arrived at the Holabird depot, Baltimore, Md., on April 7, after delivering the guns at the Aberdeen testing grounds. The total distance covered was 874.2 miles. On flat roads the average speed was twenty-six miles per hour. Coming across the mountains the average speed was 17.6 miles per hour. Within four days these gun trucks had covered a distance that would have required well nigh a month with a horse-drawn battery.

Thorough tests at both Forts Bragg and Sill show that the "cross-country"



Curtiss Ship Used by Army; Below,
Combination Eight-Inch Howitzer and
155-Millimeter Gun Carriage in Action
Official Photo U. S. Army Air Corps



try so well equipped to produce munitions where so little realization of that power exists.

In the last war we were perilously close

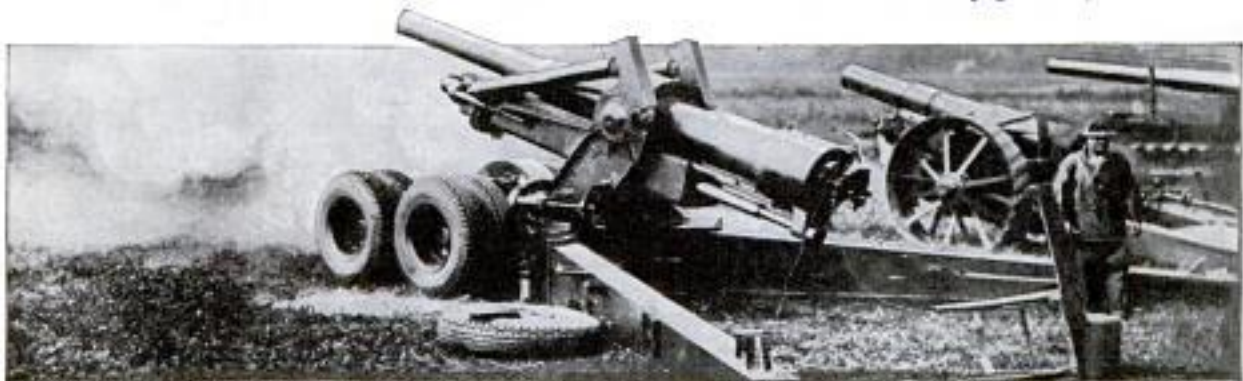
powers of the motorized battery are fully equal to those of the horse-drawn battery. There are few bits of terrain, either in mud, sand or muck, which the motorized battery cannot negotiate with an ease fully equal to that of the horse-drawn battery. But the great superiority of the motorized battery lies in its speed. On fair roads the motorized battery can travel 200 miles within a few hours. It can then cut across country, where its cannoneers may then step from their trucks, and at once go into action.

You would not expect a crocodile to fight with its meagerly developed limbs when it has terrible jaws, and can strike fearful blows with its heavy tail. So it is with nations, and so the United States is now set to make swift use, in time of war, of its great inventive and manufacturing talents. The world has never seen a coun-

to disaster months after we had become, theoretically, a belligerent. Few people realize the critical situation of our government in December, 1917. Fewer still know what it was and who it was that saved the day. A senate military-committee investigation disclosed that thousands of soldiers in our camps were without overcoats or woolen uniforms. Soldiers were drilling with sticks because there were no rifles to give them. Airplanes, machine guns and field artillery were lacking. Transportation, both by land and sea, was in desperate plight.

No adequate provision had been made for a shipping base in the great port of New York. As a consequence the railways leading to that city were crowded with cars as far away as Pittsburgh and Buffalo. A great coal famine followed, caus-

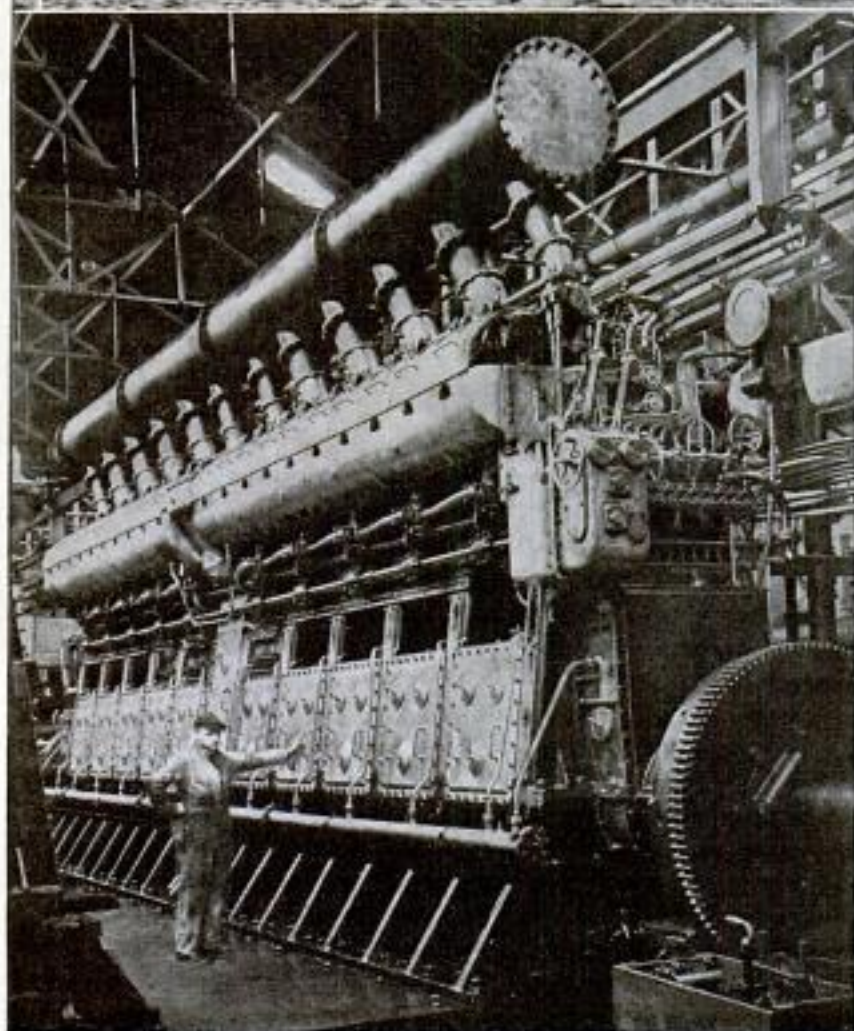
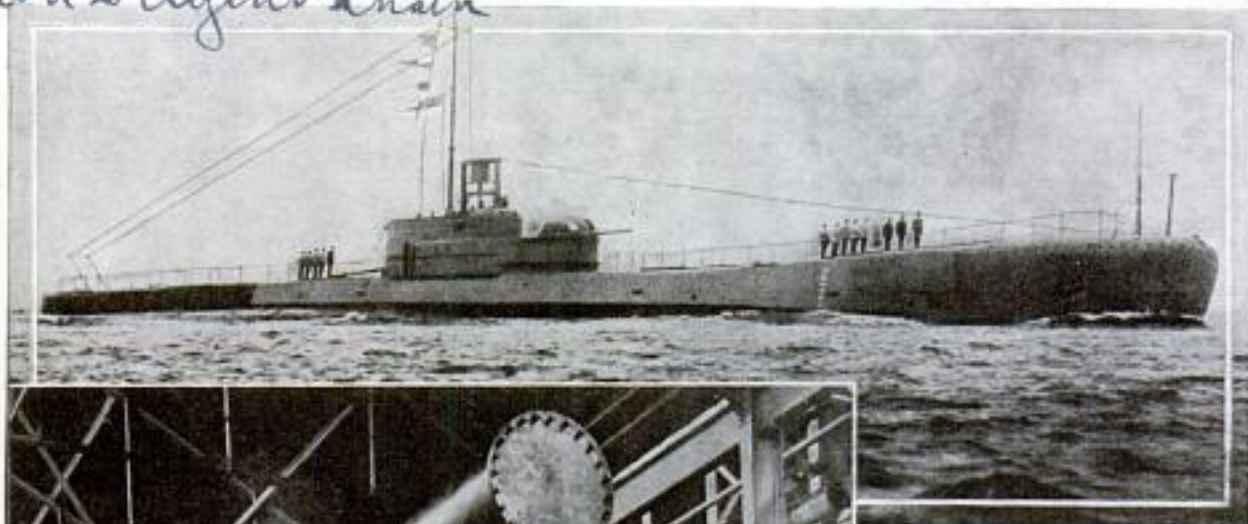
(Continued to page 114A)



C 591
56

Vickers-Armstrong,
Barrow-in-Furness
POPULAR MECHANICS
England

Giant Oil Engines Propel Latest Submarine



Courtesy Vickers-Armstrong
Top, Great Britain's Latest Submarine; Bottom, Giant Diesel Engines
Which Drive the Submarine Are Shown on Factory Testing Block

er at 405 revolutions per minute. The "Thames" is 345 feet long, with a displacement of 2,680 tons when submerged.

NATIONS TO SCRAP MANY SHIPS AS

C 638 JOB AID

About 400,000 tons of Germany's inland shipping has been ordered scrapped to improve conditions in the trade and to increase employment in the shipyards. The tonnage is about eight per cent of that nation's inland shipping. Some 1,300 vessels are included in the order. About six months ago, Germany began scrapping 400,000 tons of ocean shipping, making available to other industries about 240,000 tons of scrap iron and 5,000

Mammoth oil-burning engines, which produce greater power than heretofore used in underwater craft, propel the latest submarine, the H. M. S. "Thames," recently launched in England. In official tests, the submarine developed a speed of twenty-two and one-half knots. Twin engines of the heavy-oil Diesel type contain ten cylinders each, producing 10,000 horsepower

tons of nonferrous metal scrap. British ship owners have proposed the scrapping of 2,000,000 tons of vessels and the building of 1,000,000 tons to provide employment for 270,000 men over a three-year period. The proposal is that the government should indorse the ship owners' bills, taking a mortgage on the new vessels for one-half the cost.

Dept of Commerce
4/19/33

Bella Howell Co
1801 LaSalle St.
Chicago

605 Arcadia Rose Co
Newark, N.J. 57

POPULAR MECHANICS

REPRODUCER FOR SOUND MOVIES IN HOME IS PORTABLE C644

Simplified and so compact as to be suitable for the home, school, church or other non-theatrical purposes, a reproducer is available for projecting sixteen-millimeter sound-on-film movies. The machine is the product of the Bell and Howell company and is of the same basic design as their silent projectors. It is mounted on a new sound head that reproduces all classes of sound with excellent fidelity. Provision is made for a microphone and also for a turntable pick-up, thereby giving both disk and film reproduction. The entire apparatus is contained in two cases weighing only thirty pounds. The speaker case has provision for four 1,000-foot reels, speaker cord, reel arms, one spare tube of each type, spare photo-electric cell and other equipment, while the projector, amplifier and sound mechanism are mounted in the other case.



Growing Roses Packed in Cartons, Which Thrive While in Transit and Require No Attention from the Dealers

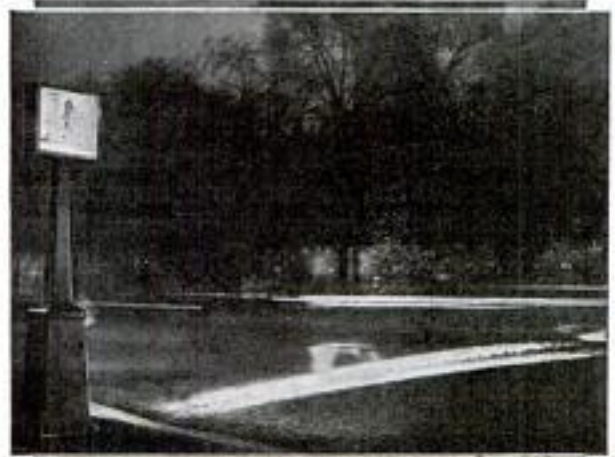
FLOWERS PACKED IN CARTONS GROW WHILE IN TRANSIT

Growing roses are now being shipped in individual cartons so packed that they need no watering or other attention while in the hands of dealers. When removed from the carton, the root block is soaked in water, then placed in the ground. In a week or two leaves appear, and blooming roses the first season are a feature of the marketing system.

For Potted Packages Wedge Nursery Co Albert Lea Tenn

LIGHTED PATH ACROSS STREET PROTECTS PEDESTRIANS B2197

Illuminated street crossings are being tried out in Paris for the protection of pedestrians. A lighting apparatus throws a beam of light across the pavement as a warning to motorists that pedestrians are about to cross. The device has been found useful in poorly lighted districts.



Illuminated Street Crossing in Paris Which Lights Up Pedestrians and Warns Motorists

HIGH SPEED OF EYE MEASURED IN READING ONE DIGIT C642

Speed of the eye in reading one digit has been measured at three two-thousandths of a second by a machine built by Prof. Robert B. W. Hutt, of Trinity College, to ascertain how many objects the eye can see at a single glance. The test objects were Arabic numerals on a white card. With two digits on a card, such as 37, he found that every person tested could see and read one, but never both, of these numbers at a single glance. The length of a single glance will vary with individuals.

Prof of Psychology
W. J. Jones
4/24/33

One meat packer is putting a bacon perfume into the ink used for labels, to make the package smell appetizing.

Science Notes 3/6/33

C490

MAGIC-RAY



IN an electrically operated hot-house on the roof of the General Electric research laboratory at Schenectady, scientific "farmers" are growing crops which would cause dirt farmers to stare in incredulous amazement.

For instance, there was the grapefruit plant six weeks old, two inches tall and in full flower. Nothing so very unusual about that, you might hazard, unless you happen to be a grapefruit grower and know that under normal conditions this plant does not flower until it is from five to ten years old and at least a few feet high. Then the baby grapefruit becomes about as remarkable as a boy in rompers with a full beard. But the practical farmer visiting this rooftop greenhouse would be no more startled by the grapefruit than by some of the other plants, for he will find sugar cane, cotton, tomatoes, California redwood-tree seedlings, tropical plants and up-state New York vegetables growing side by side with familiar products of the sunny south.

At first glance they appear just one big and happy family of plants from every clime thriving under the same roof. Then

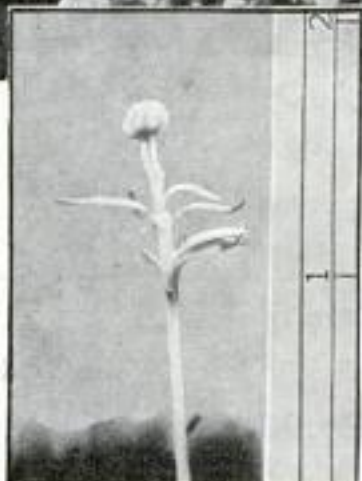


Top, C. N. Moore and C. P. Haskins of General Electric Laboratories with X-Rayed Lilies; Below, X-Rayed Lemon Tree

Schenectady, NY
you begin to notice queer things. On closer inspection many of the varieties of fruits, vegetables, flowers and farm crops are found to be radically different from those in field and garden. There is a lemon tree a few weeks old and in full leaf, some of the plants have twisted stems and others possess double leaves and various other abnormalities.

Not a very promising crop, one might surmise, until he learns that these plants are not being grown for the crop. Instead

FARMERS



Moore, are subjecting seeds, plants, bulbs and flowers to the energy of X-rays in an effort to realize the dream of the experimental biologist for generations—to change the hereditary characteristics of plants and animals, to make and control variations, and thus to create new species at

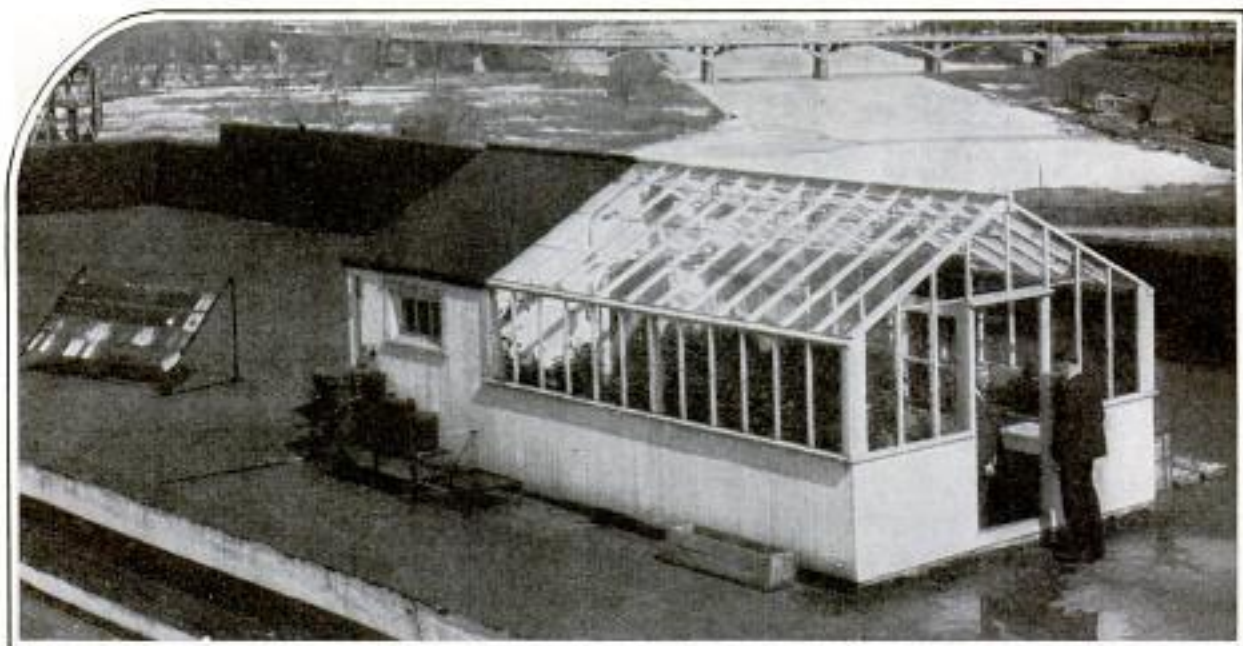


Top, Interior of Electric Greenhouse; Center, Flowering Grapefruit Plants, Five Weeks Old, from X-Rayed Seed; Below, Left, Sunflower from X-Rayed Seed, Right, Normal Plant

will. Mother Nature, if left to herself, proceeds at a snail's pace in exercising her inexorable laws through thousands of years to bring about the evolution of species. In his attempts to outwit or speed up nature's processes, man has subjected living matter to the action of heat and cold, starvation and repletion, chemicals and electric currents directly applied. And always, no matter how great the injury inflicted, normal reproduction has followed. As a result, the farmer has been dependent on hybridization—cleverly using chance variations to perpetuate such improvements as might occur at random.

some of them may be the great-great-grandfathers of our plants of the future. For in this laboratory greenhouse, two experimenters, C. P. Haskins and C. N.

Although man has been experimenting with the effects of X-rays and cathode rays on plants and animals for a long time,



it has been only in the last few years that science has realized the tremendous potentialities of such rays in the alteration of heredity and the production of new species of both plants and animals. Today the work is proceeding on a dozen different fronts although the experimenters frankly admit that what has thus far been accomplished is really infinitesimal when future possibilities are considered.

Practical results in producing improved varieties of plants, however, are already plentiful enough to lend encouragement to investigators. In California, for instance, two variants of cotton were produced, one with giant seeds, the other with the seeds free and unattached to the fiber. The former plants open the door for a variety of cotton with greatly increased yield of cotton-seed meal; the latter may simplify to a great extent the expensive ginning process.

Others working with X-rays have produced barley growing on vines instead of stalks, mosaic corn with several types of kernels present in each ear, potatoes with more and larger tubers than the parent stock, and a number of new varieties of tobacco.

These new plants were literally blasted into existence along with numbers of others which were discarded because they were deformed or abnormal in other respects. Thus men are using the magic of

Top, the Rooftop Greenhouse at the General Electric Plant; Right, Strap Leaves of Radishes from X-Rayed Seed Compared with Normal Plants



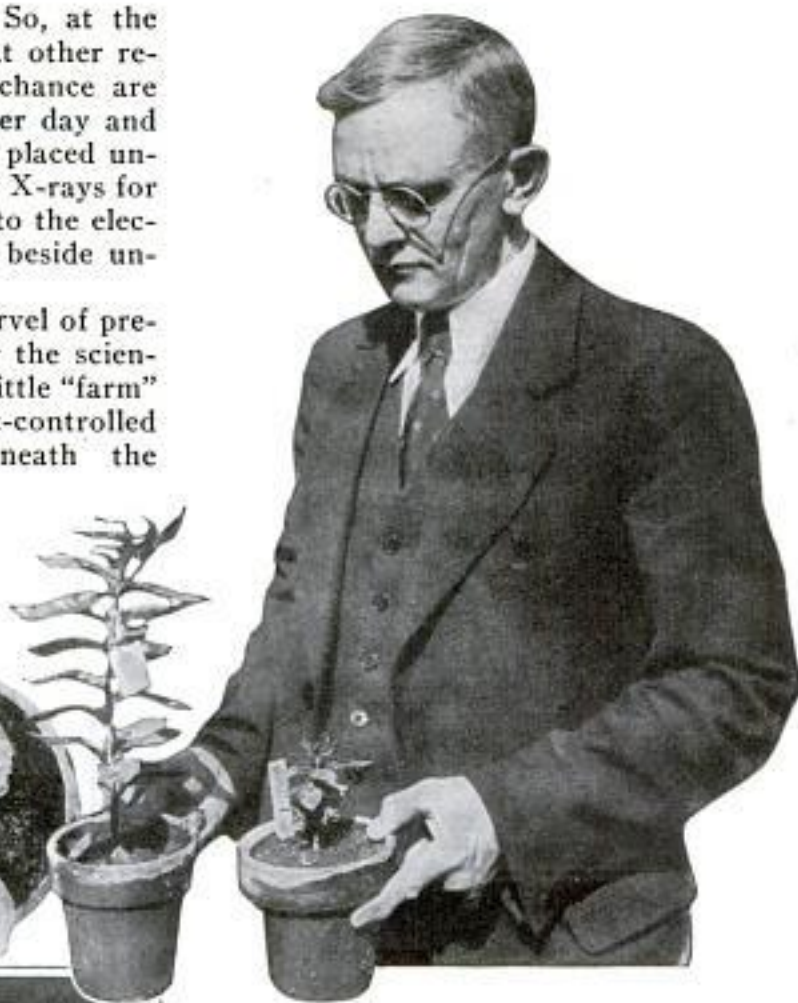
the X-ray to cause the very stream of life to alter its course. They admit the mechanism of these changes is only partly understood at present, but it is believed to be tied up in some way with modification of the chromosomes—the determiners of heredity which lie at the centers of the cell nuclei.

The force of the X-ray affects these hereditary determiners, but exactly how they are affected must today be left almost entirely to chance. New patterns of life are thus being formed by a combination of chance and choice, for Mr. Haskins points out that the X-ray, used apparently in the same way and under identical conditions, may stimulate the course of life to increased productivity, deform it, destroy it slowly or blast it instantly to death. Today it is mostly a matter of aiming the invisible rays at an invisible object, trusting to chance for a "bull's-eye," and segregating the good results from the bad. For to produce a hereditary mutation—a marked change in variety persisting generation after generation—the rays must affect the germinal cells rather than the

C490

body cells of the organism. So, at the Schenectady laboratories, as at other research centers, the seeds of chance are submitted to the tests day after day and month after month. They are placed under the influence of 200,000-volt X-rays for varying periods, then they go to the electric greenhouse to be planted beside untreated control groups.

This hothouse itself is a marvel of precision farming as practiced by the scientist. The temperature for this little "farm" is maintained by thermostat-controlled electric-heating elements beneath the growing benches, and in addition, the soil is heated electrically by means of cables buried beneath the plants. The automatic regulation of



heat in the soil and above it provides a constant and determined temperature, a record of which is kept day and night. When the plants are moved to outdoor plots, records are kept just as carefully.

One end of the little greenhouse is built of solid wood and here work with artificial lighting is to be carried on, lamps of various types providing the only illumination. Past research has already indicated that a differing degree of efficiency in crop production is obtained by the use of the same lamp at different wattages, and the field for investigation of illumination with gas-filled bulbs is rich in possibilities.

Thus far most of the experiments have been conducted with plants, but fruit flies, small fish and caterpillars have also been studied to a limited extent. Caterpillars which differed materially from their ancestors were produced by subjecting cocoons, moths and eggs to dosages of X-rays. Some of them had more than four horns or tubercles on the fore segments of the body, and some of the moths

Above, in Right Hand Man Holds Normal Grapefruit Plant One Year Old; in Left Hand, Year-Old X-Rayed Plant Which Flowered at Six Weeks; Below, X-Raying a Plant in a Lead-Lined Room

(Continued to page 120A)

C 104. Westinghouse Lamp Co
150 Broadway
New York



Installation of Black-Light Bulbs in Pilot's Cabin to Illuminate Only the Dials by Which Plane is Kept on the Right Course

BLACK BULBS' INVISIBLE LIGHT AIDS PHOTOGRAPHY IN DARK

Two black lamps, a recent product of the Westinghouse Lamp company, produce invisible light, pure ultraviolet radiations, that make possible the taking of photographs in the dark. One of the lamps consumes two amperes of electricity and the other five. Ninety-nine per cent of visible light is absorbed and eighty to eighty-five per cent of ultraviolet rays is transmitted by these bulbs. At present, one lamp requires a time exposure of five to seven seconds to take a photograph, but an increase in the amount of ultraviolet radiations, or "black light," would make it possible to make snapshots. In aviation, the lamps are placed so that only the dials are illuminated in the pilot's compartment, making for improved vision.

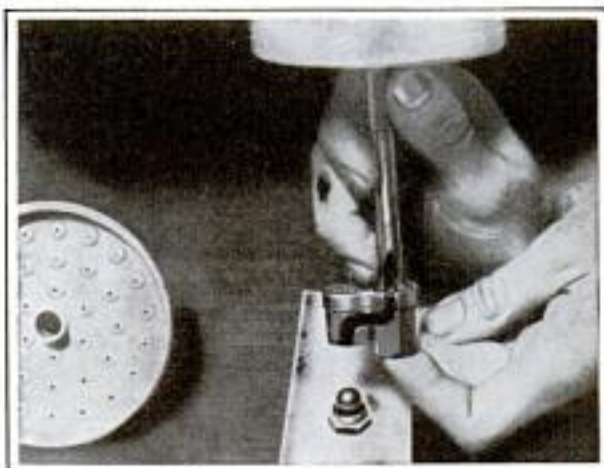
VAST POWER STILL UNTAPPED IN TENNESSEE RIVER BASIN

Less than twenty per cent of the water-power resources of the Tennessee river basin has been developed, although forty-

six plants producing 876,000 horsepower are in operation. The total water-power resources of the basin are about 3,000,000 horsepower available fifty per cent of the time, or about 2,500,000 horsepower available ninety per cent of the time. On the basis of the present practice in installation of water wheels, about 5,000,000 horsepower of water wheels would be required in the development of all the basin's resources. Of the water power now generated in the basin, 700,000 horsepower is used to drive generators of public-utility plants and about 175,000 horsepower is used by manufacturing plants, many of which generate electric power for their own use.

PERCOLATOR STOPS WHEN COFFEE IS DONE

When coffee is ready to serve, the percolating process is stopped automatically in an electric percolator equipped with a simple but effective ball valve at the base of the pipe leading to the coffee. Thus boiling water is prevented from being pumped over the surface of the coffee. The ball-valve pump consists of a small chamber placed in an offset at the lower end of the percolating pipe. At the first appearance of steam in the pipe, a back pressure is set up which causes the ball to seat itself and effectively cut off the flow of water upward toward the coffee.



Percolator with Ball Valve Which Stops Circulation of Water When the Coffee is Done

Coleman Lamp and Store Co. Wichita, Kan.

Recd. 1933-503

C 632

Rept. of Internal 4/21/33



Some of Actors Whose Lifelike Movements Amuse Audiences in Vienna Theater

LIFELIKE MOVEMENTS OF ROBOT ACTORS AMUSE AUDIENCE

Tiny robot actors, on a small but modern stage, provide amusement for the audiences of a "figure theater" in Vienna. Mechanical ingenuity and artistic skill both contribute to construction of the figures, about eighteen inches tall, which go through their movements with a grotesque grace that seems natural. Music and intricate lighting effects serve to heighten the illusion. Most of the figures are carved from wood, but leather, parchment, sea shells and ivory are also used. The human figures wear costumes lavishly decorated and their movements are quite different from those of marionettes operated by wires from above. Instead of wabbling and jerking, the figure-theater stagefolk walk, kneel and rise with dignity, raise or lower the hands gracefully, and look up or down expressively. The eyes are inset and are capable of manipulation to express emotion. The figures are controlled with wooden rods from below, and remarkable scenic effects are produced with chemical crystals which change and grow before the eyes of the audience.



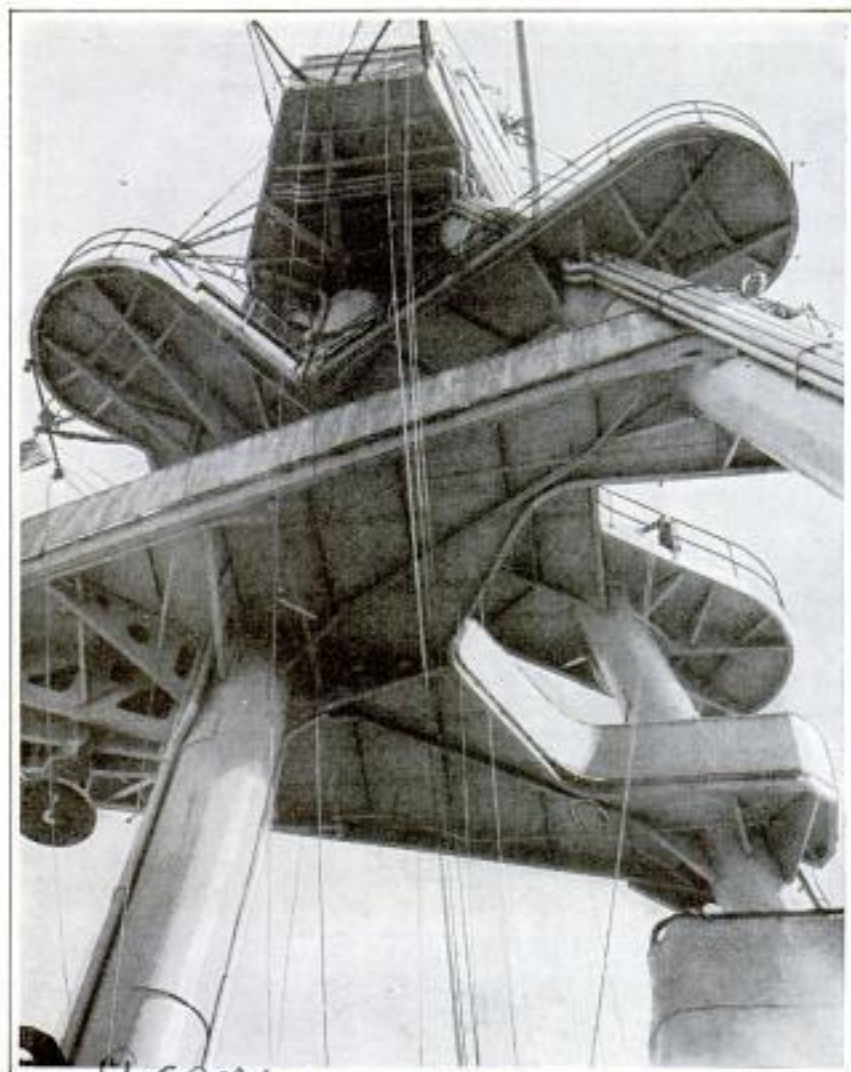
CANNED WORMS FOR ANGLERS WILL LIVE FOR WEEKS

50 cents net. C 62 22
Fishermen can now obtain live angle-worms packed in cans. Five dozen worms are contained in a ventilated can, clean and odorless, with sufficient food to last them for several weeks if the contents are kept moist, and the can is kept where air circulates. The worms, of course, must be kept away from the direct rays of the sun.

Removing the shine and restoring the nap to worn garments are possible under a French chemist's process.

no further data

Antonia 33 S W abrad, Chicago
Von Lingerker Antonia 33 S W abrad, Chicago



Mainmast of the "Arizona," Which Is Supported by Three Steel Tripods; Any One of Them Will Hold It Up if Others Are Shot Away

THREE TRIPODS SUPPORT MAST OF MODERN WARSHIP

Looking up at the mainmast of one of Uncle Sam's fighting ships, such as the U. S. S. "Arizona," one observes what at first appears to be odd construction. Actually, the mast is supported by three sturdy steel tripods instead of one, and any one will hold the mast up in case the other two should be shot away.

VIOLET RAYS IDENTIFY SEEDS BY LIGHTING UP ROOTS

Certain seeds can be distinguished from others in a mixture by exposure to ultra-violet rays. Italian rye grass, sometimes mixed with the more expensive English rye grass, is easily identified when its germinated seeds are placed on filter paper and subjected to the short rays. The paper around the roots of Italian grass

gives off a peculiar glow while that around the English grass roots shows no change. United States department of agriculture scientists use this method to protect farmers in buying seed.

C 539 BOY BUILDS AUTOS FROM OLD PARTS

Three vehicles which he calls "getabouts" have been built by an eighth-grade schoolboy in Arizona from discarded automobile parts and other odds and ends. One four-wheeled car has a three-quarter horsepower washing-machine motor, a battery and coil from an old automobile, steering wheel and shortened springs from a wrecked car, wheels from a coaster wagon and a home-made belt idler. An auto parking light with a larger lamp is the headlight, a motorcycle horn gives warning when the car reaches its top speed of

ten miles an hour, and motor compression and the driver's feet serve as brakes. Another car has three wheels, is powered with a two-cylinder motorcycle engine and makes sixty-five miles an hour. The third has four wheels, two from a motorcycle at the rear and two from a coaster in front. A lawnmower motor speeds it along.



Schoolboy's Homemade Auto Which Derives Its Power from a Washing-Machine Motor

Oloy Watson
Mesa, Ariz.

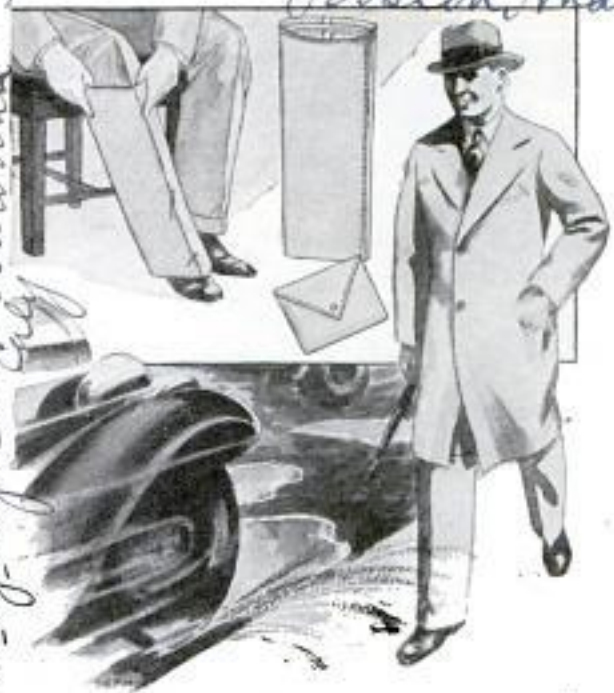
Los Angeles Calif. sold Letter C 598 Cordesig Rain
Islanddale Calif Ship Co. 815
 Boyleston St
 Boston Mass

POPULAR MECHANICS

CAMERA MAKES COLOR PHOTOS ON A SINGLE FILM C 645

Full color photographs can be made at a single shot on a single piece of film, by using a camera invented by Maurice Poirier. The action is the same as when the ordinary camera makes white and black pictures. Poirier's camera has crown-glass lens ground so that it looks like a miniature pyramid, consisting of four prisms abutted base to base at an angle of forty-five degrees. To receive the quartered light, the celluloid base of the frames of film is divided into four square parts, three of which are colored green, purple and orange, with the fourth, black and white. Thus, four images are taken, all alike except in color. Developed in the usual way, the negative is then printed on a second strip of film carrying an emulsion sensitive to light of all wavelengths or colors. A projector, equipped with a special prismatic lens, resolves the four images thus produced into one image, tinted to the most color-loving fancy. The process eliminates the use of filters.

My Herald Tribune 4/24/33



Waterproof Covers for Trousler Legs Intended for Rainy Weather; They Are Easy to Attach

MUD GUARD FOR TROUSER LEG IS EASY TO PUT ON

Mud guards for trouser legs are now available to men starting out on rainy days. They are made of lightweight waterproof material, slip on over the trousers and are attached just above the knees with small fasteners. A permanent crease is sewed down the center and the guards are packed in a rubber case which can be carried in the pocket. They can be obtained to match a suit.

FLYING JACKASS HELPS PILOTS REMEMBER MISTAKES C 606



Student flyers at Boeing school of aeronautics may make a mistake or "pull a boner" once, but they seldom are guilty of the same error twice. The reason is the Flying Jackass club which has as its emblem a little animal of

metal with wings sprouting from the shoulders. Each student who makes a mistake which he would not have made had he stopped to think is made a member of the club, presented with the emblem to take home and polish, and is ordered to write a full report of the blunder, which is filed in a compartment in the wooden base on which the emblem is mounted. One member clambered out of a ship and left the ignition on, another came down at night without landing lights, and others were guilty of similar errors.

A. J. Wonnabe, in charge of ground instruction

FLEXIBLE STEEL RULE FORMS ITS OWN COIL SPRING C 607

Occupying little more space in the pocket than a watch, a flexible steel rule extends automatically to more than six feet when two releases are pressed. The flexible steel is coiled in a round metal case and thus forms its own coil spring to extend itself. It is recoiled in a few seconds by pushing the exposed length back into the case. This rule is particularly handy in measuring objects of various shapes, such as pipes or boxes.



A. H. Theuer, 33 Union Square, New York

c 531 Emb. Walter E. Burton
1032 Florida Ave
Akron Ohio



Why

COTTON *is*



Top, Inspecting Skeins of Rayon; Below, Applying Lacquer with Spray Gun Operated on Air from Tire

LATE bulletins from the court of King Cotton:

A refrigerator liquid has been developed which will not burn, has practically no odor, is almost inactive chemically and whose fumes are not poisonous when breathed.

Midwestern cows increased their milk output and gave milk with a higher butterfat percentage, when fed a sugary food made from cellulose.

A revolution in cotton planting is predicted. If this occurs, cotton raisers will try to produce as many tons of cotton plants as possible on each acre instead of striving for high-grade fibers. The entire crop will be harvested like hay and will go to a factory for conversion into gunpowder, unbreakable automobile windows, paper and paint materials.

It would be a simple matter chemically for you to get drunk on your shirt or use it to sweeten your breakfast cereal.

You may find difficulty in connecting some of the bulletins with King Cotton, in understanding, for instance, how a new refrigerant is related to a bale of the white

For further information

C 531

from F. L. Byrne, Publicity Bureau.

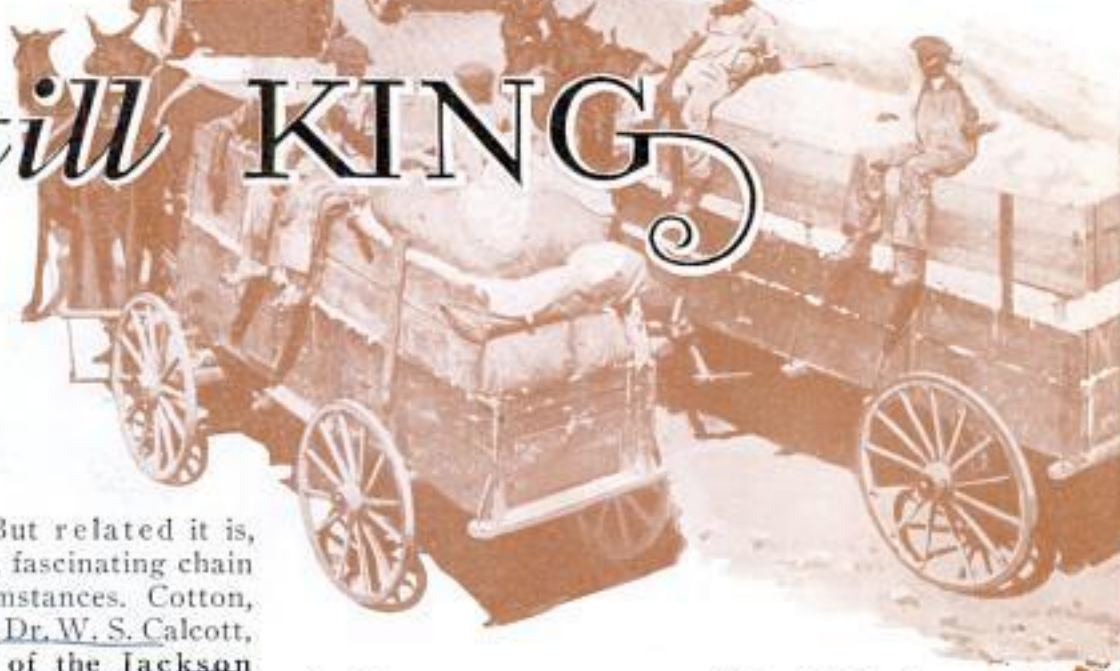
E. I. du Pont de Nemours Co.

Wilmington
Del



Cotton Going to the
Gin; It May Reach
Consumer as Any-
thing from Gunpow-
der to Scuffless Shoe
Heels; Insert, Chem-
ist Making Labora-
tory Tests of Dyes

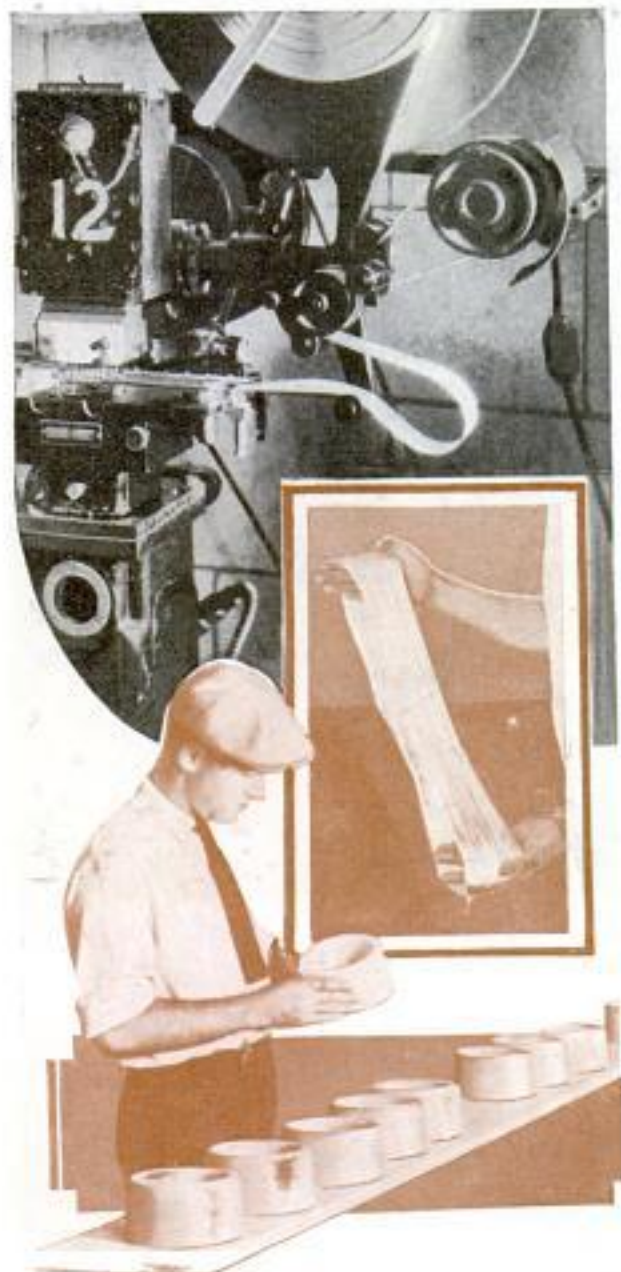
Still KING



fibers. But related it is, and by a fascinating chain of circumstances. Cotton, explains Dr. W. S. Calcott, director of the Jackson laboratory of E. I. DuPont de Nemours and company, differs from other textile materials because it can be used in its original state or can be converted into an almost endless number of other useful forms. Thus King Cotton in his original state has given rise to vast dye industries and the numerous organic chemical plants developed from them. As a raw material—being an almost pure form of cellulose—King Cotton has created an equally amazing number of other enterprises.

Although at first more precious than silk, cotton eventually found its rise to

greater popularity hindered not by cost but by the dull appearance of the fibers. Chemists solved this by developing the mercerizing process in which cotton is treated with lye to make its fibers glossy. Then they went a step farther and dissolved cellulose in chemicals, squirted the solution through fine holes into an acid bath, and got artificial silk known as rayon, chemically the same as cotton—still cellulose. Either wood or cotton can be used as the original supply of cellulose. In time cotton may become the chief source.

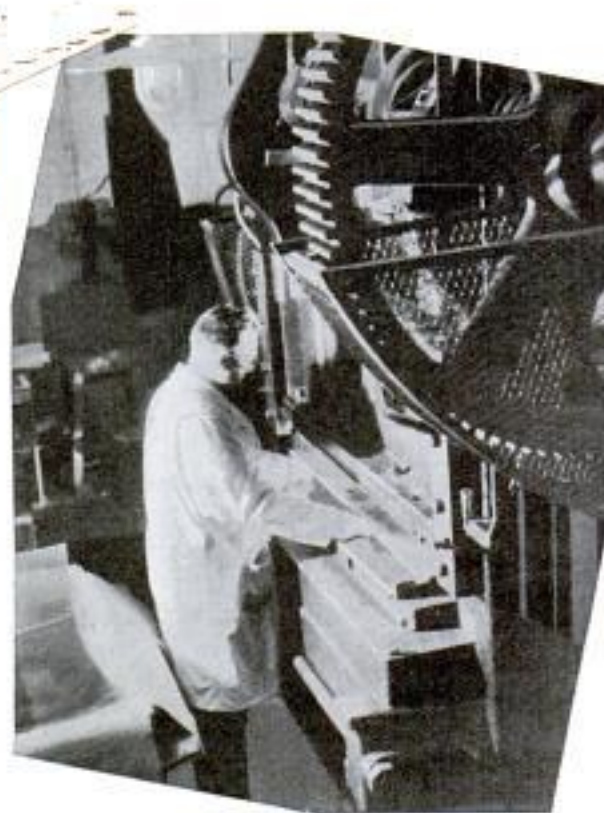


If the treated cellulose is squirted through a slit instead of a series of fine holes, the product is a thin, transparent sheet. You find it everywhere—around candy bars, on cigaret packages, and wherever good appearance or the keeping of moisture out or in is desirable. It is called cellophane.

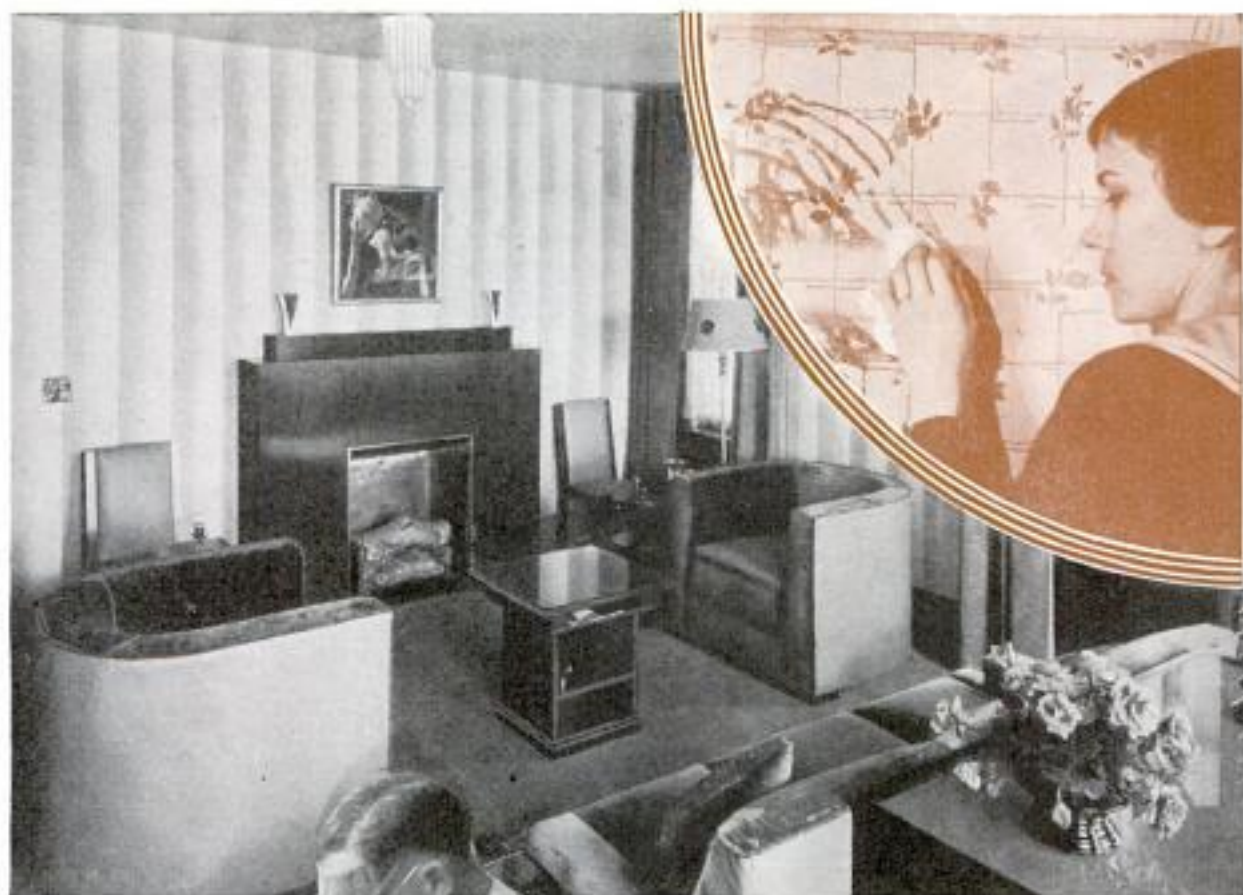
The original cellophane was excellent for many purposes but it was not waterproof. So, Dr. W. Hale Charch, who today knows more about cellophane than most people think there is to know, started out to make it moisture-proof. He performed 2,000 experiments, then he found the answer, a special coating applied to both surfaces of the cellophane sheet. The method can also be used for waterproof-

ing rayon. Artificial silk whether in sheet or thread is the simplest chemical form assumed by King Cotton when he goes into disguise. Not long ago research chemists united cellulose with acetic acid and produced another material that can be made into threads or sheets. This cellulose acetate can be dissolved in lacquer solvent but not in water. You may meet it some day in a lining in the new suit you buy. The soft, lustrous material makes the coat slip on as if it were lubricated.

By continuing to assemble molecules of cellulose with those of various other chemicals, chemists can produce an imposing array of useful products. Cellulose united with nitric acid becomes nitrocellulose that may be converted into imitation ivory, lacquer for your automobile, photographic film and smokeless powder. When treated with camphor, nitrocellulose becomes plastic and easily molded. A different chemical treatment makes nitrocellulose stick to glass—and safety glass for automobiles is the result. In another part of the car it may be found as an artificial leather. Bacteria can be persuaded to work on cellulose and produce indus-



Above, Machine Punching Holes in Motion-Picture Film, and Spools and Skein of Rayon Yarn Made from Cotton; Below, Cutting Pyralin Sheets in Making Non-Shatterable Automobile Glass



Room Furnished with Cellulose Products; Below, Making Articles of Cellulose Products



Insert, Wallpaper Which Can Be Washed with Soap and Water; Cellulose Products Make This Possible

ors upon removing it. This mixing of dyes which are selective in their actions cuts down manufacturing costs.

The dye industry years ago broke its bounds and branched out into other fields. That is the explanation of the relationship that exists between cotton and the new refrigerant mentioned at the opening of this article. Every high-school chemistry student knows that phenolphthalein is a changeable dye that tells whether a solution is acid or alkali. Someone found that it is also an excellent laxative. Aspirin is another product of dye chemistry that has gained wide popularity. With it are hundreds of other medical compounds that are made synthetically.

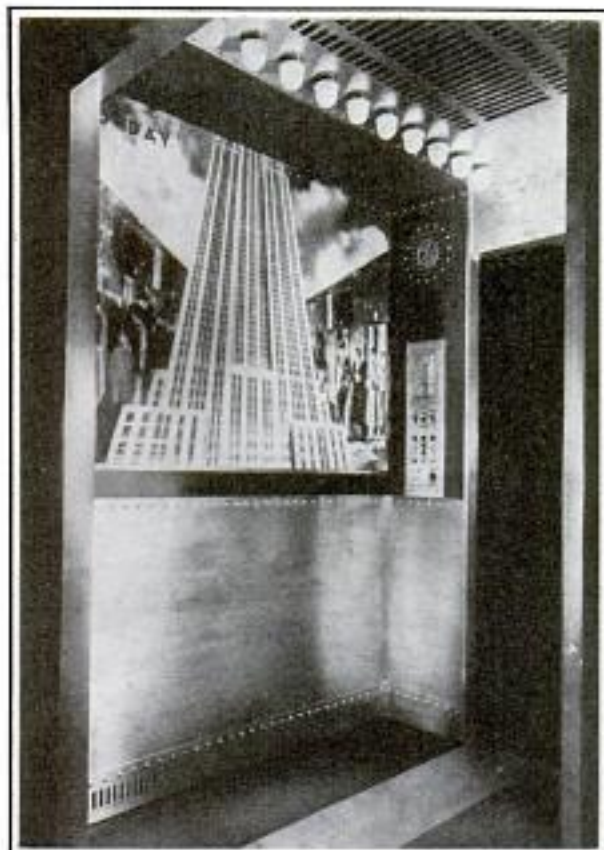
trial alcohol, various acids and synthetic manure for fertilizing plants.

King Cotton was responsible for most of the growth of the synthetic-dye industry, so he can be given credit for a vast number of drugs, paint pigments and industrial chemicals developed more or less as by-products of dye making. Today, dyes themselves are giving chemists little cause for worry. It is even possible to weave a shirt from two kinds of thread, dip it into a vat of dye, and have two col-

Organic accelerators and antioxidants, used to make tires and other rubber goods last longer and wear better, are direct descendants of dye making, the first successful organic accelerator having been aniline. A recent discovery that may revolutionize house painting can be traced back to the dye industry and cotton. Dye chemists have for years used phthalic an-

(Continued to page 122A)

C 365



One of Elevators for the World's Fair "Sky Ride"; Note the Mural Wall Decoration of Car

"SKY RIDE" ELEVATORS SHOW HOW LIFTS OPERATE

One of the attractions for the World's Fair in Chicago will be the "sky ride," two towers 600 feet high and 2,000 feet apart, between which rocket cars will travel on cables at the 200-foot level. Elevators will carry passengers inside these towers to that level or to the top, and these cars are as revolutionary as the ride itself. The aluminum and steel of which the cars are built are given prominence, and photographic murals decorate two sides of the lifts. These murals are symbolical of the progress of construction made possible by the development of elevators, showing that three or four-story buildings only could be built before elevators were installed, because people would not walk more than three or four flights of stairs. It is believed that photographic murals may be used by future builders to incorporate the story of their buildings in elevator cars or lobbies. The elevators will also show all the inner workings of modern vertical transportation. At the tops of the towers, visitors can see the elevator

system in actual operation by peering at the machinery and the rising and descending cars through shatter-proof glass. All the automatic-control equipment and safety devices will be indicated, and this will be the highest display at the exposition.

C 589

MITTENS FOR PIANO PRACTICE STRENGTHEN THE FINGERS

Unusual technical ability in playing the piano has been developed by a musician who wears heavy woolen mittens while practicing and in radio and stage work. The musician is Henry Scott, who adopted the mittens when he found that normal methods of practice did not give him the finger strength and suppleness of hands required of the concert pianist. The mittens, large and pliable, fit snugly about the wrist. They are not gloves. Scott says that practice with mittens increases technical facility, gives greater finger accuracy, results in a clear-cut style and adds to the reach of the hands. He points out that it does not matter how slowly the pianist plays at first, provided he makes himself play accurately despite the heavy yarn covering on the hands. Scott often practices in two pairs of mittens. When he removes one pair, he can play practically unhampered by the heavy mittens still on his hands.



Here Is Pianist Who Practices and Plays Concert Music While Wearing Heavy Woolen Mittens

☐ Tuberculosis in cattle has been virtually eliminated the past year in Idaho, Ohio, North Dakota and Wisconsin.

San Diego Union
4/25/33

Maxwell H. Cummings
Box 93, Wayland
Mass

POPULAR MECHANICS
Philadelphia, Pa.
HURRICANES SIXTY MILES HIGH
REPORTED IN SKY STUDY

That terrific storms rage sixty miles above the earth is the report of Dr. Charles P. Olivier of the University of Pennsylvania. Some of these hurricanes, traveling at 150 miles per hour, blow at an angle of fifty-five degrees at a speed great enough to draw a balloon upward at twice express-train speed. Man has been able to ascend only ten miles into the sky, Professor Piccard's balloon accomplishing that feat several months ago. Three high-speed winds were observed and measured with the aid of meteor "trains," according to Doctor Olivier. They were caught while fourteen stations between New York and Fredericksburg, Va., were charting the flight of the Leonid meteors. One of these trains was watched for several minutes while it floated between fifty and sixty miles up. Several stations checked its motion accurately. The wind drove the train upward at an angle of fifty-five degrees and a speed of 143 miles an hour.



Album with Pages Covered with Cellophane to Keep Stamp Collections or Pictures Clean

70p- \$3.10
Leather \$4.50

TINY BULB IN TWO-VOLT PLUG
GIVES SAFE NIGHT LIGHT



Furnishing safe night light at low cost, a two-volt plug with a small bulb has been produced. The plug contains a transformer that steps the current from 110 volts down to two. Bulb, transformer and connections are in the plug. Consumption

of electricity is only one and one-fourth watts. The plug is adapted to use in places where a low-power light is required at night.

CELLOPHANE ON ALBUM PAGES
KEEPS CONTENTS CLEAN

Collectors of stamps, autographs, seals and similar material can keep their collections clean, and at the same time display them to advantage, by placing them in albums whose pages are covered with cello-

phane. Such albums contain heavy-cellophane pocket pages with flaps at the ends, which can be folded over to prevent handling and soiling. Each page has a colored dividing insert which makes possible a display on both sides and provides space for notations. One such album is of the screw-post type with loose leaves, and has a flap with snap fasteners.

ICE MAKER RUN BY WINDMILL
COSTS LITTLE TO OPERATE

Ice and refrigeration are supplied at little cost by an ice machine operated automatically by an ordinary standard windmill. It can be used with windmills already in use to pump water, or with a standard windmill used only to supply power for the ice machine. Liquid sulphur dioxide is allowed to evaporate in the ice box,

this action being caused by the windmill compressor which relieves the pressure on the substance. The evaporated mixture is drawn from the house to the windmill where it is compressed and forced through an air-cooled condenser where it is returned to a liquid, after which it passes back to the house in a copper tube



Tijco Products Co.
154 Erie, Chicago

Electric Sales Corp
Corpus Christi
Tel. 25

Designed for Penton
Products Co

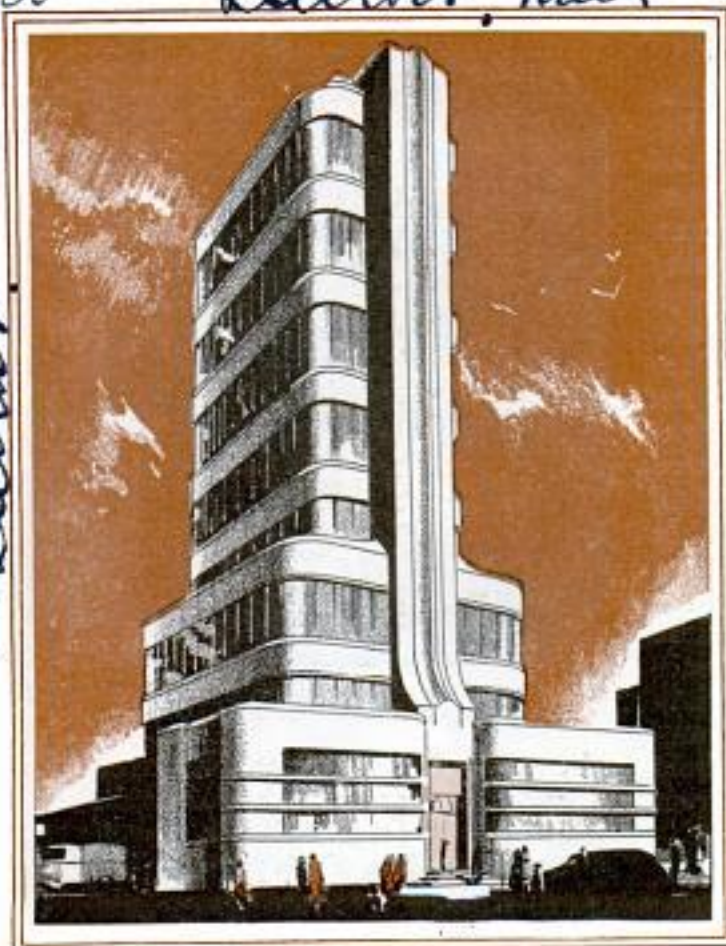
463 West 41
New York

72

POPULAR MECHANICS

Detroit Mich

By Eszter & Vallett, Inc.
Detroit



This Type of Architecture Gives the Ultimate in Lighting for Factories; Note Space Given for Window Installation

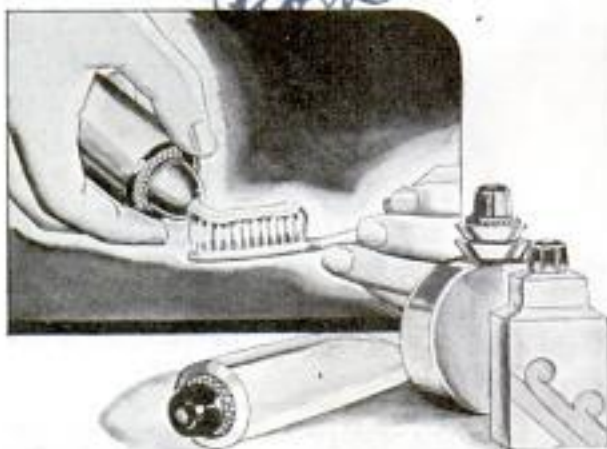
ULTRA-MODERN FACTORY PLAN GIVES FULL DAYLIGHT

Every inch of an ultra-modern factory designed for a Detroit company is brilliantly illuminated by full daylight, improving working conditions. The plant, which shows the trend of industrial buildings to advanced ideas in architecture, occupies a ground area sixty to seventy per cent less than the old-style rambling structures of one or two decades ago. Floors above the first are set back to admit maximum light and air as well as to enhance the plant's appearance. This style of architecture is gaining in popularity for use in office and industrial buildings.

and blue. Each absorbed all of the other colors in sunlight except the one it reflected. Mixing these colors theoretically gave blended hues and shades. Actually, however, the artist's palette carried dozens of different pigments. Dr. Herbert E. Ives, physicist of the Bell Telephone laboratories, has worked out three pigments which he calls "minus red," "minus blue" and "minus green." Each of these reflects mostly the light rays complementary to its "minus" hue. Mixing them gives all desired ranges of hues, and combining all of them gives black. By adding white to give tints and for the actual white parts, Doctor Ives offers a palette carrying only four kinds of paint, but sufficient for artists' requirements.

VALVE CAP WILL RELEASE CONTENTS WITHOUT REMOVAL

Contents of tube, can or bottle equipped with a cap containing a valve can be released without removing the cap. A slight turn of the cap opens the valve, and paste or cream may be squeezed from the tube. The amount can be regulated by adjusting the cap. Similarly, adjustment of the cap



Cap Releases Contents of Tube by Simple Turn; It Never Is Removed from Container

on a bottle regulates the flow of liquid, anything from a fine spray to a steady stream being available. The caps are airtight and leak-proof.

"MINUS COLORS" FOR PAINTING SIMPLIFY ARTIST'S WORK

New types of pigments recently demonstrated promise to simplify greatly the work of the artist. Hitherto the painter's "primary" colors have been red, yellow

Science News Letter
4/29/33

Superior Sales Corp.
Tulsa, Okla

Copyrighted Material

**BOYISH FIGURE DUE TO MOVIES
PROJECTED AT AN ANGLE**

Because movie projection booths are up near the roof in theaters, the boyish figure has been popular for many years. That is an explanation of the ten-year feminine revolt against curves, as outlined by Clifton M. Tuttle of the Eastman Kodak company's laboratories. If the projector in a theater points down toward the screen at an angle of seventeen degrees, the height of figures on the screen in relation to their width is increased by five per cent, resulting in relative slenderness. The tendency of the public to accept what it sees on the screen as the last word in fashion and beauty has done the rest. Large projection angles may therefore be largely responsible for the vogue of slender figures. Curves began to regain popularity when failing business conditions reduced movie attendance. Mr. Tuttle points out that a large amount of distortion can be present on the screen with the audience in no way conscious of any unrealistic effect.



Using an Electric Washer to Clean Walls and Ceilings; the Machine Also Rinses the Surface

*System. Inactive Curforn. Are
4500 Euclid Cleveland, O.*

**FLAT CAR CARRIES FIRE ENGINE
TO SCENE OF BLAZE c 179**

Firemen called to fight a blaze on a pier in San Francisco bay found the fire was in a section of the pier one mile from shore where no fire engine could be driven under its own power because the pier contained only railway tracks. The problem was solved, as the picture shows, by loading the fire engine on a flat car and hauling it to the blaze on the rails.



Key System

acm

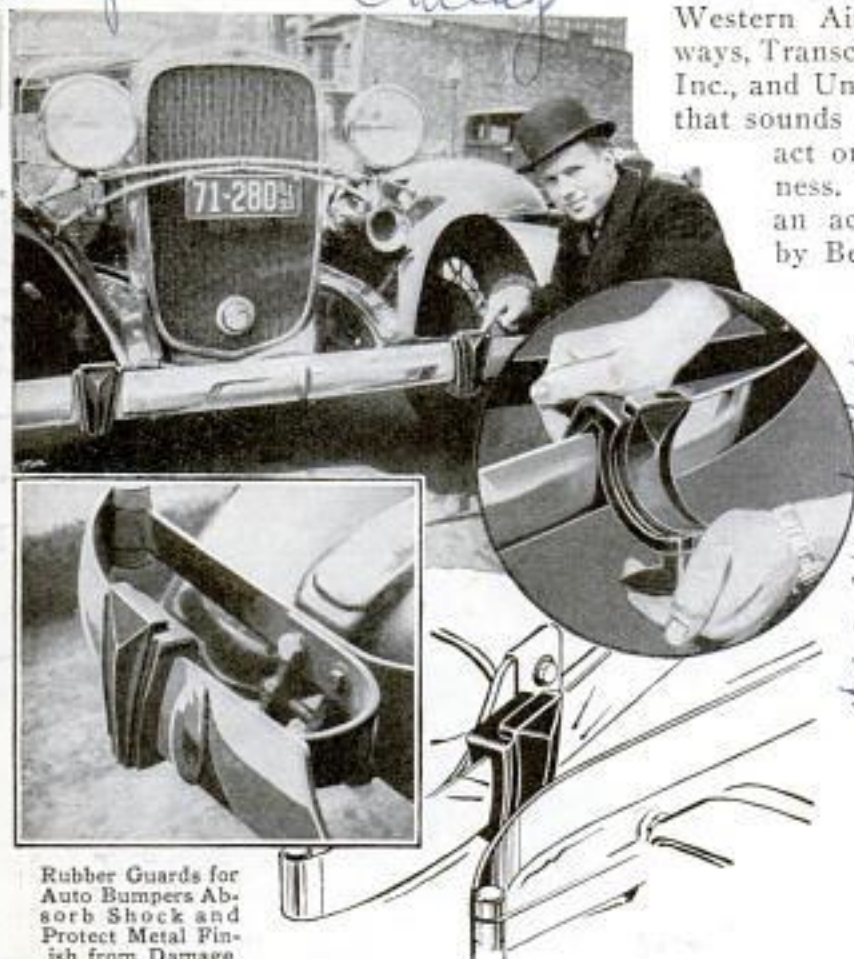
When a Fire Broke Out on a Pier Containing Only Railway Tracks, This Fire Truck Was Carried to the Scene on the Flat Car, as Shown

**ELECTRIC WASHER FOR WALLS
CLEANS AND RINSES**

Painted walls and ceilings now can be cleaned with an electric washer which rinses the walls after scrubbing them. The outfit consists of a tank containing the water and detergent, a force pump operated by an electric motor, and the scrubbers. After the wall has been scrubbed, the same machine rinses it, the water in each instance being returned to the drainage tank. One of the secrets of its work is the even pressure at which the detergent is applied, this pressure, rather than the rubbing, removing most of the dirt. One man operating this outfit can do as much in a day as three men by hand.

74
Bumper

2308 *Ohio*
Chicago



Rubber Guards for Auto Bumpers Absorb Shock and Protect Metal Finish from Damage

RUBBER GUARDS FOR BUMPERS ABSORB SHOCK OF IMPACT

Bumper guards, consisting of thick pads of heavy, resilient rubber finished in black, protect the metal finish of auto bumpers from damage and at the same time absorb much of the shock of impact in minor traffic collisions without transmitting the shock to either the bumper or the car. Such impacts as do occur are free from noise, and it is claimed the rubber protectors help to prevent breakage of glass and aid in preventing frame strain. The cushions, which can be slipped over a bumper in a few seconds, also will help to eliminate underpassing and locking of the bumpers.

NOISE ANALYZER TESTS PLANE TO END AIR ILLNESS

Prevention of air nausea among passengers on America's transport planes may result from scientific tests in which a sound analyzer was used to detect disturbing noises in the big liners of the

Western Air Express, American Airways, Transcontinental and Western Air, Inc., and United Air Lines. It is known that sounds set up vibrations which react on the inner ear, causing illness. To track down these noises, an acoustic analyzer, developed by Bell Telephone laboratories

and the Electrical Research Products corporation, was installed in passenger planes. A movable microphone isolated sounds from propellers, wing tips, motors, exhaust stacks, windows, fuselage paneling and rigging. In one experiment, it was revealed that the slap of control wires between fuselage walls was causing thirty per cent of cabin noises. This fault was corrected, reducing vibration considerably. The engineers also found that a large amount of vibration was the result of harmonics set up in

materials which did not originate vibrations by themselves. This action is similar to that of pianos when the vibrations of certain strings actuate other strings not sounded on the keyboard. When harmonics occur, the vibrations multiply. The engineers pointed out that these vibrations cause metals in transport ships to harden and finally break.



Testing Noises in Transport Plane in Attempt to Reduce Vibration That Causes Discomfort

463 Wash. N.Y.

To be built by M. Freyssinet
on Mont Valerien hill.

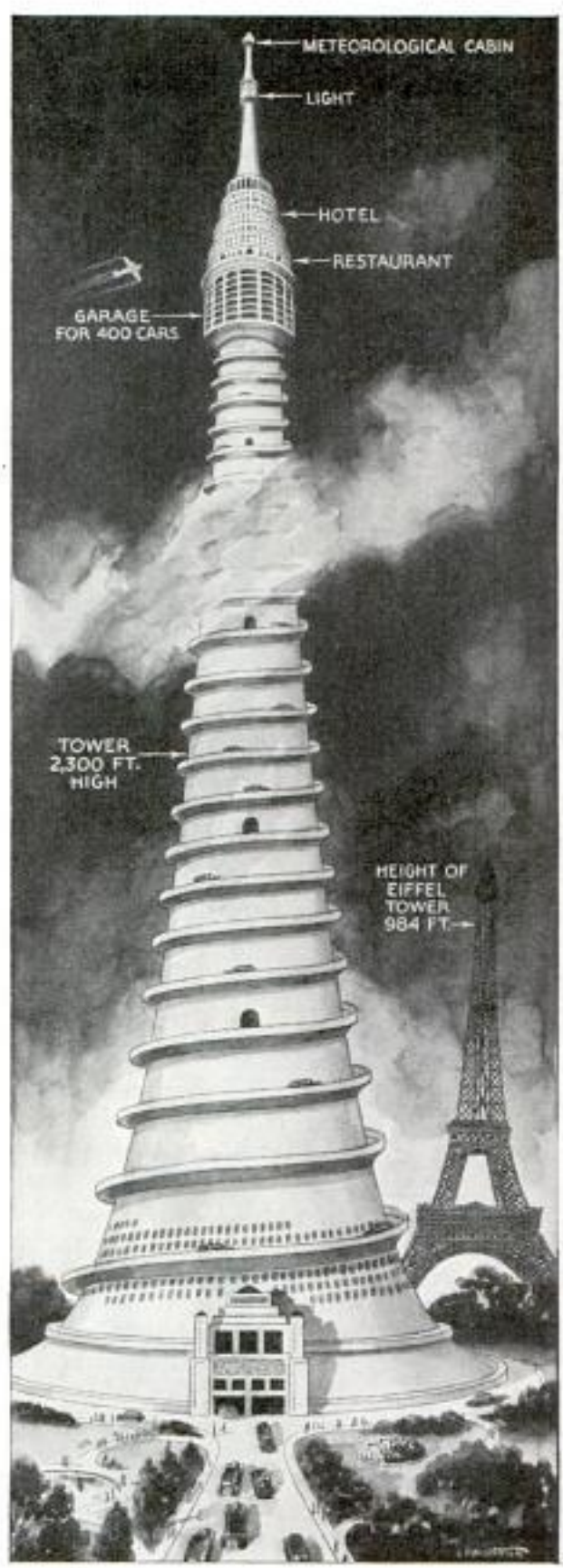
Paris
**TOWER NEARLY HALF MILE HIGH
TO HAVE A SPIRAL ROAD**

One of the features planned for the Paris Exposition of 1937 is a mammoth tower of concrete, 2,300 feet high, up which motorists can climb in their cars. The motor road, three and one-half miles long, would spiral around and around the tower to a height of 1,640 feet, where a garage accommodating 400 cars would be situated. Above the garage a restaurant is planned and above that a hotel several stories high. On top of the hotel a lofty pillar would support a powerful aerial beacon, and a cabin for meteorological observations. Cars ascending the great spiral ramp would travel under their own power, but in descending, they would be attached to a monorailway, the driver steering the car while the speed is controlled by the monorail attachment. From the ground the beacon, it is estimated, could be seen for 160 miles, and it could be observed from an airplane over England. The site for the tower is a hill 500 feet high, on the outskirts of Paris.

C643

**INVISIBLE ENERGY IN NIGHT SKY
FOUND BY SPECTROSCOPE**

Even when the night sky appears inky black to the human eye, it is a luminous power house of energy under the spectroscope. This sky energy is not starlight, according to Dr. V. M. Slipher, director of Lowell observatory, Flagstaff, Ariz. Part of it is an ~~aurora~~ which the eye never sees. The rest comes beating down ceaselessly upon the earth, possibly from space. As revealed by the spectroscopic "eye," there are really three auroras. One is the well-known visible display so often accompanied by magnetic storms. The second, although never seen, is permanent. The third comes briefly, flashing on just after sunset and just before dawn. Its arrival is the moment when the last rays of the sun, or the first, touch the earth's atmosphere directly above the observer's head. Doctor Slipher has named these light emissions "cosmic radiations," which should not be confused with the cosmic ray. Dr. Henry Norris Russell, of Princeton University, says these radiations probably originate in the extremely rarefied upper layers of the earth's atmosphere,

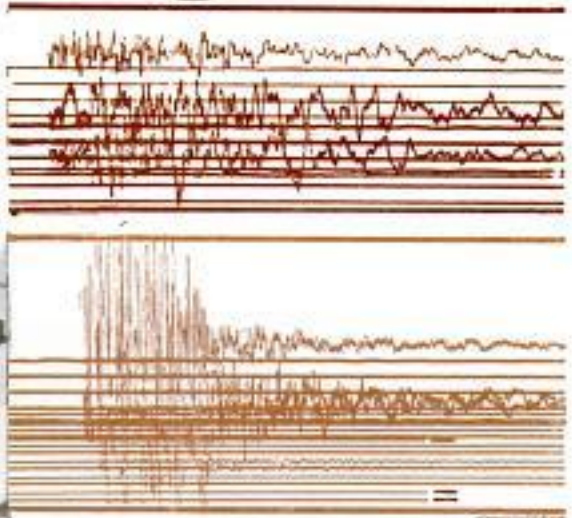


Proposed 2,300-Foot Tower for Paris Exposition; It Would Be Circled by Spiral Motor Road

which reflect radio waves and make it possible to send messages around the world.

*Denver Post 4/23/33
NY Times 4/23/33*

Chaining the



Left, Accelerograph Ready to Be Installed to Record Earthquake Shocks; Top, Two Accelerograms Showing Violence of Recent California Disturbance; Upper Record Was Made at Los Angeles, Where Shocks Were Not Severe, and Lower Record at Long Beach, Where Tremors Were Severe

Washington, D.C.

SCIENTISTS of all nations have fought the earthquake giant for centuries, beginning in the early days of the Chinese empire. Until recent years, their accomplishments have been few, confined mainly to registering distant disturbances on the seismograph.

Latest developments in the attempt to chain the earthquake are instruments that record its different movements. In this work, the United States coast and geodetic survey, co-operating with scientists, has played a leading part.

The only records of this type are three accelerograms revealing the violence of the earthquake on March 10, 1933, in southern California. The first shock automatically put recording instruments to work, thus trapping the temblor into writing its own history.

As interpreted by Frank Neumann of the geodetic survey, these records reveal a very strong up-and-down motion of the ground at Long Beach on March 10, as well as a sidewise movement. There really were two vertical motions, one a slow rise and fall of the ground and the other a rapid up-and-down tremor. Mr. Neumann explains that the fast tremors may have

crumbled the mortar between the bricks of buildings so that the walls were shaken down more easily by later shocks. The ground moved in almost every direction before the earthquake was over.

As these strong-motion records accumulate, experts hope to gather information that will guide the building industry and that some day may enable science to predict accurately the moment at which an earthquake will strike a certain area.

Man has learned much by studying working models of buildings erected on large shaking platforms. By subjecting these structures to synthetic quakes, engineers and architects have developed theories that have been applied with considerable success to construction of shock-resisting homes, offices, schools and factories.

Just what happens to a building in an earthquake?

W. E. Hart, structural engineer for the Portland Cement association, answers:

"The action may well be described as a sudden powerful hammer blow delivered at the base of the building, followed by another blow from the opposite side, when the earth movement ceases as suddenly as it began. These blows coming in rapid

Earthquake Giant



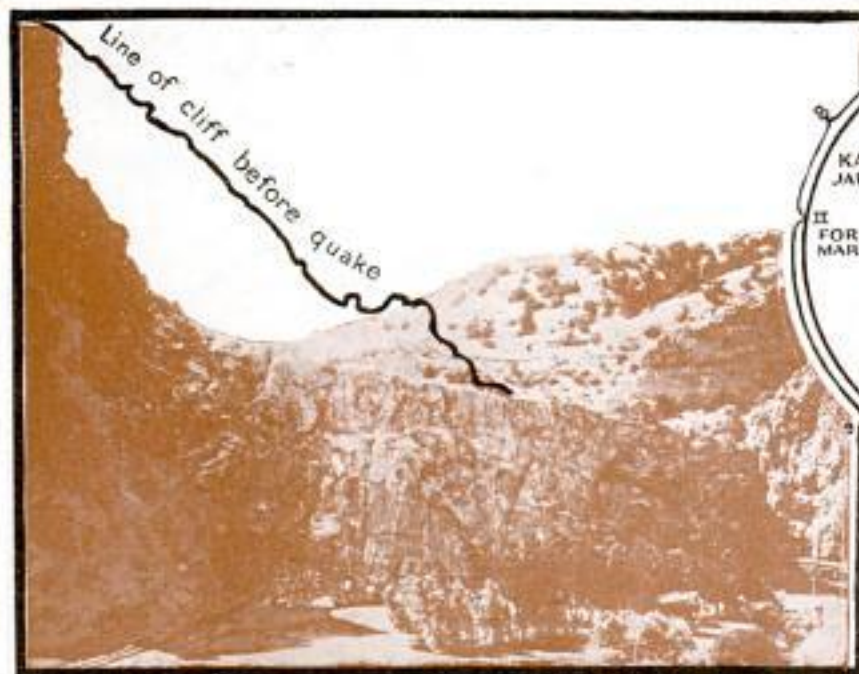
Left, Guardsman on Duty in Earthquake Zone; Note How Walls Were Ripped Apart

succession set up vibrations that apply unusual stresses to various parts of the building. Sometimes the damage begins with the first blow and increases with each vibration. Other times, some seconds pass before the structure begins to give way."

Buildings of medium height can be constructed so that they will be practically quake-proof, claim noted engineers who have studied earthquake effects for years. These authorities say that a building with a substantial framework solidly tied together by strong walls and floors, made of good materials, should be reasonably safe.

E. M. Scofield, contractor, who was a member of the coroner's jury which investigated the recent California disturbance, says that by an added cost of three to seven per cent, any building can be made shock-resistant.

Engineer Hart recommends reduction of the danger of falling walls, cornices



Top, Showing How Cliff Was Shaken Down by Montana Shocks; Bottom, Right, Magnified Motion of Point on Earth's Surface as Shocks Begin



1906-1907
Top, Segments 7, 8 and 9 in Circum-Pacific Belt Unrelieved in 1906-'07; Shocks in Columbia, Formosa and San Francisco Enabled Prof. Omori to Predict the Valparaiso Quake

and copings, which caused much of the damage at Long Beach, by making these parts integral parts of the building. Overhanging decorations and cornices would be eliminated.

Dr. Bailey Willis, geological engineer of Stanford University, says:

"Reinforced-concrete walls and reinforced-concrete filler walls in reinforced-concrete frames exhibited the highest degree of resistance among structures tested by the Long Beach shock. Good brick laid in cement offers good resistance but is stronger if reinforced. Wood frames with wire or metal lath and good stucco gave the best satisfaction in light buildings."

Steel-skeleton skyscrapers escaped damage, probably due to the fact that such structures are elastic. When the earthquake jerks the skyscraper's basement to the left, steel a few stories above is pulling the other way and absorbing part of the energy. As the wave climbs, it loses a little energy at each floor and actually is "tired out" before it reaches the top.

A thirty-story steel-frame building capable of withstanding wind pressure of thirty pounds per square foot at the top is considered by many experts to be safe against any shock that might be reasonably expected.

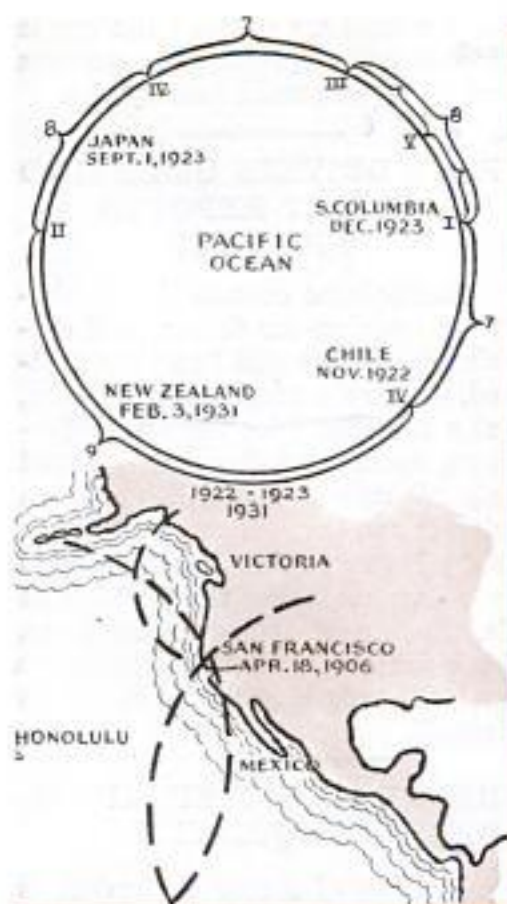
After careful study, technical men have



concluded that good design, good workmanship and the proper use of good materials are the requirements for buildings that can be expected to resist earthquakes. Reinforcement with steel or metal laths is generally recommended.

Meanwhile, science continues to seek the earthquake's secrets. Capt. N. H. Heck, of the United States coast and geodetic survey, lists the accelerograph, the displacement meter and the Weed strong-motion instrument as three parts of the "trap" which the survey is using to detect the strange movements of the earth's crust. The accelerograph measures violence of shocks, the displacement meter records the distance and speed of the earth's sway from side to side and the Weed instrument traces two components of horizontal earthquake movement with a single pendulum on a moving plate of smoked glass.

By means of the seismograph and long study, science has decided that quakes are caused by sudden release of tension



Top, Diagram Verifying Forecasts in 1922, 1923 and 1924; Center, How Distant Quake Is Fixed in Position from Three Stations; Bottom, How House Is Affected; Top, Right, Hidden Steel Reinforcement of Building

built up over a long period of time deep in the earth. This causes cracked portions of the earth's crust to rub together violently. Usually disturbances occur in the vicinity of a fault, which is a dislocation of the earth caused by slipping of rock masses.

Two earthquake belts girdle the globe. One lies astride the rim of the Pacific ocean, according to Prof. William H. Hobbs, of the University of Michigan, while the other passes through the Caribbean sea and neighboring islands, crosses the Atlantic to pass through the Mediterranean sea and border islands, follows the south slope of the mountain backbone of

Asia and continues through the Malaysian archipelago to New Zealand. Scientists sometimes venture to predict an earthquake, but without attempting to forecast the time at which the shock will occur. Prof. Martin Hango, of Hungary, came within two years of correctly predicting the Java temblor of 1931. The method used by the Japanese seismologist,

Omori, was to forecast a disturbance as likely in that section of the circum-Pacific belt which had not been relieved by earthquakes in a recent period. This method has been used by other seismologists, also, with success.

Fortunately for man, most of the forty to sixty major earthquakes that occur each year do not strike populated areas.

After all, there is some good even in an earthquake. Prof. W. A. Parks, of the University of Toronto, cheers us with this assertion:

"If earthquakes ceased, the earth would be doomed, because land would be worn smooth by the erosive action of the seas."

Department of Architecture
Museum of Modern Art



Cont. Wilkins

Showing Progress of the Building Industry; Model at Left Is Masonry Construction, at Right, Latest Steel Framework

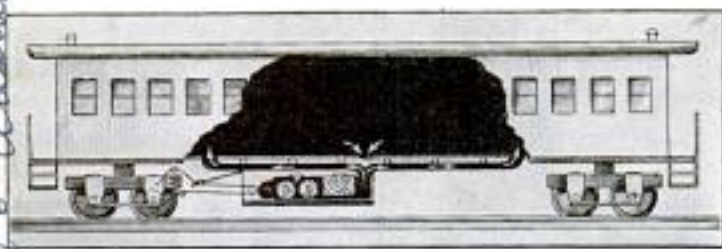
MASONRY AND STEEL MODELS SHOW BUILDING PROGRESS

How the building industry has advanced is demonstrated by three models in an architectural exhibition. The first represents the low, heavy, dark masonry building of only a few years ago, the second combines steel and masonry, while the third is the light airy tower of today, made possible by steel-skeleton construction.

FIRST AIR-CONDITIONER PATENT SEVENTY-EIGHT YEARS OLD

While air-conditioning equipment is just coming into use, the first patent for washing and cooling air was issued in 1855, seventy-eight years ago. Job R. Barry, of Philadelphia, contemplated the machine for use in railroad cars, omnibuses, stage-coaches and other vehicles. The device was to be operated by a belt driven from a car axle, similar to the method employed on the modern train, and consisted of a fan to direct air through two "refrigerating wheels" made of wire mesh, which cooled the air by contact with ice water from a storage tank underneath the car. When

Cont. G. H. Tully, Inventor. The Pullman Co., Pullman Bldg. Adams, Chicago



Inventor's Drawing of Patent Issued for Air Conditioning of Railroad Car in 1855; It Resembles Equipment in Use Today

this cooled air entered the car it would create pressure to prevent entrance of smoke and sparks.

C 646

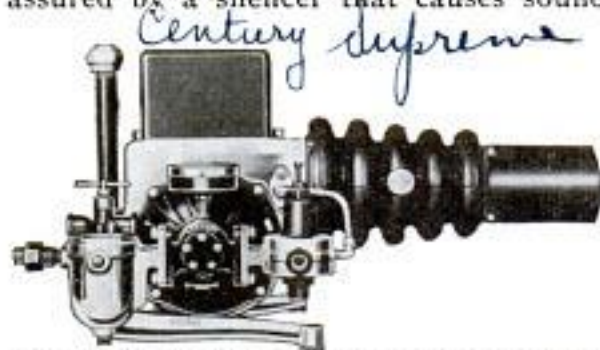
RACE DRIVERS USE RADIO TO GET REPORTS FROM PIT

Radiophone communication between racing-car drivers and mechanics in the pits has been tested, on a race track near London, as a substitute for the unsatisfactory system of flag and placard signals now in use. With radio, a driver can keep in constant touch with his managers and mechanics who are watching the position of his rivals. Racing at 100 miles an hour, drivers have found it difficult to recognize signals and placards held up by members of the pit staff.

OIL BURNER WITH A SILENCER OPERATES QUIETLY

C 478

Quiet operation of a new oil burner is assured by a silencer that causes sound



Latest Oil Burner Is Equipped with a Silencer; Vibration Is Reduced by Rubber Mountings

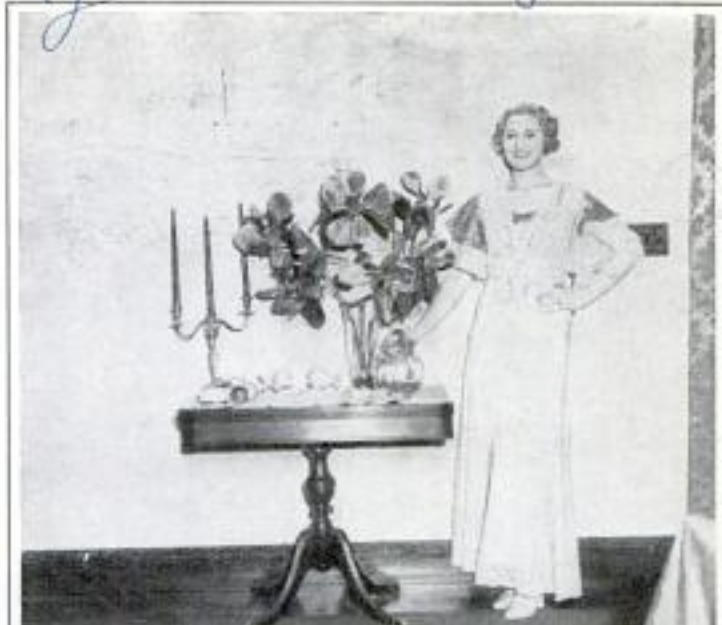
vibrations to dissipate in a series of convolutions before traveling outside the burner. Vibration is minimized by mounting the entire burner on a rubber bearing, or sleeve, in the clamp of the burner leg. This sleeve also constitutes the height adjustment of the burner. Another feature is a filter cartridge that makes it possible to clean the strainer by merely turning an external handle. The burner has a capacity of one to six gallons of oil per hour and is of the pressure-atomizing, constant-ignition type. It is fitted with thermostat and stack safety switch.

Century Engineering Corp. Cedar Rapids Iowa

at New Milford e 504
 Laboratories by
 Hackensack Water Co.
 Weehawken, N.J.
 POPULAR MECHANICS New York 81
 Dr. Alexander
 Strobl, 35 W. 52nd

FARM WASTES TO PURIFY WATER SUPPLY

Purification of water for the nation's cities by means of farm wastes may be the result of recent tests by chemists. Research indicates that the hulls of buckwheat, rice and other grains may be converted into "activated char," free of odors and tastes common to surface-water supplies during certain seasons. More than 400 waterworks in all parts of the country are using finely pulverized activated carbon, or charcoal, as a purification agent. The carbon in the form of a fine powder is applied to the water before it is filtered. Expulsion of odors and tastes is accomplished by purely physical means, nothing of a chemical nature being imparted to the water. Dr. P. Burke Jacobs, of the U. S. agricultural station at Ames, Ia., after inspecting the research laboratories of the Hackensack Water company in New Jersey, says that production of activated carbon from farm wastes offers a promising field for improving water supply. Activated carbon is now produced from fruit pits and other cellulose-bearing substances.



Room and Fixtures Illuminated with Ordinary Light and with Invisible Light Which Reveals the Decorations

ELECTRIC-WIRING DUCT REDUCES WORK

Extensions of electrical wiring can be made easily by using a metal duct into which two No. 14 wires fit. The oval case, finished in colors to match most woods, is almost unnoticeable. It eliminates trailing, dirty and sometimes unsafe cords by serving as a neat wire carrier along the baseboard, floor or other part of the room. Elbow caps are provided to make close-fitting corner turns.



"INVISIBLE" DECORATIONS SEEN WITH ULTRAVIOLET LIGHT

By the simple process of switching off the regular electric lights and turning on "invisible" ultraviolet light, a room decorated with fluorescent paint is transformed as if by magic from an attractive dining room, for instance, to a gay party-setting featuring modernistic decorations. The secret lies in the paint, which is sensitive to the ultraviolet light but is invisible under ordinary lights. By treating walls and fittings with the invisible decorations, the interior of a room can be completely changed simply by changing lights.

XTensacordant
 National Electric Products
 Co., Fulton Bldg
 Pittsburgh, Pa

c 502 Cont. *Thos E. Stinson, Jr.*
145 S Spring St
Los Angeles, Calif

SHORT CUTS for

Richfield Oil Co
Richfield California
Los Angeles, Calif

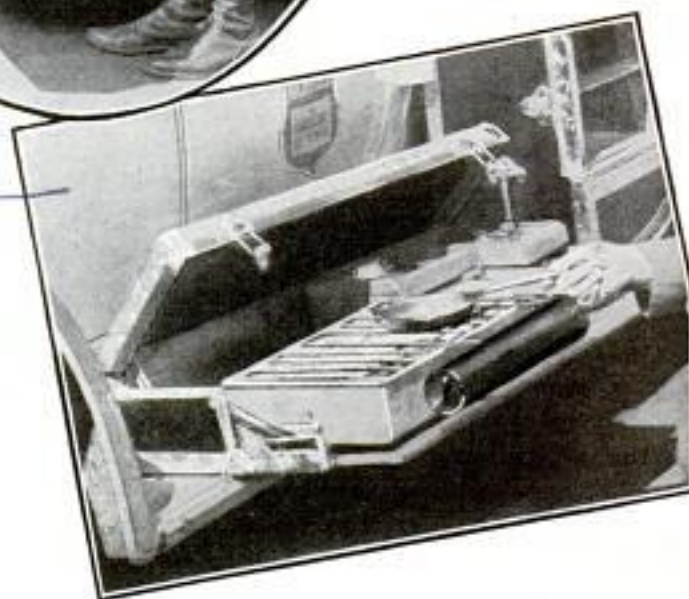


In Oval, Drawers for
Clothes; Below, Stove
Slides Out Ready for
Instant Use

IT is not what you take with you but what you leave at home that makes a camping trip a success. With twenty-seven years of automobile camping behind him, C. L. "Outdoor" Franklin, the "Richfield scout," passes on the emphatic advice to travel light. No one likes to do camp work on a vacation, and the less equipment you have the less work there is. Nearly everyone, for instance, takes too much clothing on an automobile camping trip. The chances are that one change is enough. The rest is in the way.

Too many dishes and cooking utensils is another common mistake. Some solve the problem by carrying paper cups and dishes. Experienced campers use pans that nest into one compact box. A large pail is a good place to store dishes, coffeepot, frying pan and other kitchen hardware.

"Don't expect to have a carefree time if you casually throw a lot of food and bedding in the back of the car and drive off," Franklin says. "The fun of camping de-



pends on proper preparation. It is foolish to rough it when many conveniences are available, but it is just as foolish, also, to load yourself down with a lot of superfluous gear."

A modern gasoline stove is a first essential. A wood camp fire looks fine but it takes an experienced woodsman to pre-

Auto CAMPER

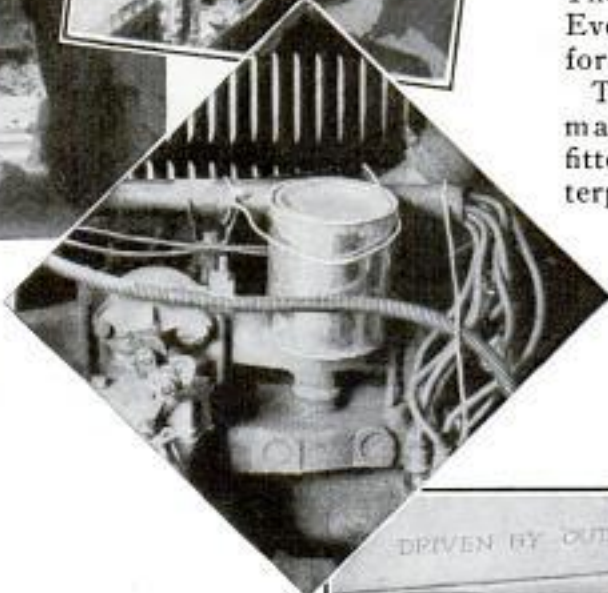
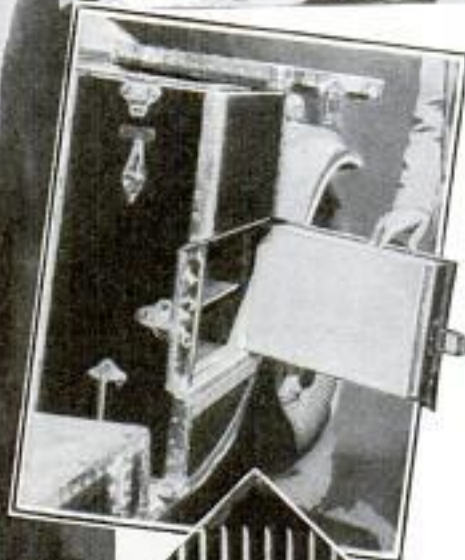


Above, a Running-Board Pantry with All the Necessary Incidentals for a Meal; Left, Camping Boxes Do Not Interfere with the Doors

pare a meal over one. Keep the stove level—otherwise the food tilts to the side of the pans. If the exhaust manifold on the engine has a flat top your cooking problems are simplified. An hour before you stop, remove the paper labels from some canned goods, lay the cans on the exhaust manifold, and tie with wire. By stopping time the food will be piping hot. Handle the hot cans with gloves and watch out for spurting juice when you open them. You can clamp a small aluminum roaster on the manifold if it is large enough, or a square tank to heat water. An old suitcase, carried upright and fitted with shelves, makes a good traveling pan-

try. A glass jar is the best place for butter. Don't forget at least one sharp knife and a can opener.

A bed of boughs has its place in the wilds but not where a more comfortable bed is available. If there are only two people, fit the interior of the car for sleeping. The seats should lower down flat and form an ideal bed. An air mattress, blown up with a bicycle pump, is spread over the seats, and blankets laid on top. You can make screens to fit into the car windows. Make the frame shorter than the window opening and roll the glass up until it holds the frame in position. A hammock hung from the roof keeps clothing out of the



Scenic Views Courtesy
Auto Club of Southern California
Top, Fitting Metal Table-
ware in Stove Compartment,
and a Running-Board Ice
Box; Right, Can of Food
Wires to Exhaust Mani-
fold; Below, Cooker Heat-
ed by Exhaust Gases

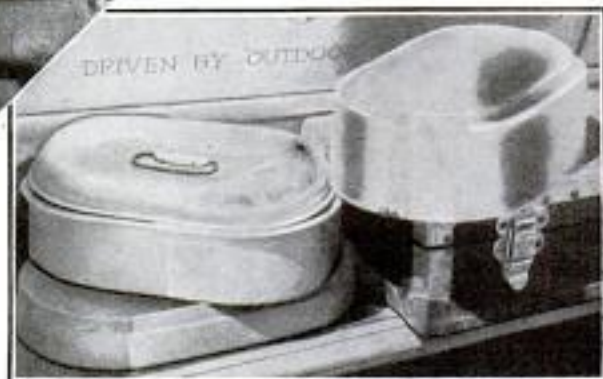
way. For more than two people, carry one of the simpler touring tents that can be erected in less than five minutes. It should be waterproof and have a sewn-in cloth floor. The openings should be covered with mosquito netting. Air mattresses laid on the floor are warmer and more comfortable than cots. Also, they take up less room.

In deciding what to leave at home, don't discard the blankets. Even after a hot day it is cold in the mountains and deserts. If you discover that you didn't take enough blankets, spread newspaper under the mattress and between the top layers of bedding. The tent and blankets are rolled up into a compact bundle carried

on the roof or running board. You can keep the dust out of the bed roll by wrapping it in heavy paper. Rubberbands from a discarded inner tube make strong straps.

Since Franklin is an old hand at automobile camping, let's inspect his car. He calls it a combination hotel on wheels and a lazy man's dream. It is fully equipped for an extended trip, but you need a second glance to tell where the equipment is stored. All except a blanket roll is carried outside in two neat boxes on each running board and a large rear trunk. The weights are equalized. Everything is arranged for minimum labor.

The outboard boxes are made of five-ply veneer fitted together with waterproof glue and covered with duralumin sheet metal, and are bolted to the car. The metal tops are dust and waterproof. On the running board also is a



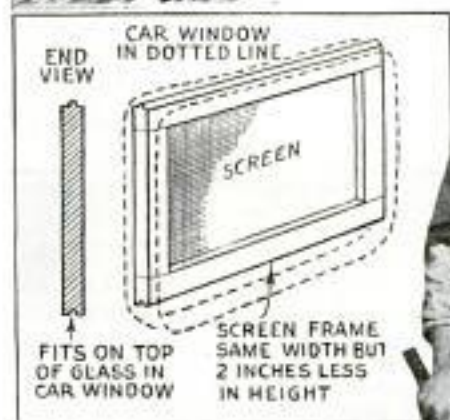
sturdy ice box holding twenty-five pounds with room for storing plenty of food. A flat trunk on the running board behind the ice box holds the gasoline stove, pans, enameled plates and eating implements, in cloth-covered shelves and drawers. The stove slides out on its base and thumb-

screws raise either end to level it. The large rear trunk contains an oak water keg on one side and a chest of drawers on the other. The keg is packed in sawdust and connected with a spigot on the side of the trunk. The top of the trunk lifts and exposes a shaving mirror, and shelf for toilet articles.

On the left running board is another chest for clothes and incidentals. Behind it is a patent aluminum cooker that obtains its heat from engine-exhaust gases circulated through the base. Franklin stops at a wayside market late in the afternoon, plops vegetables and meat into the cooker, and finds them done when he



Above, Fitting Canvas Top on Box; Left, a Group of Acoma Water Carriers Doing a Balancing Act



Above, Screen Frame for Car Window; Right, Probing Tire for Tacks and Glass

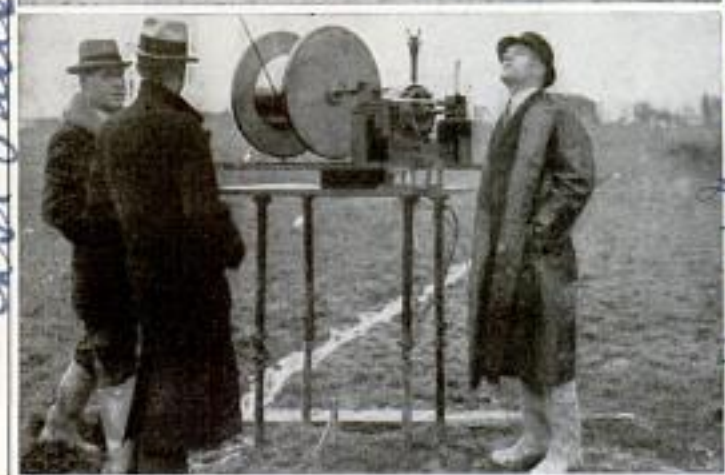


parks for the night. Behind the cooker, in another box, is the pantry. Square tin boxes with tight-fitting covers are filled with flour and loose groceries. The inside of the car is cut for sleeping, and Franklin can make his bed, place screens in the windows, and retire in less than five minutes. Besides the blanket roll, he carries a small folding table in the back seat.

A small camping outfit allows campers to reach country closed to heavily loaded cars. When leaving the highways, carry a hatchet, trench shovel, lantern, washbasin, first-aid kit, chains and tow rope. Instead of burying tools behind a seat, some stow them in a metal box fastened between front bumper and radiator.

at Wausseau Institute
for Research near Berlin

Westinghouse Electric Mfg Co
East Pittsburgh Pa



Top, Ready to Release Balloon; Bottom, Watching the Flight; Note Spool of Wire That Holds the Balloon Captive

SMALL BLIMP LIFTS ANTENNA FOR RADIO BROADCASTS

Held aloft by a baby blimp, a radio antenna trails 1,500 feet in the air above the experimental station of a Pittsburgh broadcasting company. Whether signal strength is greatly increased by this arrangement is the objective of tests now in progress. A light aluminum wire serves the dual purpose of restraining the "captive aerial" and of feeding it radio programs. Theoretically, at a distance of forty miles, signal strength several hundred times that now possible will be obtained by using the antenna-carrying blimp. It is known that radio waves travel without loss from the earth to the "heavyside layer" where they are partially absorbed and bent back to earth. The return path being without loss, it often happens that the waves travel for hundreds of miles and return to earth with fair intensities. Engineers of the Westinghouse Electric and Manufacturing company hope to solve the

problem of signal-strength loss by placing the antenna high enough above the earth so radiations may be permitted to travel directly from the antenna to the ground. Computing the curvature of the earth, the engineers find that the antenna should be 450 feet high to "see" thirty miles, and 4,200 feet for eighty miles.

RIFLE SHOOTS TWELVE BULLETS A SECOND

Capable of firing 750 shots a minute, more than twelve per second, Germany's deadly machine-gun rifle has been tested in secret. It is said to be the lightest weapon of its kind, weighing only a fraction more than ten pounds. The rifle is easy to handle and has no noticeable recoil. It contains but three parts. Submerged in mud or sand, it remains undamaged. Firing speed can be regulated from single shots to successive bursts of from 250 to 750 shots a minute by merely touching a small lever near the trigger.

The rifle has a range of nearly 3,000 yards for accurate firing. Discharged 1,000 times in rapid succession, the barrel does not become extraordinarily hot, due to air-cooling permitting the complete discharge of hot gases following each shot.

POUND OF FUSE WIRE WORTH ELEVEN MILLION DOLLARS

Fuse wire costing more than \$11,280,000 per pound forms the fusible element for



Some of Tiny Fuses Containing a Platinum Filament One-Thirtieth the Diameter of Human Hair

Littlefuse Laboratories
1702 Wilson Ave
Chicago

C 562
Down days from 7/16

very delicate electrical instruments, meters and some radio tubes. One pound of the platinum from which the wire is made, however, can be drawn into a filament 4,750 miles long, and since each fuse uses only a very small piece, the cost per piece is relatively little. The delicate filament is one-thirtieth the diameter of a human hair, cannot be seen with the naked eye, and is so light it floats in air. To make it usable, the filament is sealed in a glass tube and caps are placed over the ends. This constitutes the fuse. If a current greater than one one-hundredth ampere passes through it, the metal will fuse and thus protect the instrument with which it is connected. For convenience and speed in making connections, the fuse is placed in a tubelike metal connector which is fastened to the binding post of the instrument by a metal strap. The current wire plugs in at the top of the connector.



Aquarium Which Can Be Hung on the Wall Like a Picture; Pasted to the Back Is a Marine Scene

e 556
RUBBER NUT SEALS TIRE VALVE AND REDUCES DAMAGE



Sealing the rim against rain and dust, a rubber nut for the automobile-tire valve has been produced to replace the metal nut. It also protects the tube against damage in the event of punctures and blow-

outs, since the valve stem readily frees itself from the nut, permitting the tube to rotate with the outer casing. Thus, rim-cut damage is reduced and the valve stem is saved from being ripped out of the tube. While there are no threads molded into the nut, it is constructed of such soft rubber that it threads itself tight against the rim, holding the valve stem rigid.

e 572
WALL AQUARIUM LIKE PICTURE MAKES NOVEL DECORATION

Instead of keeping your fish in a bowl on a stand, you can now hang them on the wall and make them serve as living-room decorations by using a wall aquarium which resembles a hanging picture. The aquarium has a flat back and sloping

front and sides, all of glass, with metal binding edges. On the back is pasted a water or submarine scene, and sand is placed in the bottom, blending into the background to give an effect of depth. A siphon is used in changing the water.

e 565
VENTILATOR FOR THE KITCHEN FITS IN STOVEPIPE

Heat and cooking odors are removed from the kitchen by a ventilator unit that fits into the stovepipe. The unit replaces a twenty-four-inch length of pipe in the ordinary arrangement for carrying away fumes. A two-blade fan, driven by a squirrel-cage electric motor, will clear the kitchen of odor-



laden air in about one minute, as compared to the natural draft which requires from thirty minutes to two hours. The ventilator also is supplied in special units for electric-stove or other installations. It makes a stove hood more efficient. The unit is constructed with a permanent opening between oven and the chimney flue. Three hours' use costs about one-third of a cent.

*Barrett Regulation Engineers
 C. W. Cleveland, Seattle, W. A.*

e 549 *Reynold B Johnson*
 335 *Marquette St*
 POPULAR MECHANICS
diamond
Much



Showing How Machine Grades Student's Test Paper; Light Flashes if Answer Is Right

ROBOT MARKS PUPILS' PAPERS IN SCHOOL TESTS

Test papers in the school can be graded by a robot that works by electricity. Tests are of the multiple-choice type, that is, several answers are given from which the student selects the one he thinks is correct. A test paper and a special perforated slip numbered exactly like the test paper are given to the student. If he decides that answer No. 3 is correct for question No. 1, he punches out perforation No. 3 on the special slip. The other questions are handled in like manner. When the test is completed, the slip is placed in the robot, and a light glows after each correctly answered question when a button is pressed. The total score or grade shows on a dial, and wrong answers are indicated by the absence of lights. Slips are checked at a rate of ten per minute.

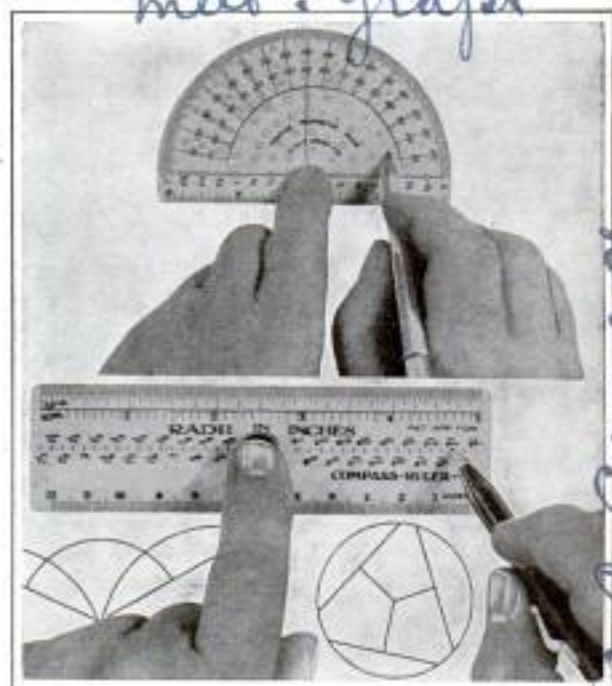
COLDEST COLD EVER PRODUCED STILL HAS A LITTLE HEAT

Not yet has science been able to produce a temperature that has absolutely no heat. The coldest cold, attained recently by experimenters at the University of California, is 459.1 degrees below zero, Fahrenheit. This temperature is within .25 degree centigrade of the absolute absence of heat, or absolute zero. The experimenters are continuing their work in

the hope of producing an even lower temperature. Attainment of absolute zero is believed essential to the solution of many scientific problems. One theory is that the practical absence of heat is necessary to the creation of a perfect vacuum. Another is that new low temperatures will aid in the manufacture of supersteel. The substance used in reaching 459.1 degrees below zero was a compound of gadolinium, a metallic element.

e 567
COMPASS WITHOUT A NEEDLE IS PROTRACTOR AND RULER

Needle holes and slipping and tearing of paper are eliminated by using a compass without a needle which is also a protractor and four-inch rule. The point of a central indicator takes the place of a needle, and when used as a protractor, this point is placed at the vertex of the angle and the degrees are read off in the usual manner. The rule combines with the other features to make a complete instrument for measuring and making drawings. The device is safe and convenient to carry, as it consists only of a printed celluloid and the central metal part, and any kind of a pencil, or even a fountain pen can be used with it. A compass-ruler has been made to meet the need of those who do not employ a protractor. It has a five-inch ruler



Above, Compass, Protractor and Ruler in One Unit; Below, Compass-Ruler without Protractor

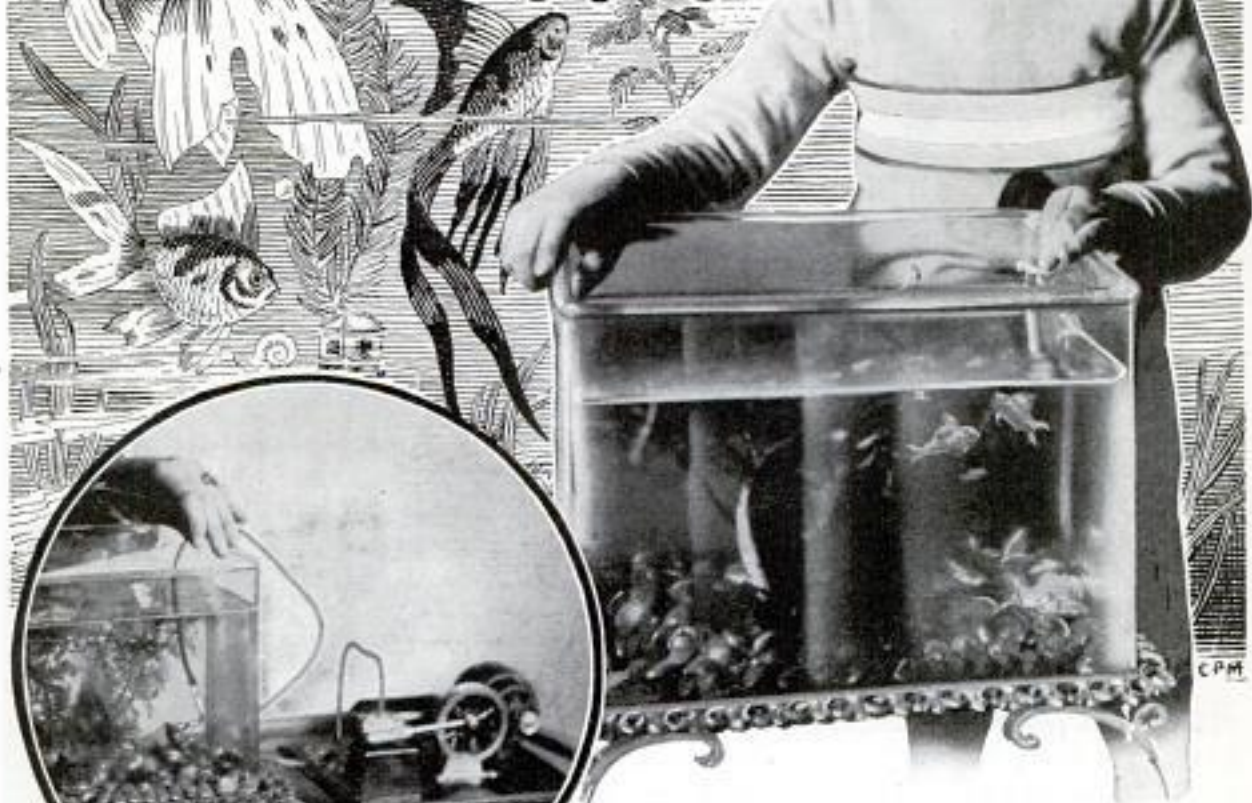
C. F. Nelson and
W. P. Mudgett
 e 586

Prof. W. P. Mudgett
and

B. C. Carter
W. J. Mielie
West Summerland

c473 Eugenie Isrouf, Vaughn's
Seed Store,
10 W Randolph
Chicago

KEEPING YOUR GOLDFISH Happy



Top, Keeping an Eye on His Finny Pets; Left, Small Pump for Forcing Air into Aquarium

DON'T kill your goldfish with kindness. Many homes have little Jacks and Jills swimming about in some kind of a bowl, but few people realize that keeping their finny pets healthy and happy is largely a matter of don'ts.

For instance, don't overfeed them, don't handle them too much, don't treat them for one disease when something else may be the matter, don't cramp their style by cramming them into a bowl too small—in fact, you don't even need to change the water if you keep it well mixed with air.

Ordinarily a goldfish is subject to only three or four ailments, and he almost

talks out loud about his illness. If his back fin droops, that's his SOS that his stomach aches or that living with that other fish has given him a pain in the neck.

When that fin is lowered to half mast, drop Jack or Jill into another bowl filled with a salt solution. If you live on the coast, just dip the "medicine" right out of the ocean, using one part sea water to five parts of fresh water. Leave the fish in his bath for several hours and soon you'll notice that he's as chipper as ever.

If you live inland, you may use a salt solution, too. But don't grab the shaker and sprinkle table salt on the fish's tail. There are some chemicals in it that may be worse for the fish than the disease. Obtain pure salt, putting a tablespoonful in a gallon of fresh water.



Even a poor fish is entitled to enough room for comfortable movement. If you have four or five fish about two and one-half inches long, you'll need a four-gallon aquarium. That gives them space for playing games or setting up house-keeping, and it also is large enough for plant life. This tank is twelve inches long, nine inches wide and nine deep, if it is the rectangular type.

Place the aquarium so that the

One Step in the Correct Method of Feeding Goldfish; Only as Much of This Granular Food Is Poured in as Fish Will Eat in a Few Minutes; This Keeps Aquarium Clean

If one of your pets swims frantically about, or if he appears to be scratching his back against the sides of the bowl, he's telling you that something must be done about those parasites at the edge of his scales. These pests can be picked off with tweezers. If this leaves a raw spot, paint it with balsam, using a small, soft brush.

You may notice in the spring or fall that Jill is growing a sort of white cape. Actually, this is a fungus or mold that starts on the scales and spreads into the gills. If you don't give her an ammonium salt bath, she will choke to death.

Perhaps the most serious malady that your pets may get is bladder trouble. Swimming lop-sided is the signal for this ailment, which should be treated by placing the fish in shallow water with plant life and feeding it cut angle-worms. There is no sure cure, according to Eugene Grouf, who looks after the happiness of goldfish in a Chicago store of the Vaughan Seed company.

plant life will get two or three hours of sunlight each day. Ultraviolet lamps will produce the same effect.

Avoid sudden changes in temperature of the aquarium water. Sixty degrees is about right. A floating thermometer eliminates guesswork, although you usually can tell by dipping your hand into the bowl.

Pour in only as much food as your fish can consume in five or six minutes each day. Plenty of artificial foods are available, but many dealers recommend granular types. Water fleas, cut angle-worms and bits of raw beef are great delicacies. But feed only as much as the fish can eat each day, because it decays.

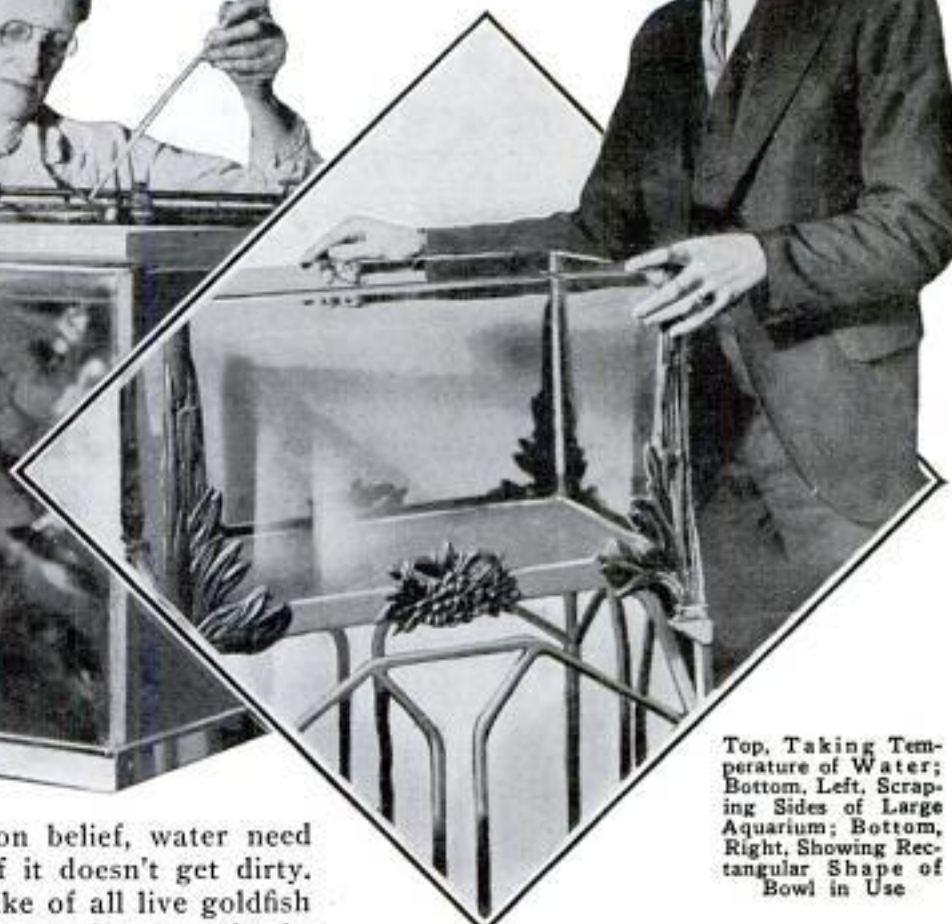


buy from 10 W Randolph Chicago



Then there are water plants, called by such names as cabomba, anacharis and myriophyllum, that your fish will eat.

There is one job that you may find monotonous. That is changing water. Con-



Top, Taking Temperature of Water; Bottom, Left, Scraping Sides of Large Aquarium; Bottom, Right, Showing Rectangular Shape of Bowl in Use

trary to the common belief, water need never be changed if it doesn't get dirty. But—and for the sake of all live goldfish—be sure the water contains enough air.

This can be done by dipping up the water and pouring it back into the bowl. However, the water should be changed more often in this case. Sufficient plant life in the aquarium will relieve you of some of the work for it helps aerate the water. The most efficient method is that in which a small electric pump forces air into the bowl.

If chlorine is used to kill bacteria in your city's water supply, let the water stand from one to three days, giving time for the escape of fumes that are harmful to goldfish.

Whether you own the common, hardy variety or the delicate telescopes, lion-heads and orandas, their care might be summed up like this: "don't overdo it."

*J. W. McIntosh
Eastern Kentucky
Univ. L & N*

Wisconsin General Hospital Medical School, University of Wisconsin



Simplified Method for Administering Oxygen Eliminates Costly Equipment and Discomfort to Patient

TUBE TO ADMINISTER OXYGEN BY INEXPENSIVE METHOD

Use of a small rubber tube for administering oxygen to patients may replace more expensive and complicated methods. A simplified treatment has been developed by the staff of the University of Wisconsin hospital. It consists of the rubber tube, which is lubricated and passed gently through one side of the nose until the tip lies along the back wall of the throat. Thus, oxygen is conducted to the region of the opening in the windpipe. The tube is held in place by narrow strips of adhesive tape attached to the patient's lip and cheek so that no movement and tickling of the throat can occur. The percentage of oxygen inhaled depends on the care with which the tube has been placed and on the rate of flow of oxygen from the cylinder to which the tube is connected. A humidifier and meter for registering the oxygen flow also are used. It is claimed that unusually high concentrations of oxygen can be administered by this method. When an oxygen tent is used, the upper part of the patient's body and head are inclosed, but part of the oxygen concentration is lost each time the flaps are raised to permit nursing care. An oxygen chamber incloses the patient, bed and nurse in a gas-tight arrangement.

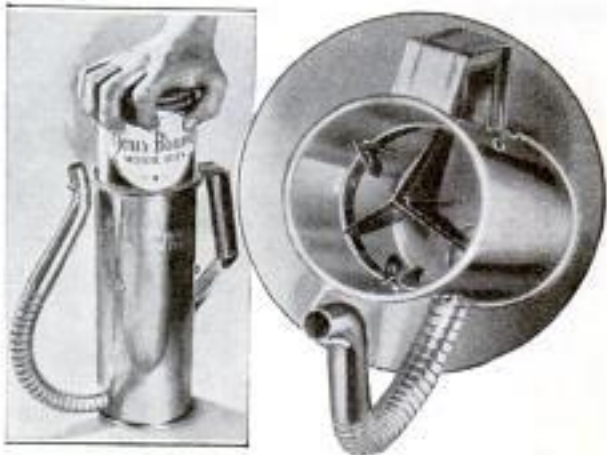
CRAWFISH AND CAT SAVE TIME ON RAILROAD PROBLEMS

When the foundation of a set of railroad track scales became filled with water recently, the bridge-and-building foreman found that the drain pipe leading from the bottom of the scale pit had become packed with mud. Faced with the problem of how to clean out the pipe without digging it up, the foreman placed a large crawfish in the pipe and sealed one end. On his next inspection, he found that the crawfish had dug its way through the mud and out the other end, leaving an opening all the way. The job was completed by flushing the pipe with a water hose. On another occasion, the foreman was confronted with the problem of reinforcing a broken stone culvert under a high railroad fill with a twelve-inch pipe. While trying to devise a way to get the pipe through the culvert, he noticed a friendly cat. Tying a fishing line to the cat's tail, he pushed the animal into the culvert. As the cat dashed from the other end, it was relieved of the fishing line, which then was used to pull a rope through the culvert. By means of the rope, the pipe was dragged into place.

C 522

OIL DISPENSER SLASHES CANS AND STOPS SUBSTITUTION

To stop the practice of unscrupulous dealers who substitute inferior grades of motor oil for quality products, some refiners have placed their product in sealed



Dispenser with Knives Inside for Opening and Mutilating a Sealed Can of Motor Oil

containers. Now a companion dispenser for the sealed container is being brought

*American Can Co.
New York Central Bldg.
New York City*

Factory man of fine Miles Caley

out. From the outside, the dispenser looks like the usual measure with its gooseneck spout. Inside, however, there is an arrangement of knives and blades. When the sealed can of oil is pressed into the dispenser, the blades rip open the can and drain it, at the same time mutilating the can so that it cannot be used again. The oil drops to a chamber below the knives and is poured into the breather pipe in the customary way.



Wilkes

Passenger Bus in Two Sections; Circle Shows How Easily Vehicle Is Maneuvered around Corner

so that it can be turned at an angle of forty-five degrees, facilitating operation of the vehicle around corners and curves. Should the engine fail, its section can be uncoupled and another attached to the trailer, which has accommodation for fifty-five passengers.

CLAY TILES EASILY INSTALLED BY LOCKING ON WALL

Anyone can install a new-type clay tile without previous experience by using the manufacturer's method. In a new house, special setting sheets are nailed directly to the studs or furring strips. The tiles lock onto the setting sheets, the joints are filled and the job is done. In modernizing an old house, the sheets are applied right over the old wall and the tiles are set into place.

Kraftile



The body of the tile is molded wet from high-temperature fire clay. Excess moisture is dried out and the glaze is applied, combining the tile and the glaze to obtain extraordinary resistance to cracking, crazing and lifting.

e 340

DETACHABLE ENGINE FOR BUS IS MOUNTED ON WHEELS

Mounted on its own set of wheels, a detachable engine for motor coaches has been developed in Europe. The arrangement is similar to a motor car pulling a trailer, the engine serving as car and the passenger compartment as the trailer. The driver sits in the detachable-engine compartment, which is just like the front of the ordinary bus or coach. The difference is that the section containing the engine is coupled to the passenger section

PLANT LABELS MADE OF METAL MARK GARDEN ROWS

Permanent labels for rows of vegetables or flowers in the garden are available. The stake and frame are made of aluminum, while the writing surface is soft copper. This copper pad will retain indentations made by a pencil in writing. In addition, a celluloid slip behind the copper pad is provided for keeping an abbreviated record of work in the garden. The labels are made in two styles, one as a stake to push into the ground and the other as a frame to wire on shrubbery.



100 or more for 60c each less than 100, 60c

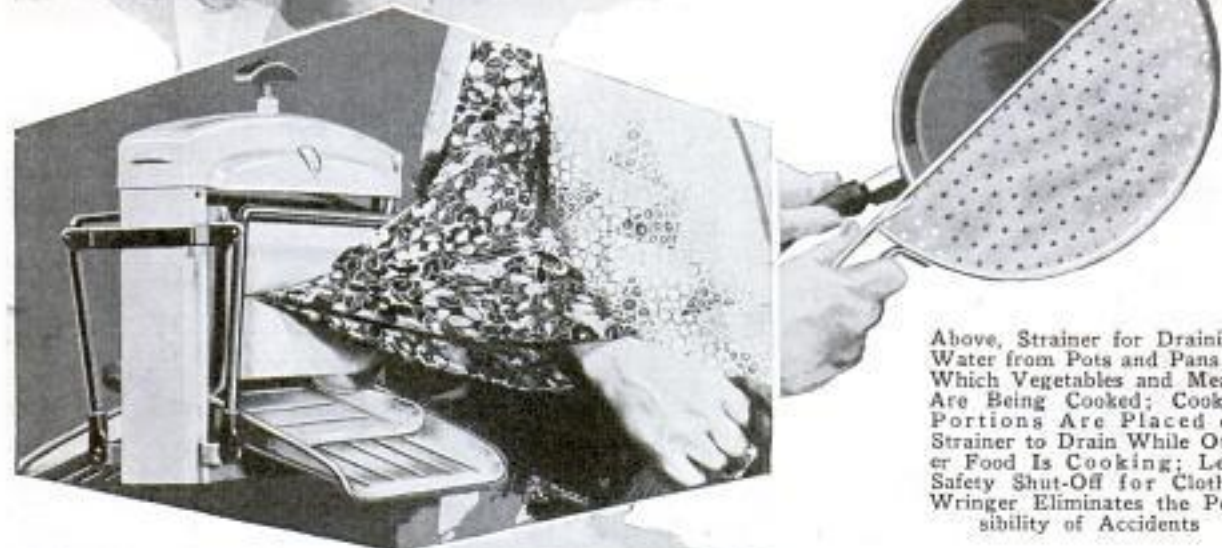
Beers Floating Pullman

John A. Cheape
Copyrighted material
Charlottesville, Va.

New CONVENIENCES



Left, Clothes-Basket Carrier Suspended on Rollers from a Wire; the Carrier Is Pushed Along as the Clothesline Is Filled; Right, Glass Teakettle That Serves as a Teapot; Tea Bag Is Placed Inside Lid with Its String Holding It Out of Water; When Kettle Boils, Tea Bag Is Released into Water



Above, Strainer for Draining Water from Pots and Pans in Which Vegetables and Meats Are Being Cooked; Cooked Portions Are Placed on Strainer to Drain While Other Food Is Cooking; Left, Safety Shut-Off for Clothes Wringer Eliminates the Possibility of Accidents

Right, Metal Turntable for the Refrigerator Supports Six Triangular Glass Food Containers; the Arrangement Eliminates Moving Several Other Dishes to Reach One in the Rear of the Compartment; Nesting the Containers Saves Twenty-Percent Storage Space; Food Is Kept Fresh Longer by Means of Covers for the Glass Jars



for YOUR HOME



Top, Breaker for Chipping Ice Cubes by Turning the Handle and, Below, De Luxe Freezer Designed for Quick Freezing with Chipped Ice from the Breaker



Right, Attachment That Takes the Work Out of Roasting Coffee for Breakfast; as Shown, the Roaster Is Used in Connection with an Electric Motor; the Attachment Fits on the Inverted Motor; Coffee Is Prepared by Pouring It into the Container, Which Is Heated by Electricity through a Separate Outlet Plug and Cord



Above, Steel Trays for Freezing Ice Cubes in Individual Rows; Top Photo Shows the Section Removed from Freezing Compartment; Bottom, Breaking Loose the Cubes Easily by Quickly Bending the Section; the Trays Are Stainless Steel, All One Piece, Folded Like an Accordion



Above, Uses to Which New Kitchen Shears Can Be Put; Top, Serrated Blade Prevents Vegetables from Slipping While Being Cut; Center, Unscrewing Cap from Bottle; Bottom, Opening Bottle by Means of Projecting Nib on Handle

C286

Cmt. Kenneth P. Wood
110 N. 49th St
Phila

96

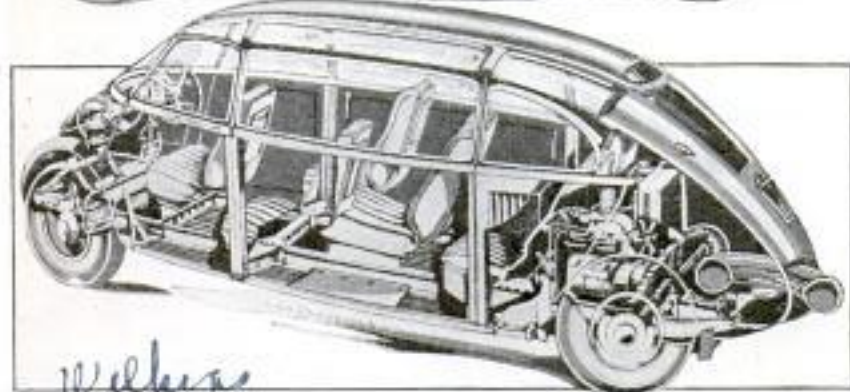
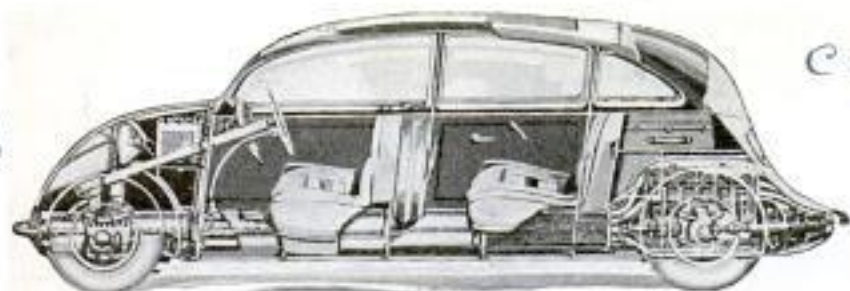
POPULAR MECHANICS

Phila

TAILS GRAFTED ON
GOLDFISH

C626

Bush-tailed Japanese goldfish, with their four or more long, waving tails, are produced by a grafting process. When the fish are very small, their flesh is transparent so every bone can be seen. At this stage the few born with two or more tails are separated from the rest. Then a man with a magnifying glass fastened in front of his eye and several miniature tools reaches under the water and snips off the tails of the plain little fish. He then joins three or four tails to the backbone where one was



Top, Streamlined Car with Spare-Tire Compartment Back of Front Seat; Below, Spare Tire Fits in Tail of This Car with Staggered Seats

SPACE FOUND FOR SPARE TIRES
IN STREAMLINED AUTOS

When automobile manufacturers began streamlining the rear of cars, they were confronted with the problem of finding space for spare wheels and tires. One Italian designer solved the difficulty by housing the spare behind the front seat in a compartment for that purpose. In a second type, containing six seats, part of them staggered, the spare wheel is placed at the back of the rear axle.

before and fastens them with tiny bandages. That the practice pays is proved by the high prices paid for fish of this kind, some of them bringing from \$300 to \$1,000.

C563

REMOVABLE SECTION OF PLANE
IS PACKAGE COMPARTMENT

Usually the compartment formed by the fuselage behind the pilot is inaccessible, but one type of monoplane utilizes this



Monoplane with Removable Cover Back of Cockpit, Thus Providing a Space for Baggage

YOU WOULD BE HEAVIER ON SUN
THAN ON THE EARTH

C625

If you weigh 140 pounds, you would be a giant on the sun. According to scientific computations, your weight there would correspond to 3,871 earth-pounds and you probably would have difficulty raising one of your 300-pound hands. On the other hand, you would weigh only twenty-three pounds on the moon and but fifty-three on Mars. The force of gravity is so much less on Mars than on the earth that a 140-pound man would be quite nimble there. If he retained his same strength after reaching Mars, this man would be able to run with the speed of an average express train, to skip over ten-foot walls and to do other extraordinary things.

Cmt. Kenneth P. Wood
110 N. 49th St
Phila

General Western
Aero Corp. General Western
Airport, Wichita Kansas

Barbara Caly

Count Mario Revelli di Beaumont

U.S. Times 4/11/33 C 578 Ernest Loynes
Waldmoor, near

C 575

STARCH SPEEDS UP MUSCLES FOR SPLIT-SECOND ACTION

That extra supply of energy for split-second action comes from a quick chemical breakdown of so-called animal starch in the human muscles. Dr. Jacob Sacks of the University of Michigan, compares this fast breakdown with the "choking" of an automobile to give it that quick response before the vacuum tank and carburetor buckle down to their jobs. Normally the muscles do their work by burning lactic acid with the oxygen in the blood stream. But when quick action is necessary, requiring energy faster than oxygen can be carried to the muscle tissues, glycogen, or animal starch, stored in the muscles, undergoes two rapid chemical breakdowns. Both produce energy for short but violent exertion, says Doctor Sacks. If the extra stress keeps up, the heart has time to increase its rate of beating and to pump more oxygen-charged blood to the muscles so they can keep on with the work imposed on them.

any Arbor, near Worcester, England



© General Picture News
Worker Is Shown Rounding Petals of Wrought-Iron Roses to Make Them More Lifelike

Weds. Wall

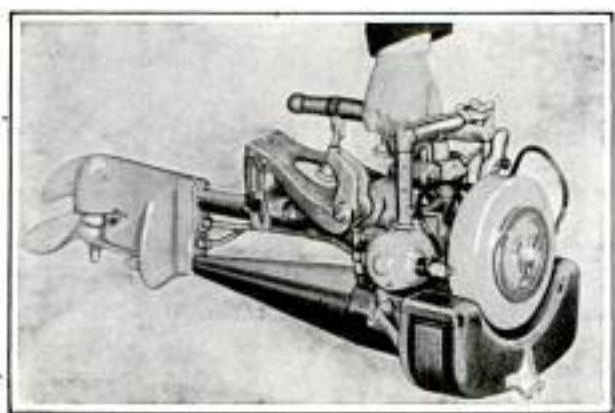
ROSES MADE OF WROUGHT IRON ON BLACKSMITH'S FORGE

Wrought-iron replicas of roses are fashioned in an English blacksmith shop. The art has been handed down from father to son for five generations. Products of the family's shop have become famous in many countries.

HANDLE FOR OUTBOARD MOTOR MAKES IT EASY TO CARRY

Portaging from one stream to another on an outboard motorboat trip is simplified if the motor is fitted with a handle. One company is making a motor in which the handle used for steering can also be employed for carrying when the power unit is to be taken overland. To convert the handle for carrying purposes, it is folded inward against the motor and locked by a catch. It is so placed that the weight is distributed evenly, permitting it to be handled easily.

C 487



Outboard Motor with a Handle for Easy Carrying; the Same Handle Is Used for Steering

Johnson Motor Co
Waukegan, Ill.

"CAT'S WHISKERS" ON DIRIGIBLE KEEP TAB ON WINDS

Tiny wires outside the control car of the dirigible, U. S. S. "Macon," tell which way and how hard the wind is blowing in the manner of the sensitive whiskers of the cat. Connected to an instrument called the hot-wire anemometer is a tiny tungsten wire, such as is used in an electric-light bulb, one one-thousandth of an inch in diameter, through which electric current passes. The current also has an alternative route through a galvanometer. A strong wind will cool the wire more than a light breeze, and as resistance is decreased by cooling of the tiny "whisker," a lesser proportion of current passes through the galvanometer, where it is measured. A second circuit detects changes in the yaw and pitch of the wind, that is, in horizontal and vertical fluctuations. Conceivably, the instrument might be used to permit the wheelsman to trim his course.

C 601

by J. W. Knobelack

Perfected at suggestion of
Research Institute
atmos. also

C152 Lincoln Savings Bank
Brooklyn, N.Y.

Lawrence D. Batson
Electrical Equip. Division
Dept. of Commerce

e583

WIRED RADIO SYSTEM EXPANDS
IN EUROPEAN COUNTRIES

"Wired radio," a system of broadcast reception requiring direct transmission of programs by wire from a central receiver into the homes of subscribers, is expanding rapidly in several European countries. Sometimes the service is supplied over the regular telephone wires, but in such a manner as to permit the usual telephone service. The subscriber is furnished a loud speaker of special design which is plugged into an outlet provided for that purpose. Most systems provide two or more programs by duplicating the wiring outlets. The broadcast programs are received at the central receiving station and transmitted by wire into the subscriber's loud speaker. Growth of the system in Europe is said to be due to local conditions resulting from channel congestion. In the distribution of radio channels, some nations are allotted only a few, in some cases no more than two. This restricts the number of stations which may be operated simultaneously in that country.



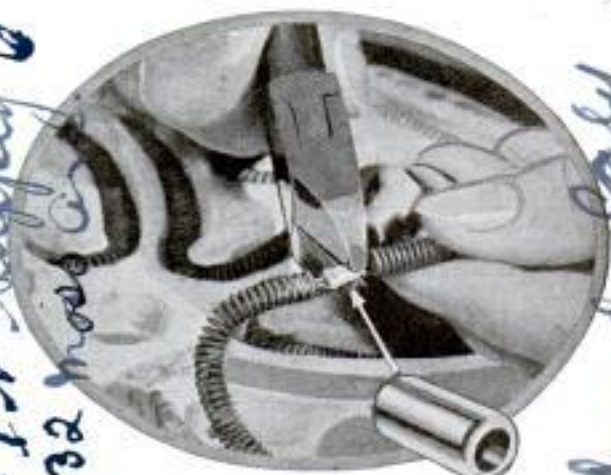
Making a Deposit in an Automatic Bank Depository Which Issues a Receipt to the Customer

COIN-IN-SLOT BANK DEPOSITORY
GIVES RECEIPT FOR MONEY

To encourage the deposits of those who cannot visit the institution during regular business hours, a Brooklyn bank has installed a day-and-night depository intended both for the making of deposits and the withdrawal of money. The latter is in the form of a request which is filled by the bank sending the money through the mails. In either case, the depository automatically furnishes a receipt. It resembles a mail box with a door at the top for the insertion of the pass book and the deposit sealed in an envelope, or for the insertion of a request for the withdrawal of funds. It is operated by inserting a nickel which opens the door and which is credited to the account of the depositor. An interior mechanism records the time of the transaction on both the envelope and a receipt which is issued to the customer through a slot at the bottom. The envelopes drop into a safe which is opened by officers of the bank at regular intervals.

SLEEVE FOR HEATING ELEMENT
REPAIRS BROKEN ENDS

Permanent repairs can be made on burned-out sections of elements in electrical appliances by slipping a metal sleeve over the broken ends and crimping the sleeve. It can be attached in less than one



Connecting Broken Ends of Heating Element; Lower Right, Metal Sleeve for the Job

Names and addresses of manufacturers and dealers in articles described, and any details in our possession, will be furnished by our Bureau of Information upon request accompanied by return postage.

minute. Only a pair of pliers is necessary. The repair is said to restore the element to full efficiency.

Safe Co. Hamilton

Master

mend. T. A. Supply Co. 32 Nassau St.

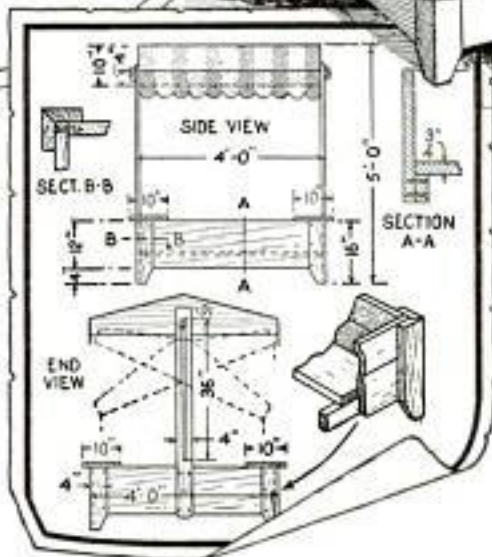
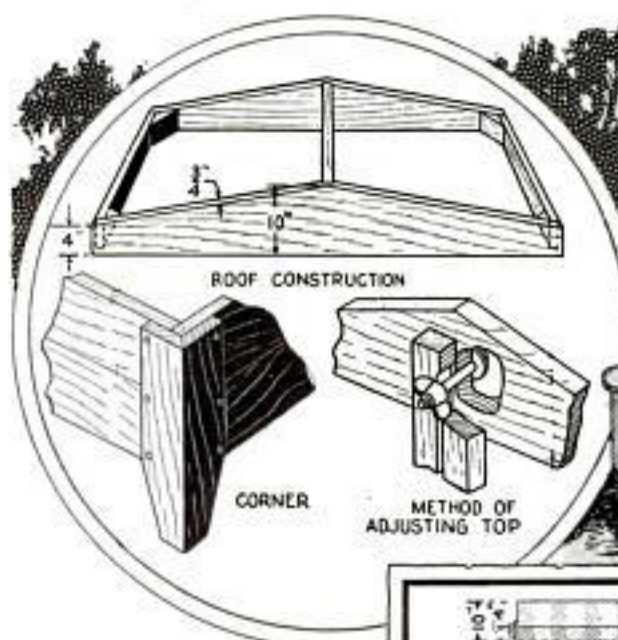
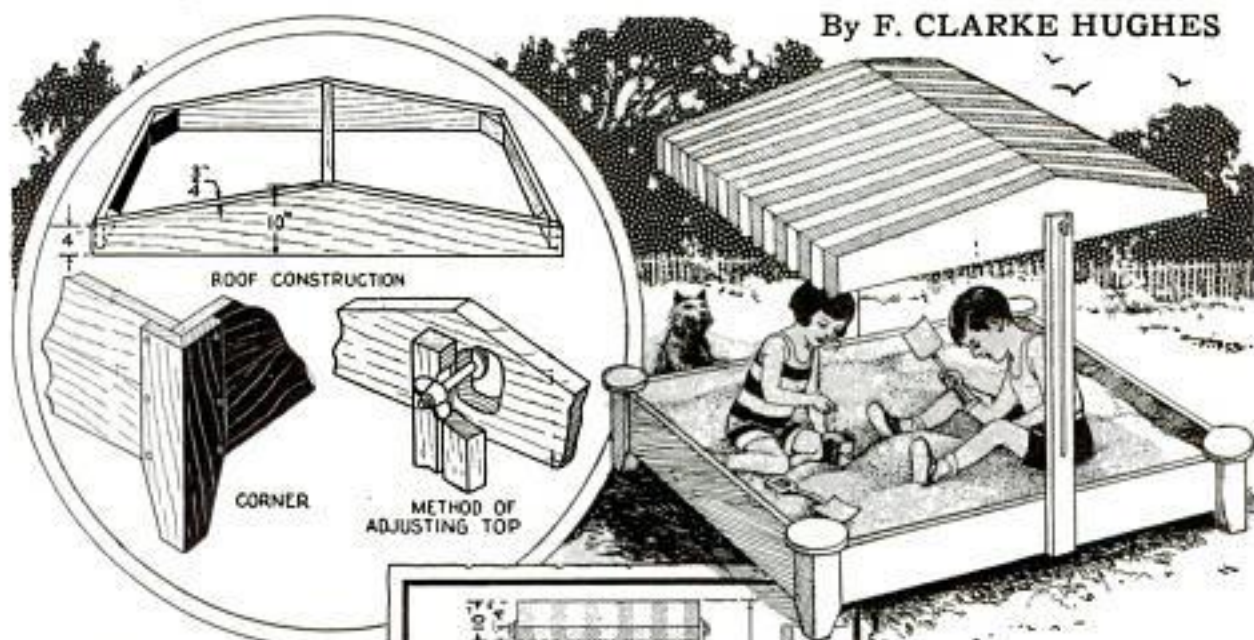
Ala. Stand, Caly

mend T. A. Supply Co. 32 Nassau St.



Portable, Shaded SAND BOX and WADING POOL

By F. CLARKE HUGHES

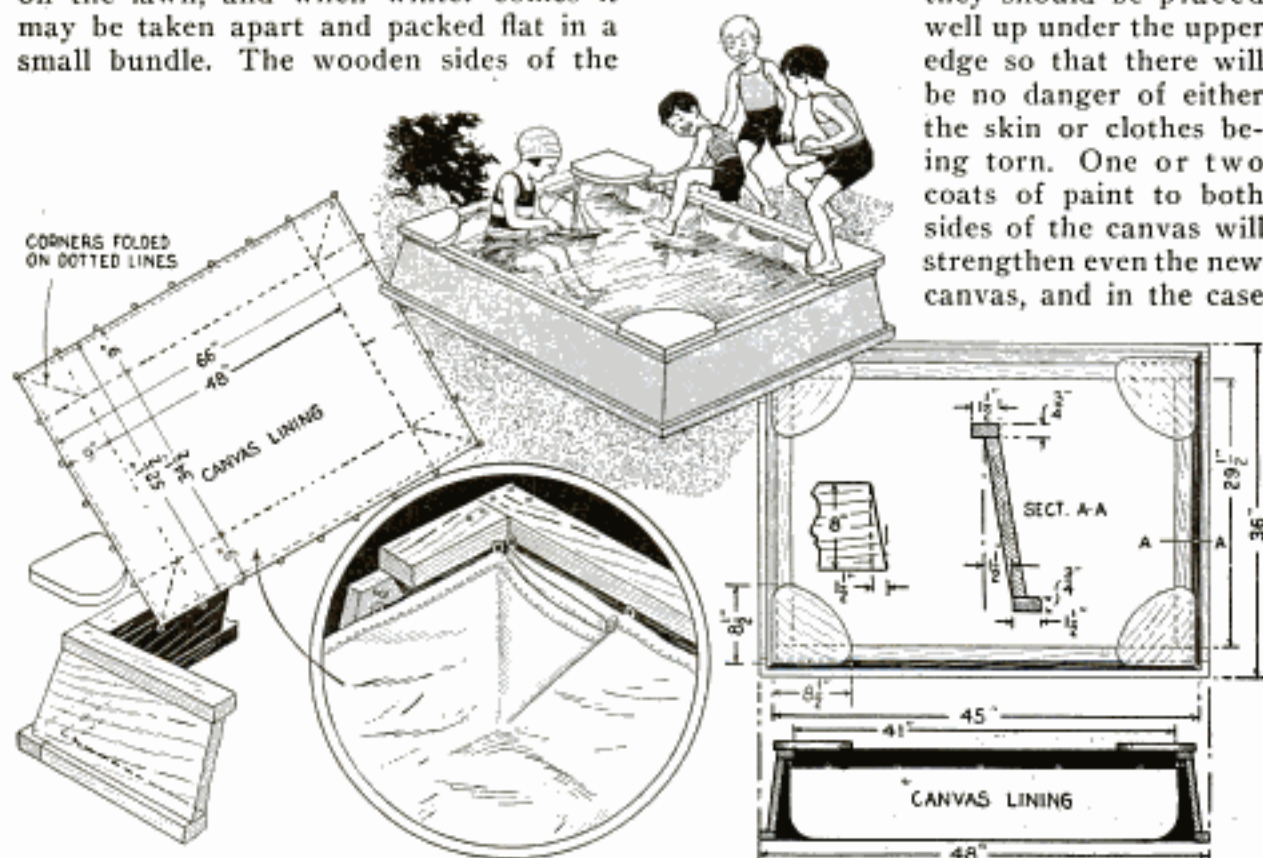


UNLESS the children's sand pile is protected in some way to confine the sand, much of it is soon wasted by being scattered over the surrounding ground. A sand box like the one shown in the accompanying drawings is not difficult to make, and the cost is small even for new lumber. The stock used should be pine, cypress or other wood that will withstand the outside weather. The box itself should be constructed first, being especially careful to nail firmly 2-in. cleats under the floor, as on them largely depends the support of the sand, which is quite heavy when damp. The floor should

be of good solid $\frac{3}{4}$ -in. material. The top or canopy gives a very colorful and attractive touch. The two vertical supports are $\frac{3}{4}$ -by-4-in. pieces, 5 ft. long. The slot in the center is made by boring a $\frac{1}{2}$ -in. hole at each end and sawing out the part between them. The uprights should be bolted to the sides of the box with about four $\frac{3}{8}$ -in. stovebolts to each support. Winged nuts at the tops of the supports permit adjustment of the canopy. When complete, the sand box should be given about three coats of good outside paint, preferably a dark green. Be sure to coat the inside and bottom of the box as

a protection against moisture and consequent decay.

There is nothing, perhaps, that small children enjoy more in hot weather than to splash around in a pool. Unlike a concrete pool, this one may be moved about on the lawn, and when winter comes it may be taken apart and packed flat in a small bundle. The wooden sides of the



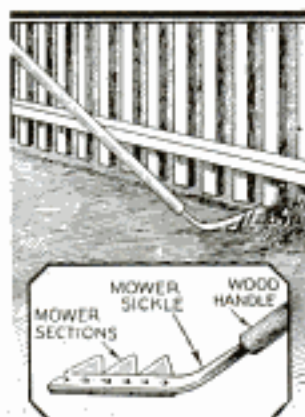
pool may be made of any of the soft woods such as pine or cypress, and are assembled after the box-type of construction, with screws in the corners. The sides should first be cut to the correct length and angle. After the main part of the box has been constructed, the top and bottom strips may be put into place very easily; the regular 1 by 2-in. pine stock known at any lumber-yard under the name of "blind stop" may be used. These strips are cut and fitted into place with square or butt joints instead of mitered corners. Seats over each of the four corners serve to cover the joints. The seats also serve as braces, and when they are in place, the body will be firm and strong even under the weight of the water. For a box of the size shown, a piece of canvas $52\frac{1}{2}$ by 66 in. is needed. Seams or joints will not, as a rule, interfere with the waterproof condition of good canvas if the seams are sewed on a machine. Small rings, spaced

about 6 or 8 in. apart, should be sewed to the edges of the canvas, and they are attached to small screws along the inside upper edge of the sides. Eyelets may be substituted for the rings if desired. Small round-head brass screws are used and they should be placed well up under the upper edge so that there will be no danger of either the skin or clothes being torn. One or two coats of paint to both sides of the canvas will strengthen even the new canvas, and in the case

of the older goods this may be necessary to render it waterproof. The painting may be done by laying the canvas flat on a floor or hanging it against the wall.

Tool for Cutting Weeds under Fences

Made from a piece of an old mower sickle, this tool is useful for cutting weeds under a fence. Three mower sections are



left on one end of the sickle, the other end of which is rounded and inserted into a hole that has been drilled lengthwise in a suitable handle. Another way is to flatten the end of the handle and then bolt the sickle to it.

Thumbtacks Aid in Trimming Panchromatic Films

The following method will be found an aid in trimming panchromatic photo films, which must be handled in darkness or a subdued safe light, where the scale on the trimmer cannot be read. Two thumbtacks are pressed into the board, one being placed on the scale to correspond to the desired width of the film, and the other to mark the length to which the film is to be cut. They should be placed about $\frac{1}{8}$ in. from the edge of the scale. The film is laid against the rule in the usual manner, then moved back against the first tack and the cut is made. The first tack is then removed and the process repeated, using the second tack to get the length. When several films are to be cut, it is necessary, of course, to make the smaller cuts before removing the first tack.

Small Funnel Provides Escape for House Flies

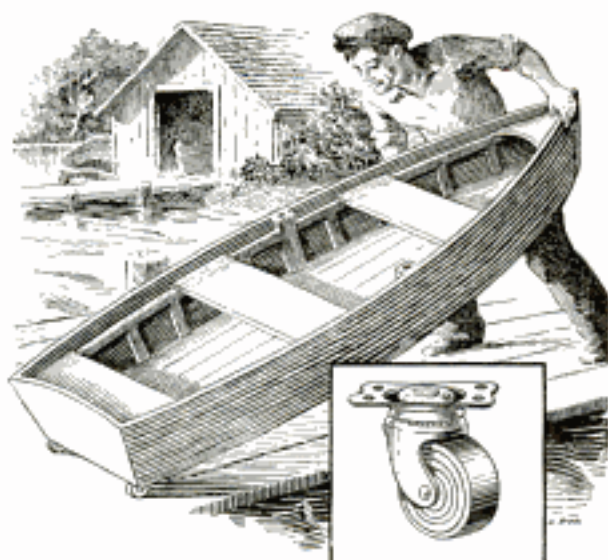
If a small funnel is placed in a hole punched through the top center of the screen, flies inside the house will escape, but those outside are not likely to enter through the small end of the funnel. The wide end

of the funnel should be flush with the screen and it may be held in place with friction tape.

Keeping Stepladder from Tipping When Set on Soft Surface

Legs of a stepladder are usually pointed enough so that the weight of a person often makes them sink into a soft surface and causes the ladder to tip. To eliminate this trouble, I made small wood boxes for the legs to fit into snugly, which provided a larger bearing surface on the soft dirt.—Charles E. Forgette, Plattsburg, N. Y.

☞ Crabs and crawfish kept in pure rain water will live several days without food.



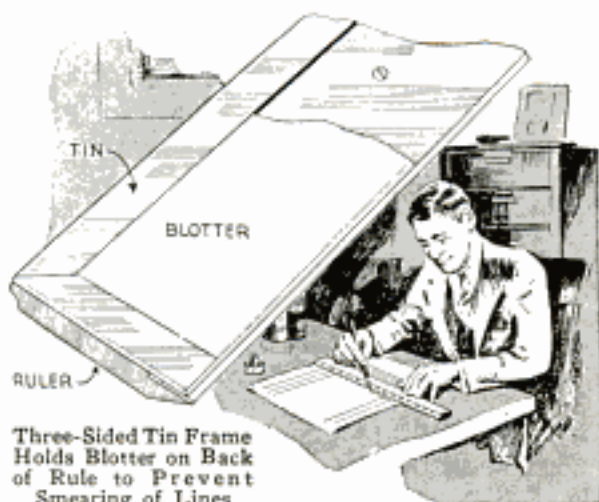
Small Boat Easily Pushed along a Dock on Large Casters Screwed to Bottom of Stern

Casters Save Time in Moving Boat

When a small boat is launched by pushing it down a dock, time and labor can be saved if a couple of large casters are screwed to each bottom corner of the stern end. By raising the bow, the weight will rest upon the casters and the boat can be pushed or pulled along with ease.—G. E. Hendrickson, Argyle, Wis.

Blotter on Rule Prevents Smearing of Inked Lines

To prevent the lines from being smeared when ruling a paper, a blotter can be fastened to the back of a rule as shown. A tin frame, which fits the rule, is tacked to the back to hold the blotter. One side of the frame should be left open so that the blotter can be replaced easily.—A. H. Waychoff, Phoenix, Ariz.



Three-Sided Tin Frame Holds Blotter on Back of Rule to Prevent Smearing of Lines

Mechanical Aids

By LEO FANTZ



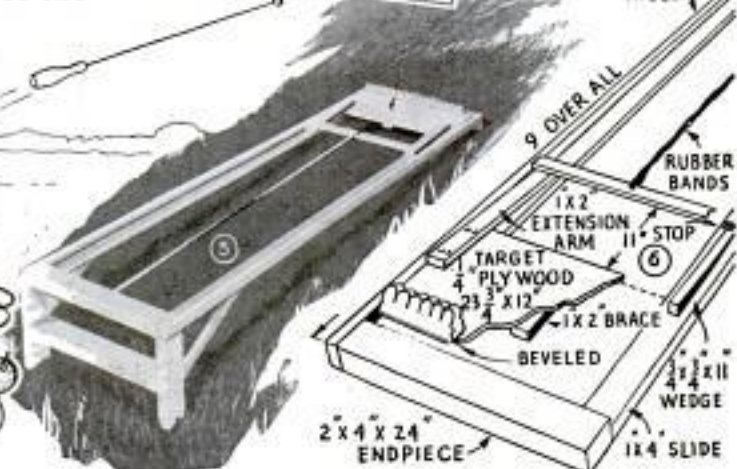
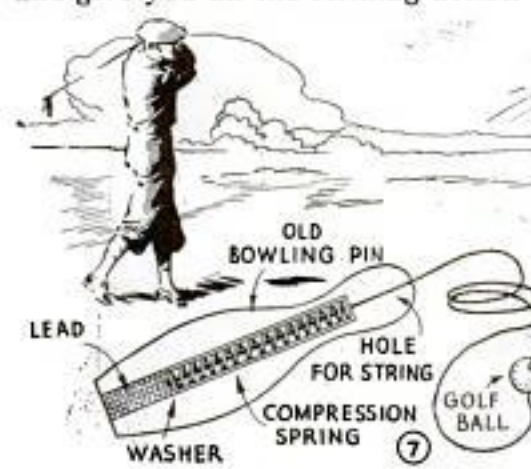
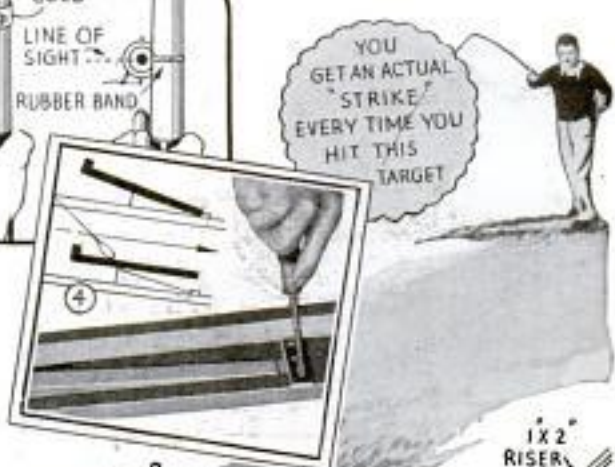
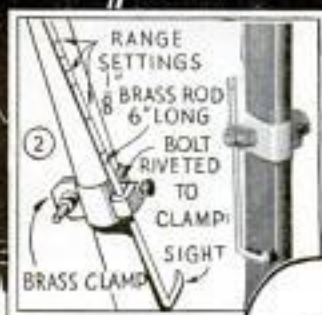
IF you are interested in archery and the arrows are landing blacks and whites, try the simple sighting device shown in Figs. 1, 2 and 3. The round metal rod can readily be slipped up or down to suit. Similar results can be obtained by slipping a rubber band over the bow, as shown.

Fig. 5 shows a practice target for casting. Scoring a perfect hit with a lightly leaded plug will release the plywood table and give you all the striking action of the

fighting bass. When well balanced, the target can be released, reeled in and set without any movement on your part other than reeling in. A quick flip on the line will disengage the plug after the "fish" has been set.

The golf-practicing device shown in Fig. 7 will reduce your driving game to backyard scale, reducing yardage to inches. The unit is easily made from an old bowling pin and a light compression spring.

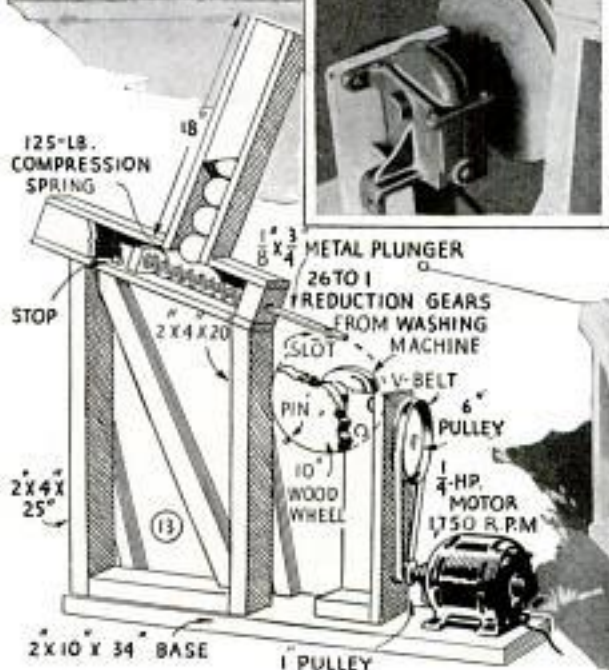
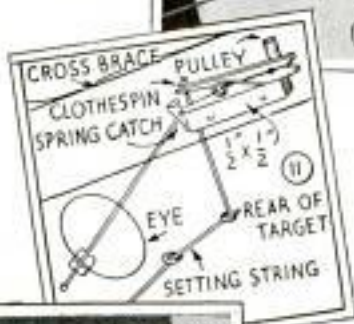
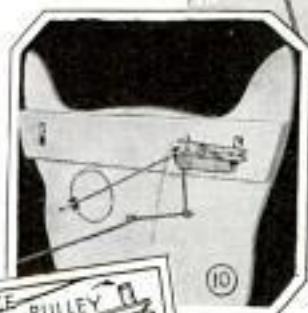
The "Woofies" are made out of plywood to the size shown in Fig. 8 and do their stuff along two light wires running through small pulleys. A third wire or string is connected to the spring catch and also serves to haul the Woofies back into position. Figs. 10 and 11 show the detail. An ordinary spring clothespin is arranged close to



to IMPROVE YOUR GAME ~ ~ ~

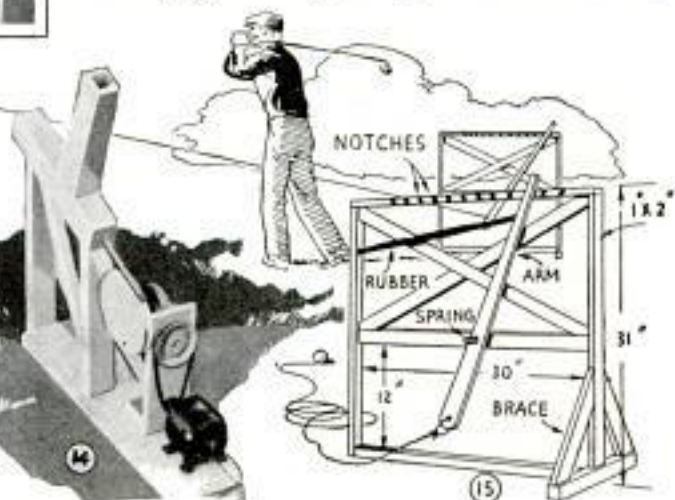
one pulley so that it will grip the wire when closed. When the pin is open, the target will slide freely down the wires and right at you. Bang away with the air rifle, and if you hit him square in one eye, the spring catch will be released and the pin will clamp tightly over the wire. A snap on the setting string resets the target. The same string pulls it back up the wires for another round.

Fig. 13 shows a real practice device for the tennis player. Properly constructed, this projector will put them out with speed which can be controlled by varying the size of the pulley on the initial take-off. The washing-



machine gear is easy to get from the junkyard, and any hardware store can supply you with a spring packing 100 to 125 lb. in a 6-in. travel.

Another one for the golf fan is shown in Fig. 15. This might be called a "golfermeter." A sock on the ball actuates the meter arm, which slips over the notches at the top of the frame. Properly calibrated, you can easily tell whether your driving game is getting better or worse.





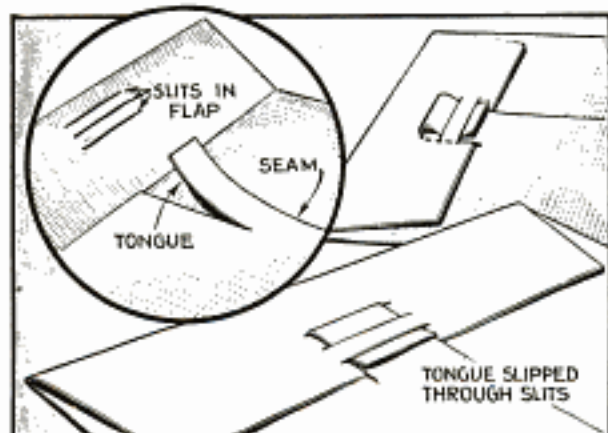
Guides Set along Sides of Hedge Permit the Top to Be Trimmed with Lawnmower

Guides to Hold the Lawnmower While Trimming Hedge

Trimming hedges with a lawnmower is easy when guides of the type shown are used. They are two horses made by nailing 10-ft. boards to endpieces, the length of the latter being determined by the desired height of the hedge and the lower ends being cut to a point. In use, the guides are set along the sides of the hedge, and the pointed ends are driven into the ground to bring the top of the guides level.—Harry Yates, Chicago.

Closing Envelopes Containing Second or Third-Class Mail

When large envelopes are mailed containing matter that goes other than first class so that they cannot be sealed, the flap can be closed by loosening the glued seam on the back of the envelope and in-



Simple Method of Closing Large Envelopes That Contain Mail Subject to Postal Inspection

serting it through three slits cut in the flap as shown. This keeps the envelope closed, yet enables the postal authorities to open it to inspect the contents. This practice has been found satisfactory when heavy, tough envelopes are used but is not recommended for light envelopes made of thin paper that tears easily.

Hints on Dip-Painting Work

If you have been disappointed in dip-painting by having the work dry streaked with runs, or you find dried drops of paint that have not drained off, the following method will aid in curing the trouble: The trick lies in withdrawing the piece from the paint very slowly—not any faster than the flow of the paint, and possibly slower. You will have better success if the paints or enamels used are of the quick-drying type, which, of course, lessens the chance of drops or runs forming after the work has been removed.

A Template for Dovetail Joints

To make sure that your dovetail joints fit correctly, make a template of sheet metal and mark off each dovetail on the work. In using the template, lay it on the work so that the edge just touches the point of the mark previously made, as indicated.—A. H. Waychoff, Phoenix, Ariz.



Stain Blends Sapwood into Heartwood

In order to get an even finish on an object that contains both sapwood and heartwood, one being much darker than the other, it is necessary to blend the two together with stain. To do this, first stain the surface of the sapwood, leaving the heartwood untouched, and allow it to dry. Then sand the stained part lightly with very fine sandpaper, and, after dusting it, go over the entire surface with the stain, applying it generously. By brushing away the excess stain on any part that tends to become too dark, you can produce a nicely blended surface.

Lifelike Decorations Made from Sea Shells



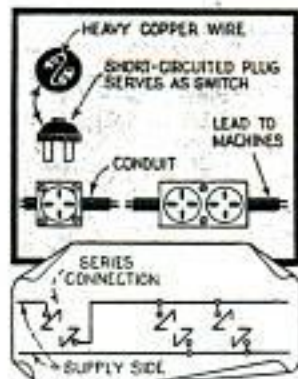
Distinctive Ornamental Articles That Find Ready Sales as Knick-knacks, Are Made Up from Sea Shells and Pipe-Stem Cleaners.

Sea shells can be utilized in making novel souvenirs that can be sold. Various shells of unusual shapes that can be picked up along beaches readily lend themselves in making lifelike imitations of birds, butterflies, turtles and animals, and also serve as decorations on jewel boxes, ash trays, desk sets, etc. The only equipment need-

ed in this work is a little glue, a few pipe-stem cleaners, and an assortment of paints. The cleaners are used as necks and legs, and for tree trunks and shrub branches. Crab feet lend themselves to imitating bird beaks and alligator heads and bodies. Painting your souvenirs in natural colors improves their appearance.

Simple Lock for the Electrical System of Your Shop

You can provide a secret lock for the electric-supply circuit of your shop by connecting a wall socket in the line as you would a switch, and providing a short-circuited plug to bridge the break. The latter is inserted in the line between where it enters the shop and the outlet sockets for the machines. In this way, there is always an



open circuit in the line except when the short-circuited plug is inserted in the socket. The latter, of course, should not be used in other sockets as it will close the circuit and cause the fuses in the line to burn out.—F. E. Gray, Ogden, Utah.

Holes Drilled near Edge of Stock without Splitting

Difficulty often experienced by having thin wood split when drilling holes close to the edge can be eliminated by first drilling a hole the same size as the point of the bit to be used. If the lips of the bit are sharp, you will be able to drill a hole within $\frac{1}{8}$ in. of the edge of thin stock in this way.—Robert Stahler Portsmouth, O.



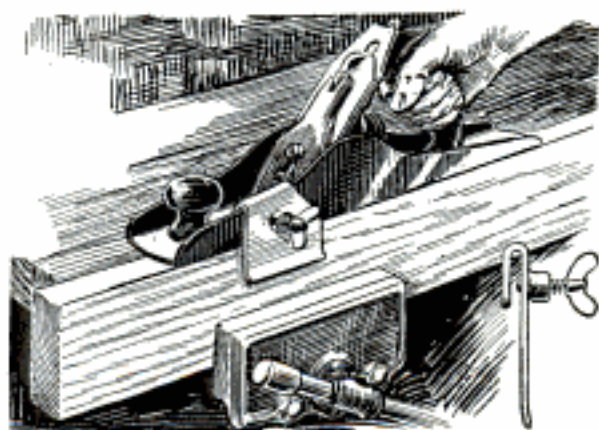
Oil-Soaked Felt in Hollow Part of Antirattler Eliminates Squeaks in Car Door

Preventing Squeaks in Car-Door Antirattlers

Squeaks, caused by friction between the two parts of antirattlers on car doors, can be eliminated in the following way, if the part that is screwed to the door post is hollow: Remove this piece, drill two small holes through both sides of the projection, and pack the hollow part tightly with oil-soaked felt. Then put a piece of friction tape over the back of the piece, to keep the oil from running out, and screw it in position. Vibration of the door causes the oil to seep out of the small holes and lubricate the contacting parts.

Iron Guide for Your Plane

This effective guide for a plane is made from a piece of flat metal such as brass or steel, bent to the shape shown. A thumbscrew is provided for clamping the guide



Flat-Metal Guide on Plane, Provided with Thumbscrew. Helps to Cut Squarely over Narrow Stock

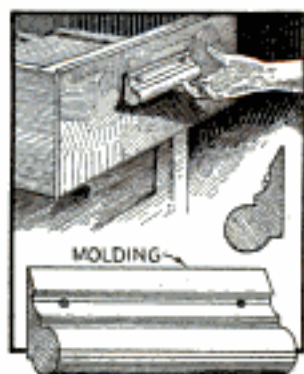
to the plane. It may be necessary to drill and tap a small steel block and solder or weld it to the guide to provide enough threads for the thumbscrew unless stock of sufficient thickness is used to make the guide.—Chas. H. Willey, Penacook, N. H.

Electric Lamp Attracts Insects to Fish Pool

A gulf-coast farmer, who has a private pool stocked with trout, employs an electric lamp to supply thousands of insects for food for the fish. The lamp is hung above the pool and is turned on at night to attract the insects, which fly around it until exhausted, when they fall into the water and are taken by the fish. This method also trains the trout to strike a lure when thrown into the water and enables the farmer to catch a mess of fish in a few minutes.

Drawer Pulls from Molding

Short pieces of picture-frame molding make neat drawer pulls. They can be finished to match the drawers, the edges may be rounded and the screw holes countersunk and the holes filled, for neater appearance.



The molding may be sanded and varnished to blend with the furniture so that it has the appearance of being part of the drawer.—Dick Hutchinson, Ithaca, New York.

Applying Shellac without Smearing Stain on Surface

When brushing shellac or varnish over a stained finish, the stain is sometimes softened and smeared by the brush, especially if more than one stroke is made over the same surface. If the shellac is sprayed on with an inexpensive atomizer, this trouble will be eliminated. After the shellac has dried for a few hours, it should be rubbed lightly with curled hair or very fine sandpaper to remove the grain before applying the finishing coats.

Sovereign of the Seas



by
H.T. Bodkin

PART IX—Running Rigging and Final Details

ONLY the running rigging and a few other details now remain before our gallant "Sovereign" will be completed. To vary the work, it is better to take up the construction of some fittings and thus gain a breathing spell between the standing and running rigging jobs.

Fourteen yards are required, made as specified in the yard chart at the end of the article. The chart also enumerates the number and kinds of blocks and rigging lines required for attaching each of the yards to its respective mast. The yards are all natural wood color and are fin-

ished exactly the same as were the masts.

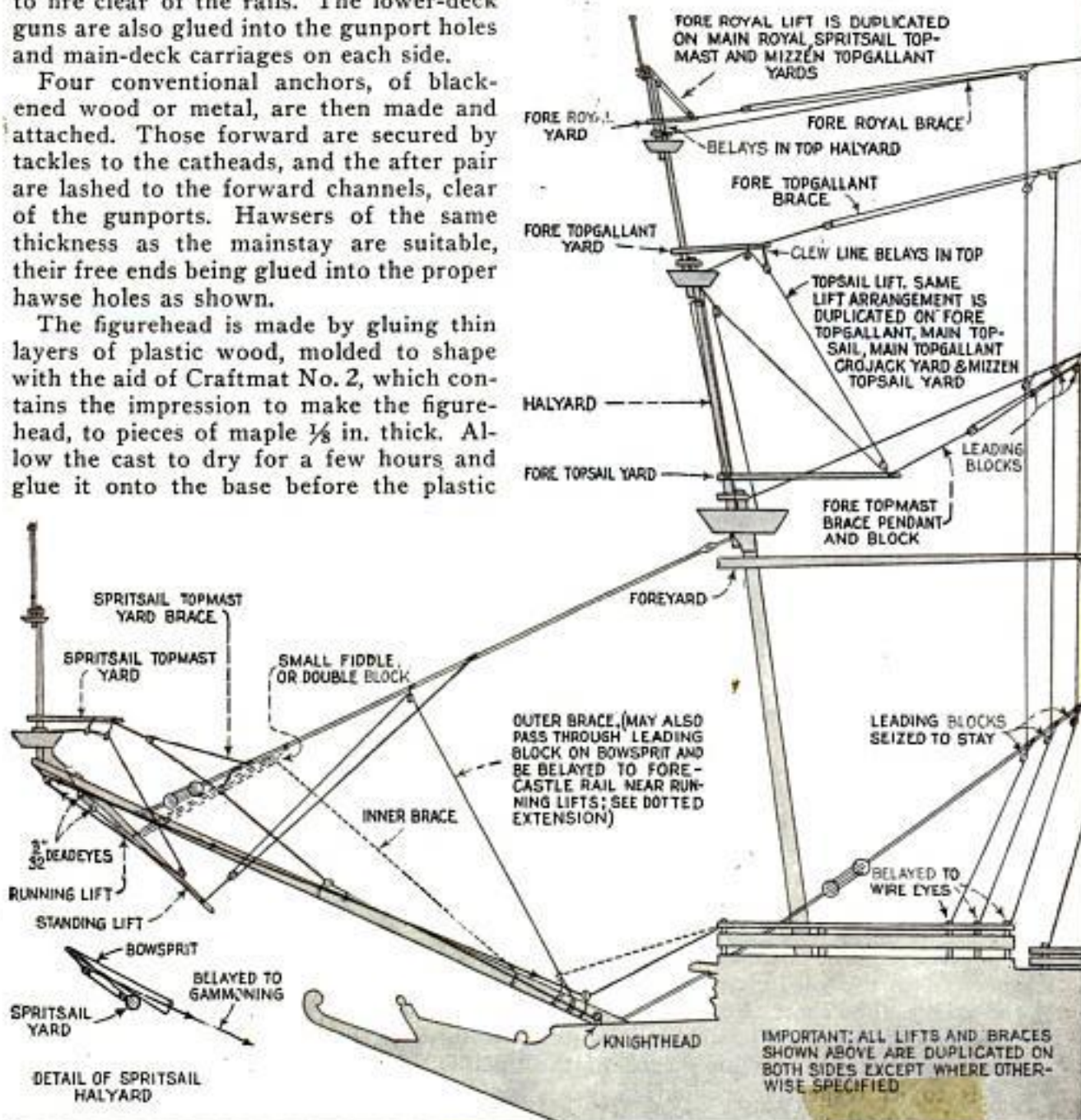
Next, the guns and carriages are made. The sixteen deck gun carriages are made the same as those for the main-deck guns under the spar deck except that a channel, instead of a hole, is cut into the tops of each, in which the gun will rest. Color the carriages dull black as before, and glue and pin in place in alinement with the deck ports. Sixteen deck guns and seventy-four lower-deck guns are then turned in a lathe. In addition, ten bulkhead guns are also turned. These are the same as the deck guns except that the inboard ends

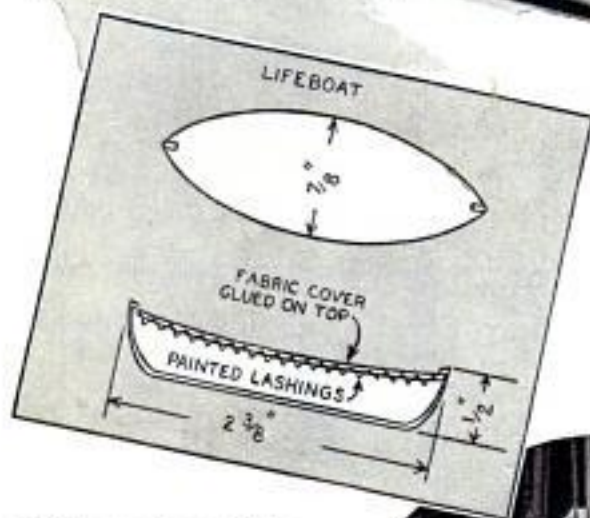
are cut like the lower-deck guns so that they may be inserted into the holes made for them in the bulkheads. If the guns are made of wood, gild them with antique gold to represent brass. Then dry-brush dark green over the gilt to imitate verdigris discoloration. If the guns are turned from brass, leave in natural-metal finish, which will, in course of time, corrode to some extent. Two guns are glued into the stern; four into the outer and inner spar-deck bulkhead (middle holes on each side not fitted); and four into the beakhead-bulkhead holes. Elevate the spar-deck guns to fire clear of the rails. The lower-deck guns are also glued into the gunport holes and main-deck carriages on each side.

Four conventional anchors, of blackened wood or metal, are then made and attached. Those forward are secured by tackles to the catheads, and the after pair are lashed to the forward channels, clear of the gunports. Hawasers of the same thickness as the mainstay are suitable, their free ends being glued into the proper hawse holes as shown.

The figurehead is made by gluing thin layers of plastic wood, molded to shape with the aid of Craftmat No. 2, which contains the impression to make the figurehead, to pieces of maple $\frac{1}{8}$ in. thick. Allow the cast to dry for a few hours and glue it onto the base before the plastic

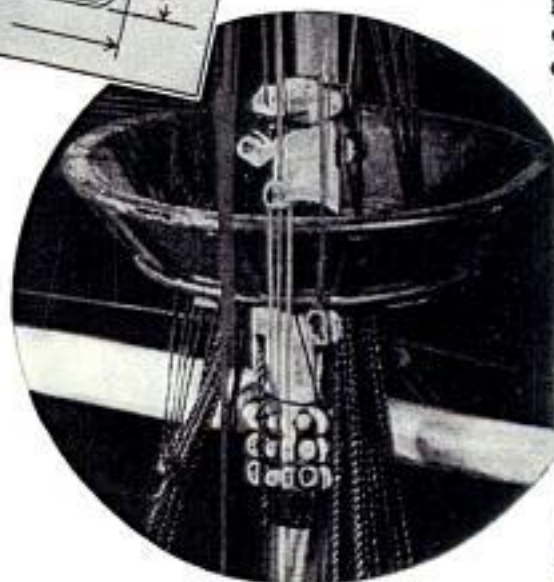
wood gets too brittle. Then trim to shape, and glue both to another piece the same thickness as the figurehead support. The latter piece is not flush with the bottom of the figurehead casts. It is assembled so that the mounted casts project about $\frac{1}{16}$ in. below its bottom edge to form a channel for the figurehead support. The whole is glued and pinned in place. If desired, the carving of the figurehead may be accentuated by tooling the recesses deeper than they are when they come from the mat. This should be done only after the plastic wood is dry, and care must be taken





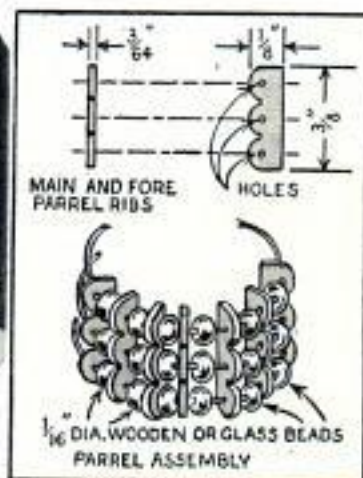
of the masts and its lines are secured directly around the main and foreyards to hold these firmly against the forward sides of their masts. It should be noted, however, that the mizzenyard parrel has but two rows of trucks (balls) and that it holds the mizzenyard tie, rather than the yard, in place. The tie of the crojack yard is an exception to other upper yards, being made as a non-adjustable sling. All upper yards, including the crojack yard, are held firmly downward and backward with simple strops passed around the masts.

With the yards attached, we can proceed with the running rigging. You will



have a number of blocks to attach. The writer discovered that the quickest way to handle these was to first seize all blocks into pendants of the correct thread sizes, about 6 in. long, before beginning to attach them into place. Regardless of their purpose, you will then have ample line to secure the blocks and can clip off the free ends as necessary. It is also safer to put a touch of shellac on the blocks and threads to make sure that none of them will come loose when adjusting the rigging tension. This applies also to all knots the rigging requires.

A study of the rigging plan shows that all lifts (vertical adjustment for the yard ends) and braces (horizontal adjustment) are duplicated on both sides of each yard. Hence, only one side of the rigging and yards is shown to simplify the plan and to help you understand just where each line runs. The one exception to this is the lift for the mizzenyard. It is single. Also, the fore topsail yard, and fore royal yard rigging, is duplicated on the other yards as described on the plan at those points.

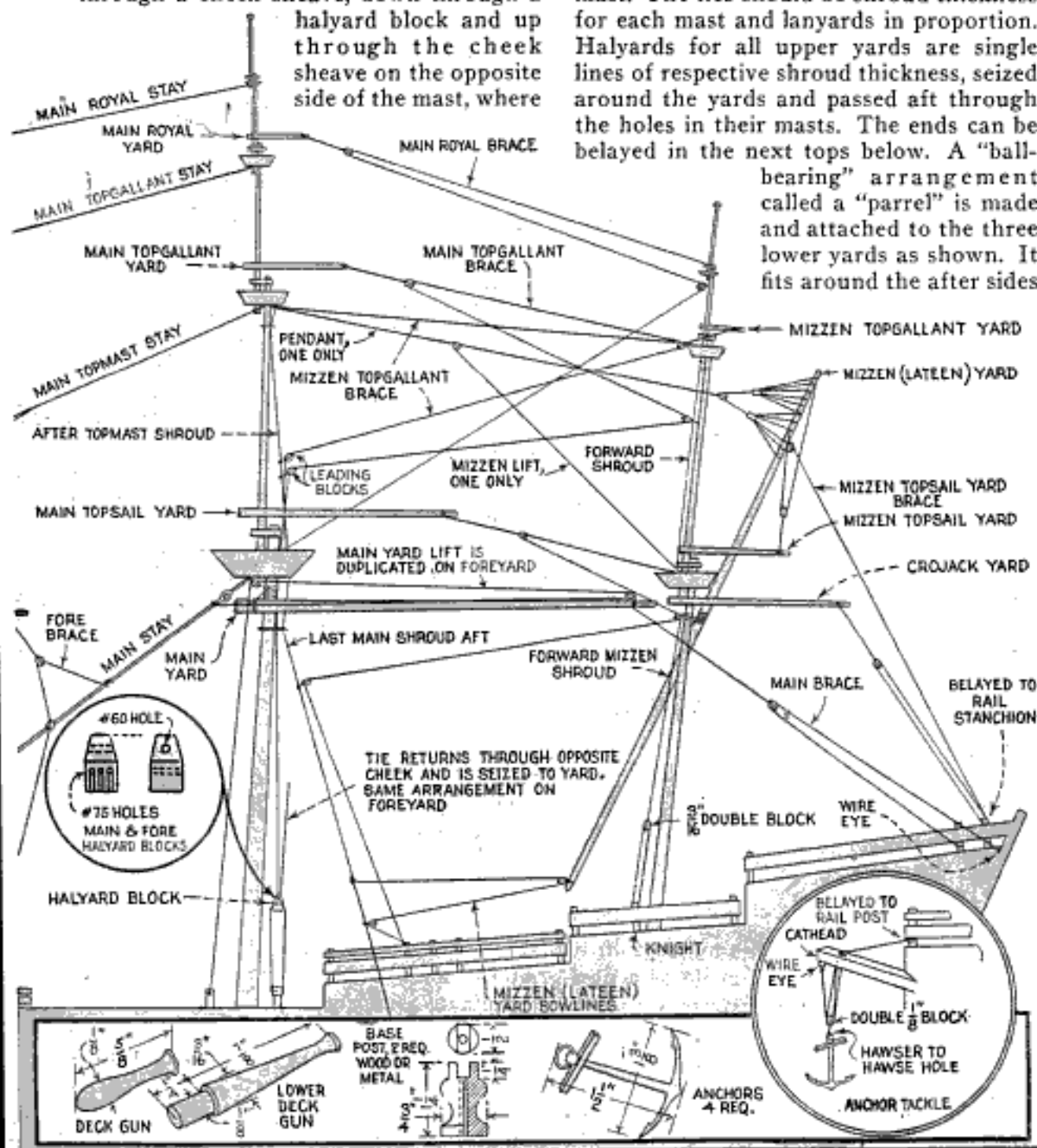


The foreyard duplicates the arrangement of the mainyard. Where lines appear to terminate as, for example, in the tops, they are to be belayed at such points. It is well to begin with the lower yards. Carefully note where each line starts; then trace its course to the belaying point at the other end. The fore topsail yard and fore royal

not to spoil the contour. The lifeboat may be of the simplified type detailed or, it can be carved out and fitted with ribs and thwart as is the original model. It rests in two chocks (cradles) on the main-hatch grating, being glued and pinned to the grating to keep it in place.

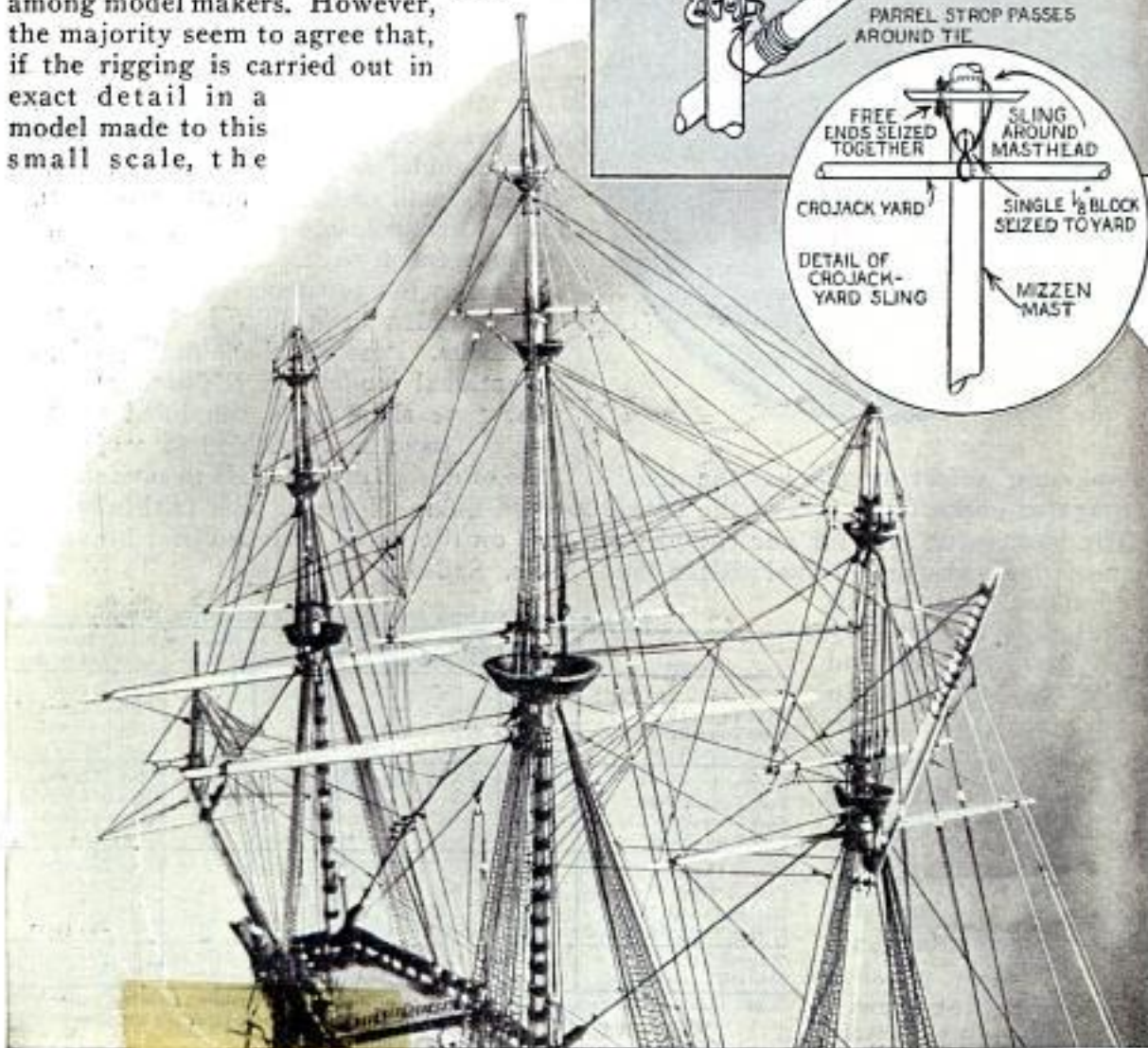
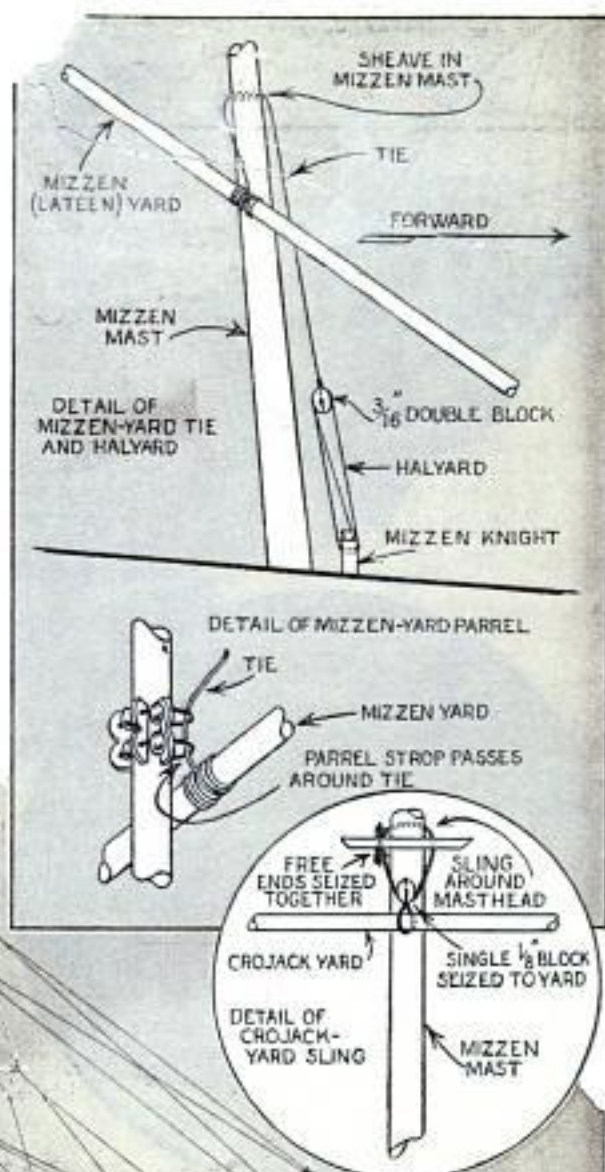
Now for the running rigging. The first job is to attach the yards to the masts. The mainyard is fastened with a one-piece tie, which is seized around the yard, passed through a cheek sheave, down through a halyard block and up through the cheek sheave on the opposite side of the mast, where

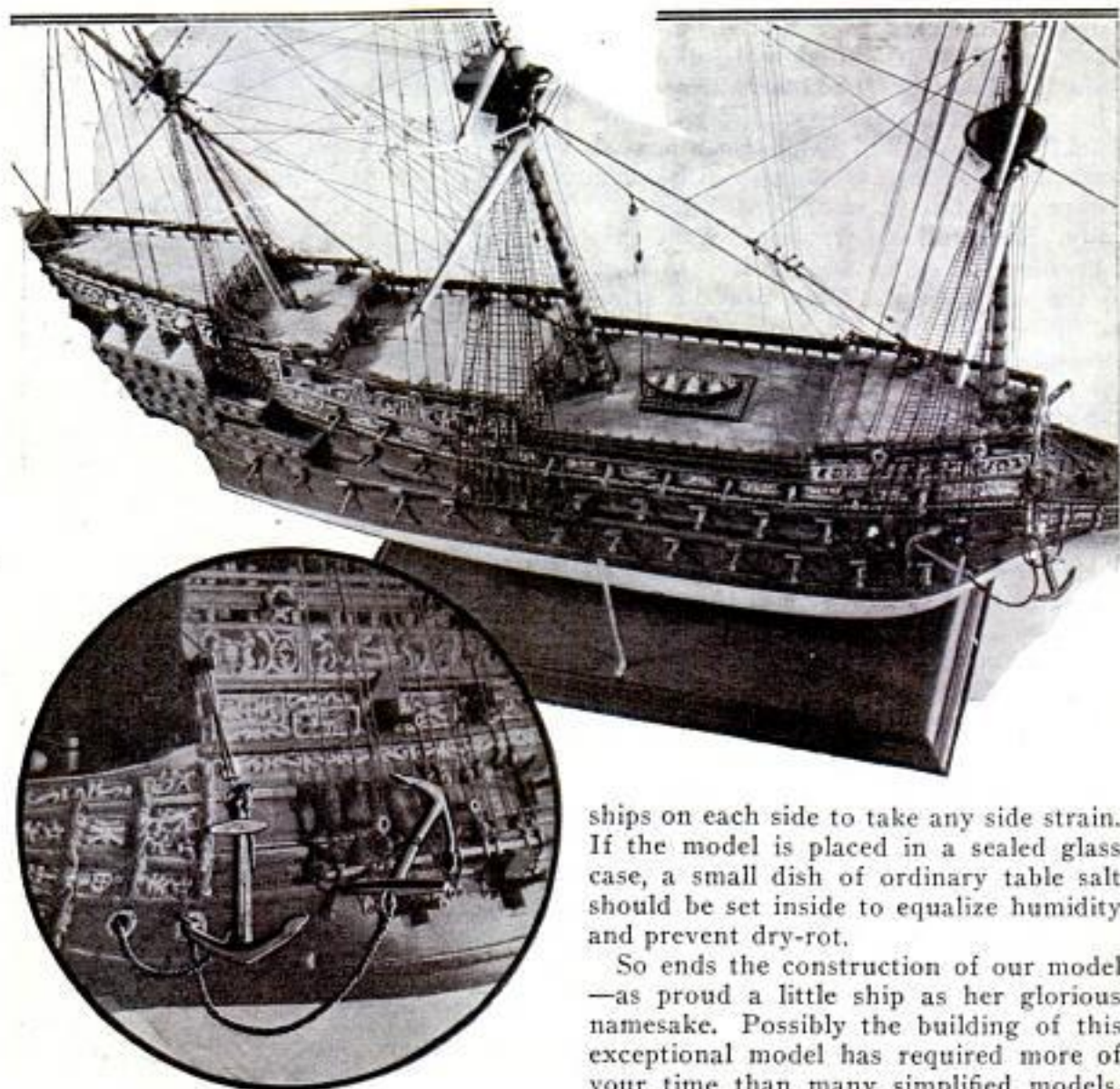
the loose end is also seized around the yard. The halyard block is set up with a lanyard, which passes through the sheave of the port knight, aft of the mast. The tie should be long enough to permit lowering the yard to the rails. The foreyard has the same arrangement. The mizzenyard is similar except that the tie is seized to the halyard block at one end and to the yard at the other, passing forward through the central sheave of the mizzenmast. The ties should be shroud thickness for each mast and lanyards in proportion. Halyards for all upper yards are single lines of respective shroud thickness, seized around the yards and passed aft through the holes in their masts. The ends can be belayed in the next tops below. A "ball-bearing" arrangement called a "parrel" is made and attached to the three lower yards as shown. It fits around the after sides



yard lifts are used as guides for rigging other upper yards, and should follow lower-yard rigging. The braces vary a bit and each should be considered individually. If you will get a clear mental picture of each line as shown on the plan before you place it, you'll have little difficulty. No detail is necessary for the two "spreaders" used to attach the crowfeet to the mizzenyard. These are the same as those used for the spritsail-topmast backstay, described previously with the standing rigging.

As now rigged, the lower yards are in positions to bend on their sails, while the upper yards appear lowered to the positions they would occupy with sails removed. This eliminates the obstructions that the lower yards would represent at rail level if they, too, were in the relative positions of the upper yards. As for fitting the sails, this is an arbitrary point among model makers. However, the majority seem to agree that, if the rigging is carried out in exact detail in a model made to this small scale, the





"blanketing" effect of sails has the disadvantage of obscuring much of the detail.

The permanent base for our completed man-of-war is also an optional matter with the builder. The type illustrated is commonly used in museums and shows the hull lines to good advantage. Two posts, as detailed, support the keel, and 3-in. wood screws of small diameter are driven through the base, through the center-post holes and into the hull. Supplementary supports of $\frac{1}{8}$ -in. polished brass rod are then screwed to the hull and base mid-

ships on each side to take any side strain. If the model is placed in a sealed glass case, a small dish of ordinary table salt should be set inside to equalize humidity and prevent dry-rot.

So ends the construction of our model—as proud a little ship as her glorious namesake. Possibly the building of this exceptional model has required more of your time than many simplified models, but, we have never yielded to a compromise of design or materials to save the few extra hours of work. She faithfully carries on the brave tradition of a brave old ship. Sail on, "Sovereign!"

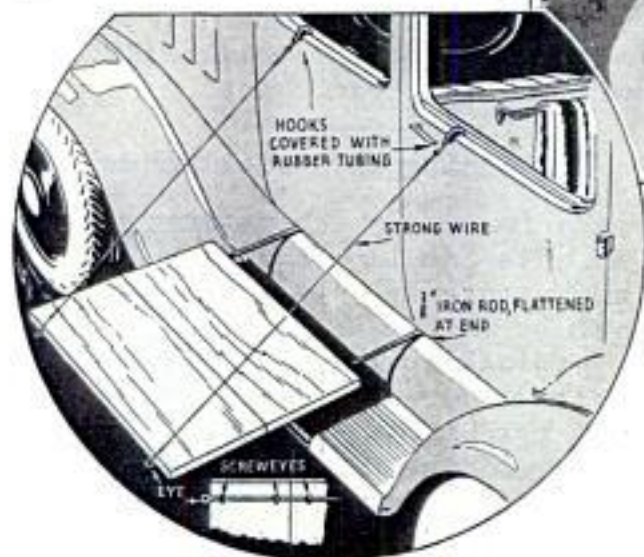
CHART OF YARDS AND RUNNING RIGGING

Name	Length	Dia. Middle Two-Thirds	Size, All Blocks	Number of Blocks	*Sizes: Pendants Lifts and Braces
Mainyard	13"	$\frac{5}{8}$ "	$\frac{3}{8}$ " Except Halyard Block	6	No. 30 Linen
Main Topsail Yard	6 $\frac{1}{2}$ "	$\frac{3}{8}$ "	$\frac{3}{8}$ "	14	No. 60 Linen
Main Toppallant Yard	3 $\frac{1}{2}$ "	$\frac{3}{8}$ "	$\frac{3}{8}$ "	14	No. 70 Linen
Main Royal Yard	1 $\frac{3}{8}$ "	$\frac{3}{8}$ "	$\frac{3}{8}$ "	8	No. 70 Cotton
Foreyard	11 $\frac{1}{2}$ "	$\frac{1}{2}$ "	$\frac{3}{8}$ " Except Halyard Block	8	No. 35 Linen
Fore Topsail Yard	5 $\frac{1}{4}$ "	$\frac{3}{8}$ "	$\frac{3}{8}$ "	14	No. 60 Linen
Fore Toppallant Yard	2 $\frac{3}{4}$ "	$\frac{3}{8}$ "	$\frac{3}{8}$ "	16	No. 70 Linen
Fore Royal Yard	1 $\frac{3}{4}$ "	$\frac{3}{8}$ "	$\frac{3}{8}$ "	14	No. 70 Cotton
Mizzen (Lateen) Yard	11 $\frac{1}{2}$ "	$\frac{5}{8}$ "	$\frac{3}{8}$ " Except Halyard Block	7	No. 35 Linen
Crojack Yard	6 $\frac{1}{2}$ "	$\frac{3}{4}$ "	$\frac{3}{8}$ " Except Halyard Block	10	No. 60 Linen
Mizzen Topsail Yard	3 $\frac{1}{4}$ "	$\frac{3}{8}$ "	$\frac{3}{8}$ "	12	No. 70 Linen
Mizzen Toppallant Yard	1 $\frac{3}{8}$ "	$\frac{3}{8}$ "	$\frac{3}{8}$ "	8	No. 70 Cotton
Spritsail Yard	7"	$\frac{3}{8}$ "	$\frac{3}{8}$ "	14 or 16	No. 60 Linen
Spritsail Toppallant Yard	3 $\frac{1}{4}$ "	$\frac{3}{8}$ "	$\frac{3}{8}$ "	10	No. 70 Cotton

Note: Diameters at ends of yards approx. $\frac{1}{2}$ of diameters at middle sections. Yards have flat taper to within $\frac{1}{2}$ their lengths at outer ends, where taper is more pronounced. *Halyards same diameters as given mast shrouds.

Simple Camp Table Attaches to Side of Car

Consisting of two boards, two iron rods and a couple lengths of strong wire, this camp table is handy for picnics or short camping trips, as it takes little space when packed, and is quickly set up. In assembling, the rods are slipped through screw-eyes driven into the underside



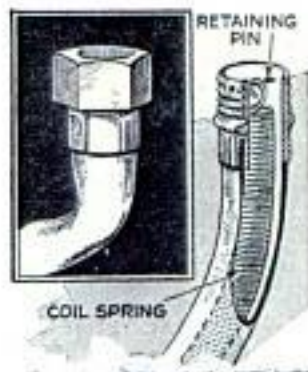
of the boards. One end of each rod, which is flattened, is pushed in the crack at the junction of the car body and the splash pans on the running board. The wires are tied to screw-eyes driven into the outer edge of the table and are fastened to rubber-covered hooks that fit over the edge of the door.

Refinishing Worn Linoleum

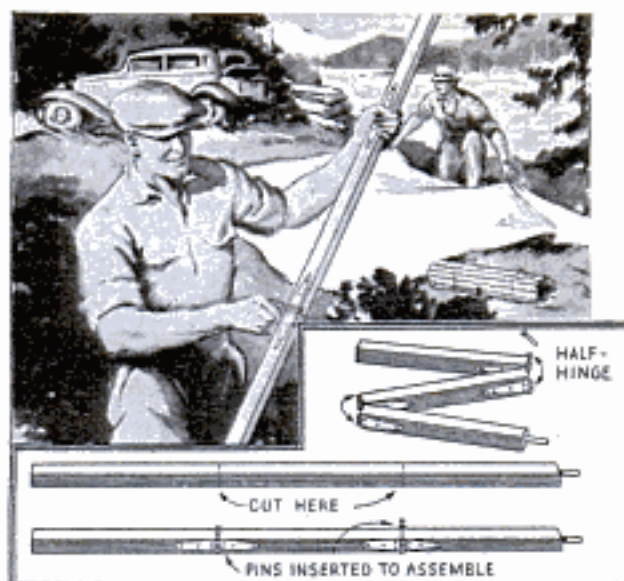
Linoleum on which the pattern and colors have been worn off can be refinished in any color and pattern desired, a stippled effect being the easiest to produce. First clean the linoleum thoroughly with hot soapy water, making sure that no wax or grease spots remain, and allow to dry overnight. Then go over it with a clean cloth to remove the dust, and apply a flat-tone washable wall paint, covering a small section at a time. While the paint is drying, prepare the stipple color. For stippling, use either a sponge, a crumpled cloth, a wad of crumpled paper or a stippling brush, depending on the texture desired. If a sponge is used, the top should be trimmed flat and the

water to soften it so that a good print can be made. After the ground color has become tacky, pour a small amount of the stipple color on a board and rub the sponge in it, tapping it on the board a couple of times to remove the surplus paint. Tap the sponge straight on the mat. The prints may overlap or they may be spread slightly apart. More of a blended effect can be obtained by applying the stipple color before the ground has become tacky, thus causing the two colors to run together. Two or more stipple colors may be used if desired. After the finish has dried overnight, it is ready for varnishing. Use a high-grade waterproof varnish and apply two thin coats, allowing the first to dry thoroughly before applying the second. If a wax finish is desired, apply a coat of white shellac and then wax the linoleum in the usual way.

Coil Spring Keeps Hose from Kinking



Inserted into the faucet end of a garden hose, a coil spring will prevent kinking at this point, and will not hinder the water flow appreciably. The spring is held in position by bending the end over a retaining pin.



By Hinging Your Tent Poles, You Can Store Them in the Car

Hinged Tent Poles Are Easily Stored

By hinging your tent poles, they can be folded and tied in convenient bundles for transportation. The poles are cut into three sections, after which two pairs of loose-pin hinges are screwed to opposite sides of the pole at each cut. By removing the pins from one hinge at each joint, the pole can be folded. If the hinges are properly placed, this alteration will not weaken the pole.

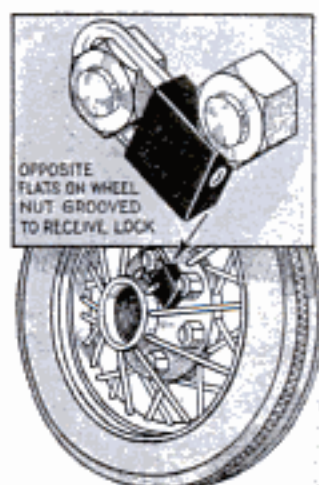
Cause of Exhaust Gases in Interior of Closed Car

Accumulation of exhaust gases in the interior of a closed car was traced to the breather pipe of the engine. The primary cause was leaky piston rings, which al-

lowed the exploded gas to pass the pistons into the crankcase, after which it was driven out through the breather pipe. The best remedy for this trouble is, of course, to make the necessary repairs, such as re-grinding the cylinders or replacing the piston rings. But if this cannot be done, the breather pipe may be connected to the air intake of the carburetor so that the gases will be drawn back through the engine. If this arrangement is impossible, then the breather pipe should be fitted with a flexible metal tube that leads to some point under the car where the fumes will pass to the rear.

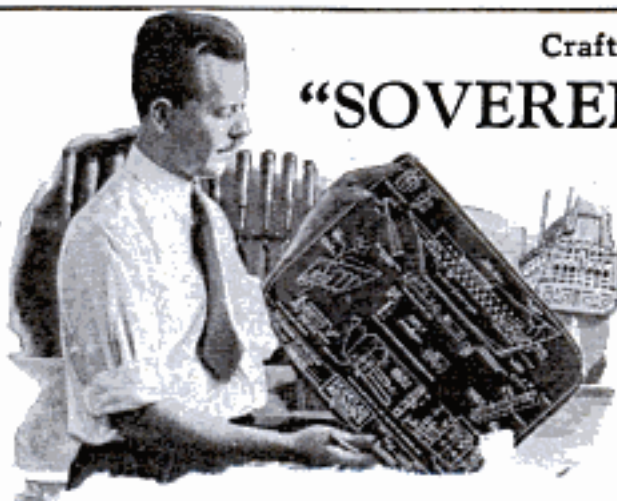
Preventing Theft of Car Wheels

Thefts of car wheels can be made more difficult by attaching a padlock to a grooved nut of each wheel so that a wrench cannot be slipped over the nut. As the lock strikes the hub, the nut cannot be unscrewed. The padlock should have a hasp with straight, parallel sides a little closer together than the distance between the faces of the nut. By grinding or sawing a groove across the two opposite sides of the nut, about $\frac{1}{8}$ in. from the top, the lock hasp can be slipped snugly into place.



Craftmats and Blueprints on

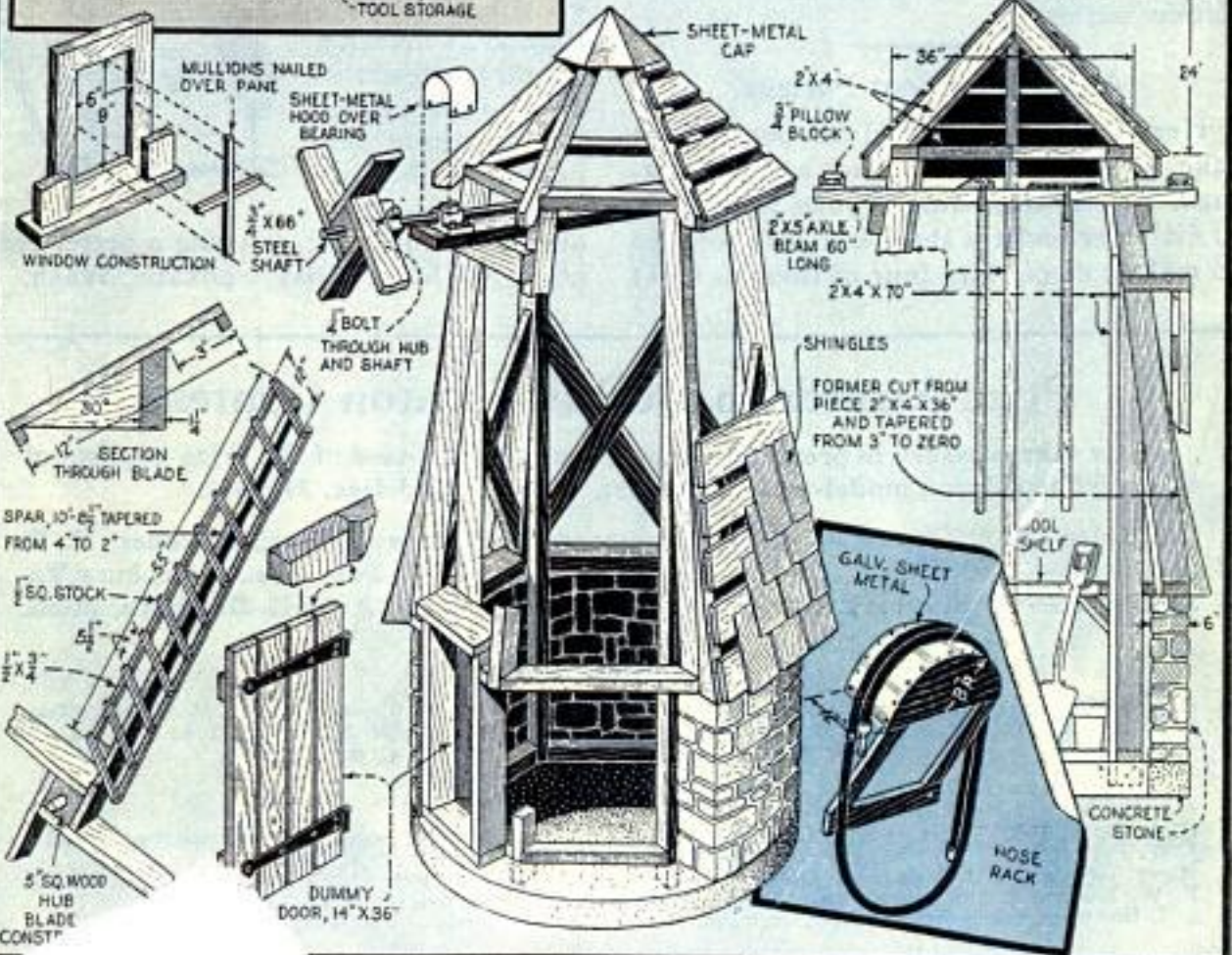
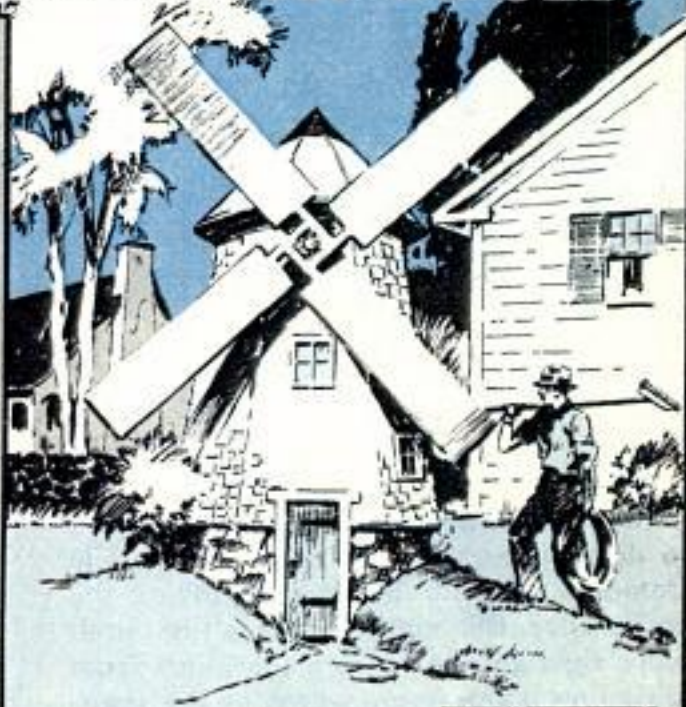
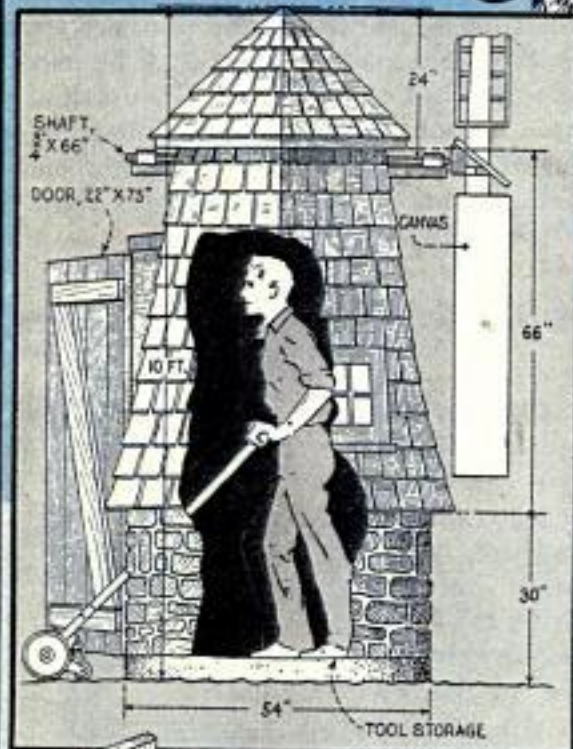
"SOVEREIGN OF THE SEAS"



A Craftmat of the stern and lower-hull carvings will be sent upon receipt of 50 cents. Craftmat No. 2, of the carvings to go on sides of upper works, 35 cents. Eight blueprints on the "Sovereign" are available for \$1.50. A list of 380 practical projects will be sent for 3 cents postage. Also, a sample print with forty illustrations of finished projects available for 10 cents. — Blueprint Department.

DUTCH WINDMILL

houses Garden Tools





Porch Frame with Dovetailed Joints Is Rigid and Does Not Loosen if Foundation Settles

Dovetailed Joints Make Porch Rigid

When building a porch, it is a good idea to dovetail as many of the joints in the frame as possible. Besides improving the appearance, this method makes the porch more rigid and helps keep the joints from loosening if the frame warps or the foundation settles.

A One-Man Boat Portage

Here is an easy method for one man to take his fishing boat across a short portage. Get several straight poles about 8 in. in diameter and cut them into 4-ft. lengths to make rollers. Lay four of them in front

of the boat at 2-ft. intervals and push it over them until the bow tilts down. Lay the other four on the ground and move the boat over them. Then pick up the first four and again place them in front of the boat, repeating this operation until the boat is moved across the portage. If a fallen log or other obstruction is encountered, a skid made of poles can be used to take the boat over the top. To do this, get three or four light poles and flatten one end of each. Then place the other end of the poles on the obstruction and drive the flattened ends into the ground.

Sheet-Metal Tab Holds Electric Wire on Binding Post

Difficulty often experienced in keeping the end of a wire attached to a binding post, can be remedied by placing a washer, made of heavy sheet metal with a tab bent up on one side, under the regular washer. In this way, the end of the wire is held between the tab and the post so that it cannot slip out when the nut is screwed down on the binding post, assuring a better connection.—D. R. Hoag, Spokane, Wash.



Prize Awards in DeWitt Clinton Contest

We take pleasure in presenting the names and addresses of the prize winners of the DeWitt Clinton model-making contest, which closed Dec. 31, 1932.

- 1st Prize—\$1,000.00.....Ivar E. Nordstrom, 141 Elmwood Ave., Falconer, N. Y.
 2nd Prize— 500.00.....P. L. Morgan, 4001 Fort Ave., Lynchburg, Va.
 3rd Prize— 250.00...J. Gordon Lake, 5941 Williamson Ave., E. Dearborn, Mich.

\$50.00 Prize Winners

- H. L. Lockhart, 5435 W. Galena St., Milwaukee, Wis. H. Gassan, 3651 Leybourne Ave., W. Toledo, Ohio.
 F. J. Leib, 1913 Steele St., Rosemead, Calif. M. M. Davis, 5051 N. Damen Ave., Chicago, Ill.
 Elmer A. Radatz, 6021 37th Ave., Kenosha, Wis.

\$25.00 Prize Winners

- G. A. Pettit, 7922 Sycamore St., New Orleans, La. Lee Buck, 857 Franquette Ave., San Jose, Calif.
 J. W. Petterson, 325 13th St., Palisades Park, N. J. Russell Nord, 38 Homer Rd., Quincy, Mass.
 Harry Tittensor, 1714 Broadway, Flint, Mich. N. L. Pietz, 11009 15th Ave., N Seattle, Wash.
 F. W. Moesser, 59 Westmount Ave., Toronto, Can. Leslie F. Garrison, West, Tr
 J. T. Guenther, 261 E. College Ave., Sheridan, Wyo. J. M. Chowins, Station A,

*International Research Laboratories
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 Compton, Calif. 228. 7th Ave
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Make Money by Printing PHOTOS on CLOTH



Scarfs, Neckties,
 Handkerchiefs,
 Fancy Pillows,
 Towels, Napkins
 and other items
 for private and
 commercial use



①
 DIPPING A
 HANDKERCHIEF
 IN THE SENSITIZING SOLUTION



②
 WAD OF COTTON USED
 TO IMPREGNATE SCARF
 LAID ON PIECE
 OF GLASS

By R. M. BLACKBURN

PHOTOS on fabrics, leather, parchment and other similar material, that cannot be removed by ordinary washing, and will thus remain clear and bright no matter how many times the pieces are laundered, can be applied by anyone. All that is necessary are good negatives that are not too dense, and a small batch of chemicals that are especially prepared and sold for this purpose.

It is advisable to start your cloth-printing experience on linen, cotton and on flat and satin-faced rayons. Let the silk crepes and satins wait until later, as many of the medium-priced silks and satins on the market today are "loaded" with material that is detrimental to photo work unless it is specially treated before it is sensitized. To do this, make up a solution by putting a quarter of a teaspoonful of ordinary household gelatine in 4 oz. of distilled water, to which two pinches of table salt are added. Let the solution stand for a few minutes and then heat it until it reaches a temperature of 100° F., after which the loaded silk is immersed for a few minutes. Hang the wet cloth up to dry and then it can be sensitized. Linen, cotton and rayon do not require this preliminary treatment.

The work of sensitizing the portion of cloth on which you wish to print a picture is done in a room illuminated by only



③
 BLOCKING OUT THE
 BACKGROUND WITH
 OPAQUE PAINT



④
 LINING UP
 NEGATIVE
 OVER CUT-OUT
 IN PAPER MASK



⑤
 TAPE HOLDS
 NEGATIVE IN
 POSITION



⑥

one 25-watt lamp. More illumination than this will cause the sensitized portions to become light-struck. Pour the sensitizing solution into a clean tray or dish, and dip the cloth into it as in Fig. 1, to make sure that it is thoroughly impregnated, being careful not to dip a larger area than is needed. Another method is to use a wad of cotton, saturated with the solution, the

*Eastern Photoplate Corp. 11612
 International Photochemical Laboratories
 New York City*

2622 N. Halsted International Research Laboratories, 114 Broadway St. Chicago

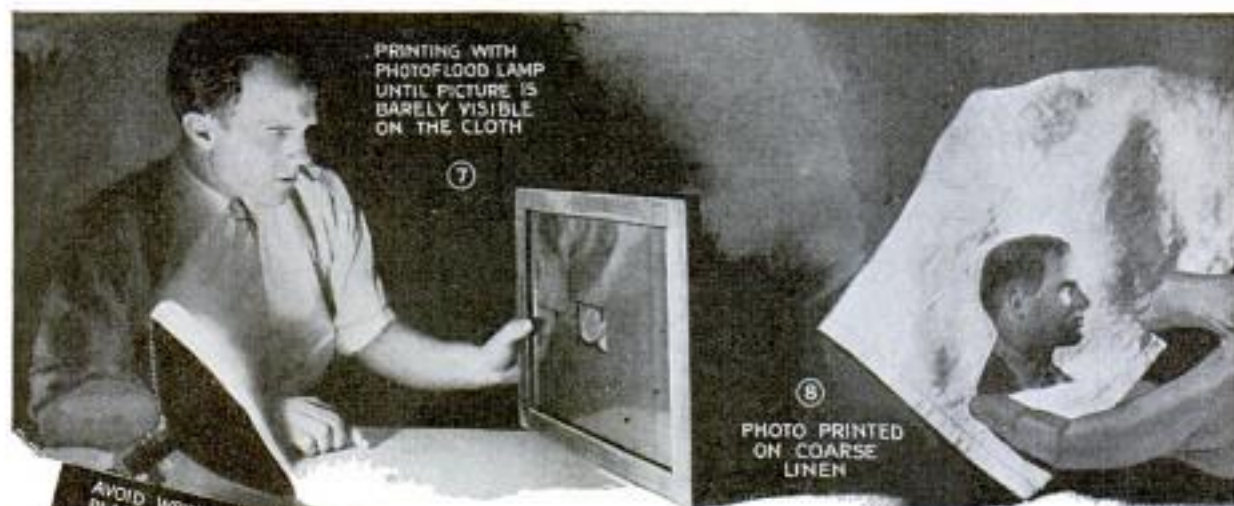


Photo Medallion Gives a Personal Touch to Bathing Suits and Other Wearing Apparel

work being laid on a piece of glass as in Fig. 2. This method is preferable as it is more economical, for, in the dipping method, the surplus fluid that is not absorbed by the cloth drips off and is lost. Each piece is hung up on a line to dry in a dark

place. You can use a cardboard box or lay the material on clean writing paper in a bureau drawer, not in contact with any metal or wood. However, be careful to avoid soiling the sensitized portion, even to the extent of getting oil on it from your hands, and also avoid exposing it to stronger light than that mentioned.

While the cloth is drying, you can prepare the printing mask and frame. Blocking out of the background, in the case of portraits on scarfs, handkerchiefs, etc., is first done by applying retouchers' opaque, which can usually be obtained at a photo-supply house. Carefully cover all the parts of the negative that are not to be printed, up to the edge of the picture, as shown in Fig. 3. Now take a piece of black paper that fits the entire inside surface of the printing frame, and make a cut-out over

which the part of the negative to be printed will fit as in Fig. 4. Tape may then be used to hold the negative in position, as shown in Fig. 5. Holding the mask and negative toward a light, apply some more opaque in case you have not already covered the entire area over the cut-out part of the mask, Fig. 6.

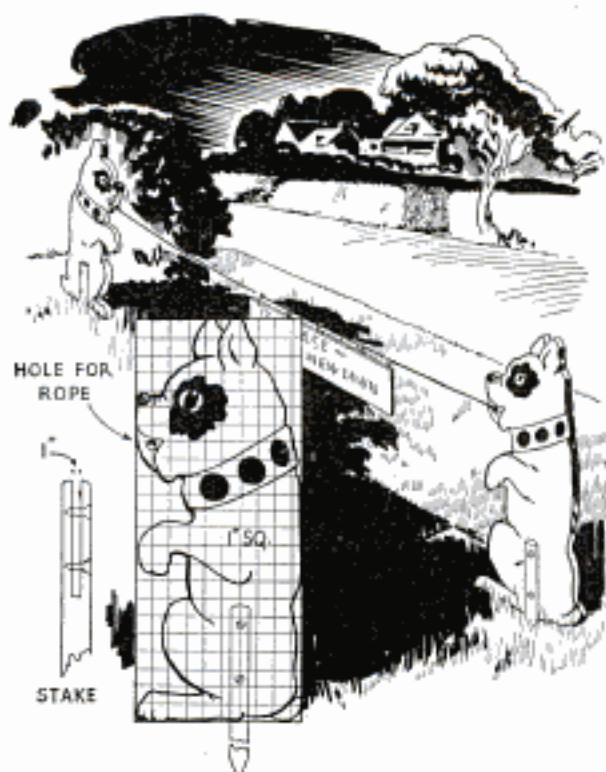
When the sensitized cloth is thoroughly dry, it may be placed over the negative in the printing frame as in Fig. 9, taking care not to work under more light than that furnished by a 25-watt lamp. In placing the cloth in the frame, you should avoid getting it wrinkled and getting any of the sensitized parts of the cloth on the outside of the

frame where the light will reach it. Such portions would otherwise turn black and spoil the work. A photoflood lamp, screwed into an ordinary socket and provided with a reflector, as shown in Fig. 7, is suitable for printing. As the sensitized cloth is very much slower in its reaction to light than the photo paper commonly used, the exposure time is not very critical. The average negative requires an exposure of about two minutes, in front of a photoflood lamp. Dark negatives will require more time while lighter ones need less. As soon as you can notice that the light portions of the cloth under the negative are becoming brown, take the frame back into the darkroom and remove the cloth. Immersing the entire sensitized portion in a developing solution, as in Fig. 10, will immediately bring out the photo. Keep it in the developer about a minute and then wash the cloth in the cleaner bath, rubbing the sensitized surface until all of the yellow stain has disappeared. When washed in clean running water, the printed cloth is immersed for 10 min. in a preserving solution, after which it is again washed in water to remove all traces of the last solution. The cloth is then hung up to dry or it can be ironed dry with a warm iron.

Fig. 8 shows a photo printed on coarse linen. You can practice on cheap handkerchiefs and then use better and finer cloth on which photos of greater detail can be produced. Additional effect can be obtained by coloring the photos, using household dyes. If, for any reason, you desire to remove a photo from the cloth, in case it is under or over printed, and you wish to do the work over again, the following solution will be found effective to bleach out the photo, leaving the cloth in its original condition: Mix potassium ferricyanide, 1 oz., hypo, 1 oz., in one pint of water and immerse the cloth.

Wooden Dogs Support Lawn Sign

Lawn signs can be made more attractive by hanging them on a rope stretched between two wooden dogs. These are cut from 1-in. stock and are supported by stakes, the tops of which are slotted to take the lower part of the bodies. The rope is tied in a hole drilled through a

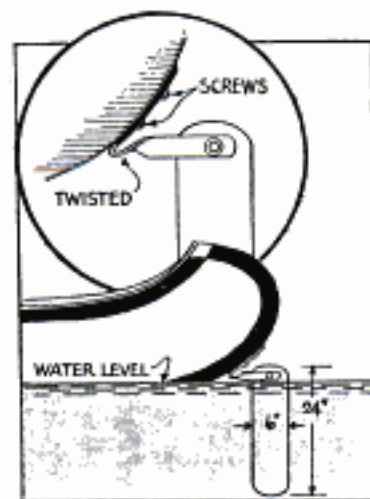


Lawn Sign, Hung on Rope Stretched between Wooden Dogs, Produces Novel Effect

portion of the mouth as shown. When the dogs are properly painted, this arrangement produces a novel effect.—Harry C. Thomas, Detroit, Mich.

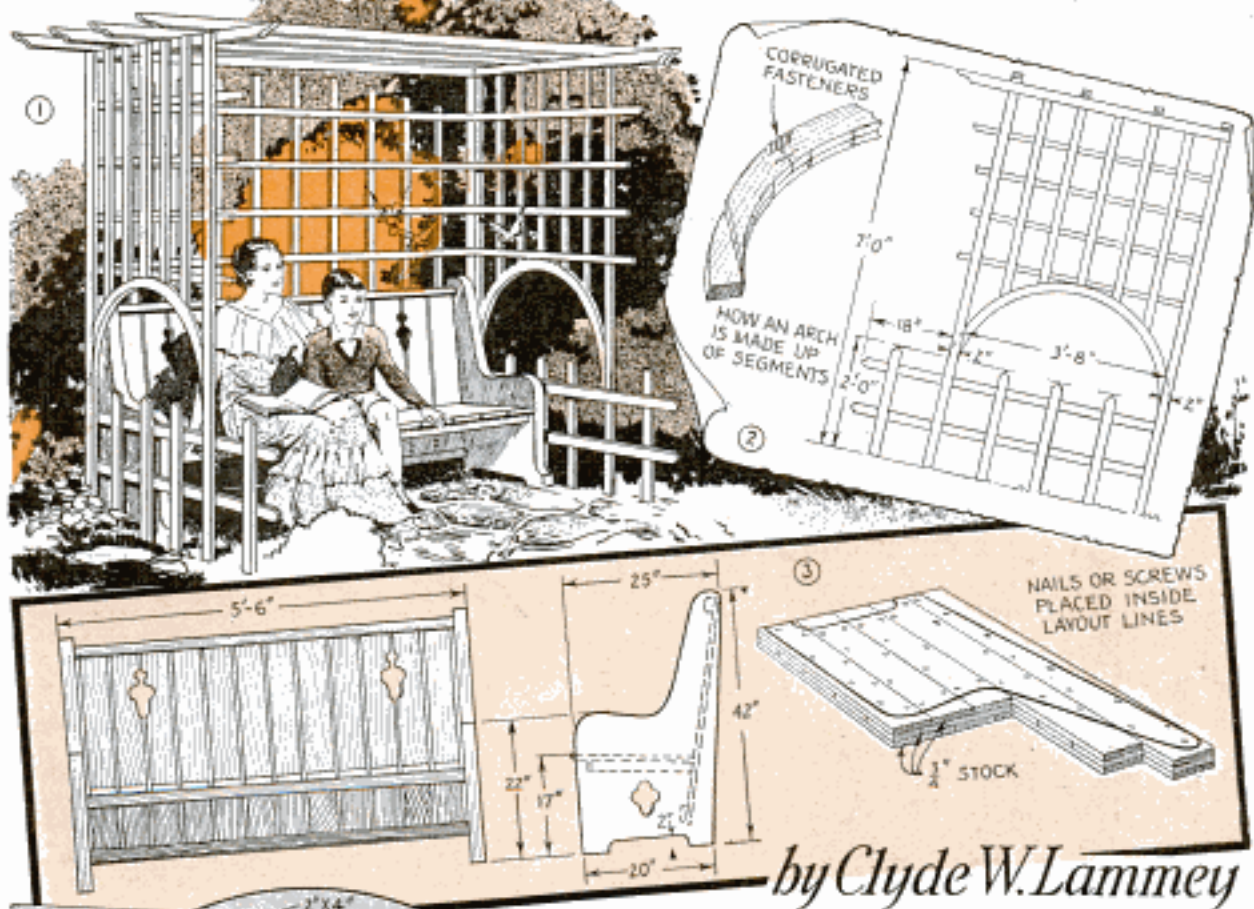
Canoe Stabilizer Improvised from Old Saw Blade

To keep a canoe from tipping, it is a good idea to fasten a stabilizer to the stern. This can be made from a piece of an old crosscut-saw blade. The teeth are ground off,



and the end is annealed and drilled for a pivot bolt with which it is fastened to a flat-iron bracket. The latter is given a half twist near the center and then bent and screwed to the keel of the canoe so that the blade hangs in a vertical position. When not needed, the stabilizer can be swung up.

You CAN BUILD THIS



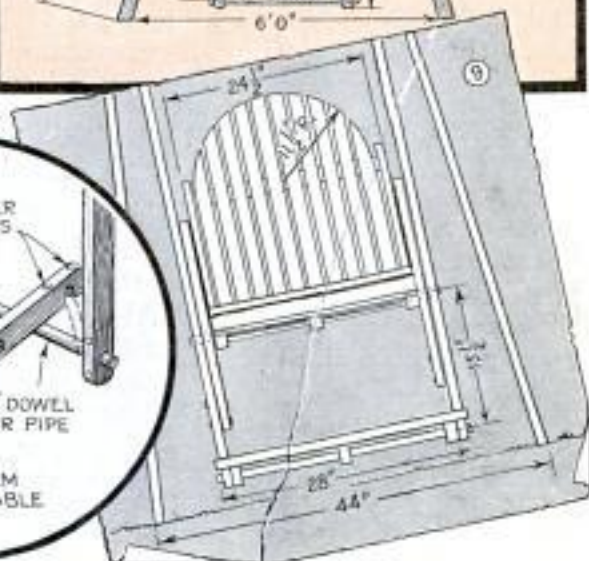
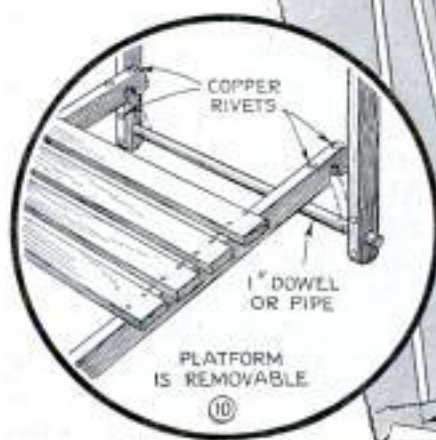
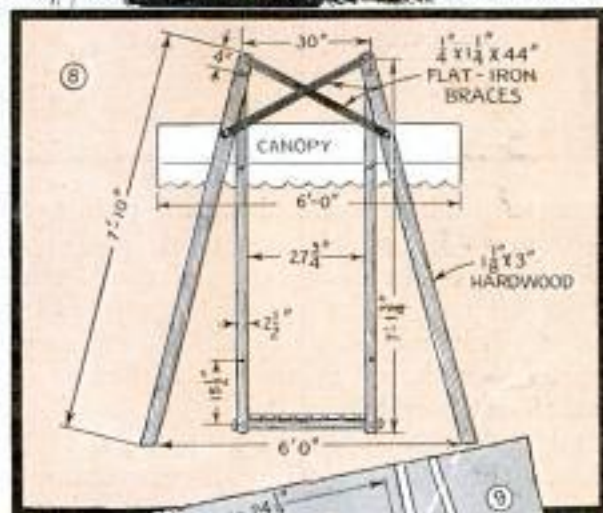
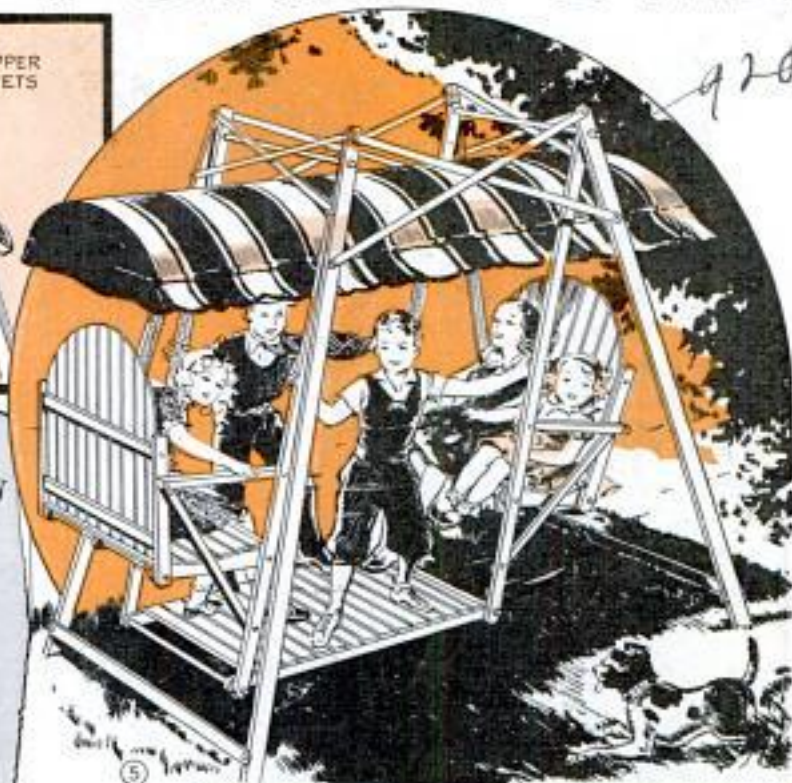
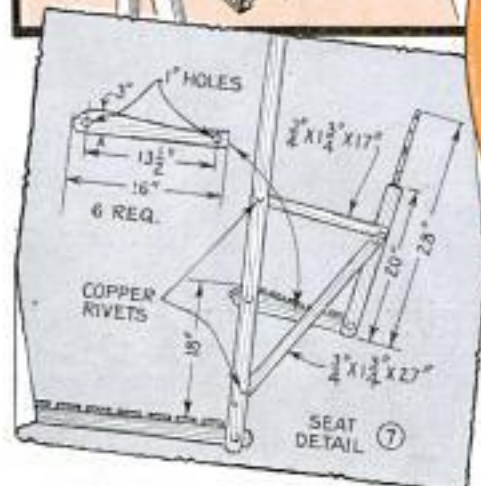
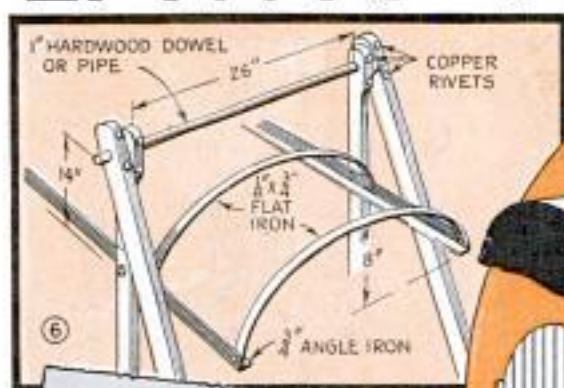
by Clyde W. Lammey

in direct contact with the ground may be made practically moisture-proof by soaking in a creosote solution for several days before use. Arbors, side arches and gateways that are to be permanent should be anchored in cement. The post is imbedded in concrete, which not only provides a firm footing but protects the lower end of the post against moisture, which would soon cause it to rot.

One of the most attractive pieces of outdoor furniture is the arbor-and-seat combination shown in Figs. 1, 2 and 3. It is most effective when used as a terminal feature of the main garden path, or placed before a bank of shrubbery. The material for the arch is cut into segments of the proper size and curvature, and the parts are fastened securely together with corrugated fasteners. The same design altered in width to form a bench or chair may be used as a separate piece. As a chair, the seat should be about 24 in. wide. The end pieces are built up solid from 3/4-in. stock, laid with the grain at right

LAWN furniture not only adds to the attractiveness of the grounds about the home but offers a cool, shady retreat from the direct heat of the summer sun. Cypress and white pine are the best materials to use for outdoor furniture, the former generally being preferred because of its natural resistance to moisture. Parts

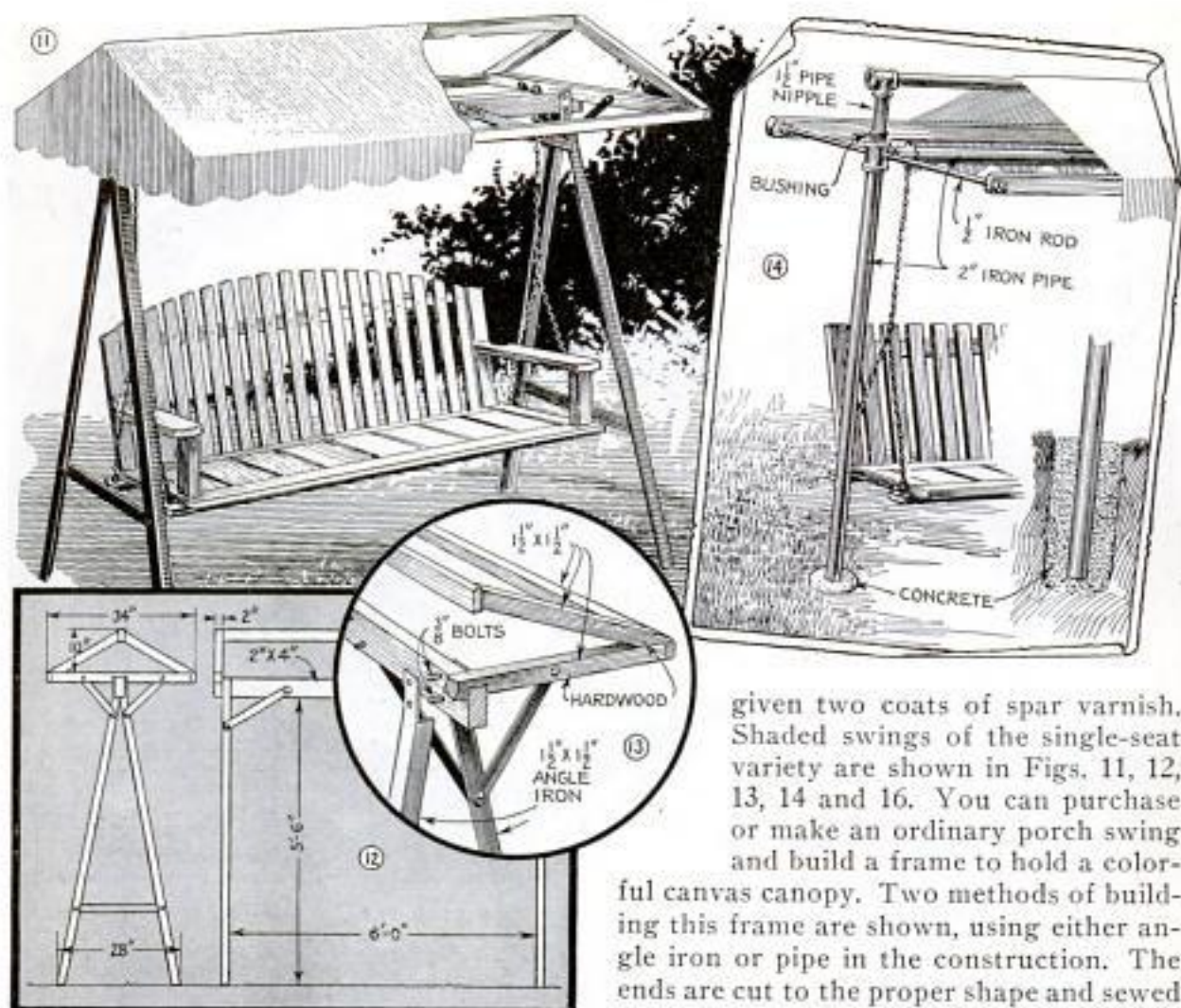
LAWN FURNITURE



angles and nailed or screwed together. The waste is sawed off to the pattern line.

Corner shrubbery will be greatly enhanced by the arbor-and-seat combination shown in Fig. 4, the seat being made as a separate unit. Details of the end construction are given in Fig. 19, this being built up three-ply the same as the one shown in Fig. 3, with the exception that the outer strips are spaced $\frac{3}{4}$ in. apart. The dimensions of both arbors are only suggestive as to the proportions; they may be altered to suit any condition, or fancy of the builder.

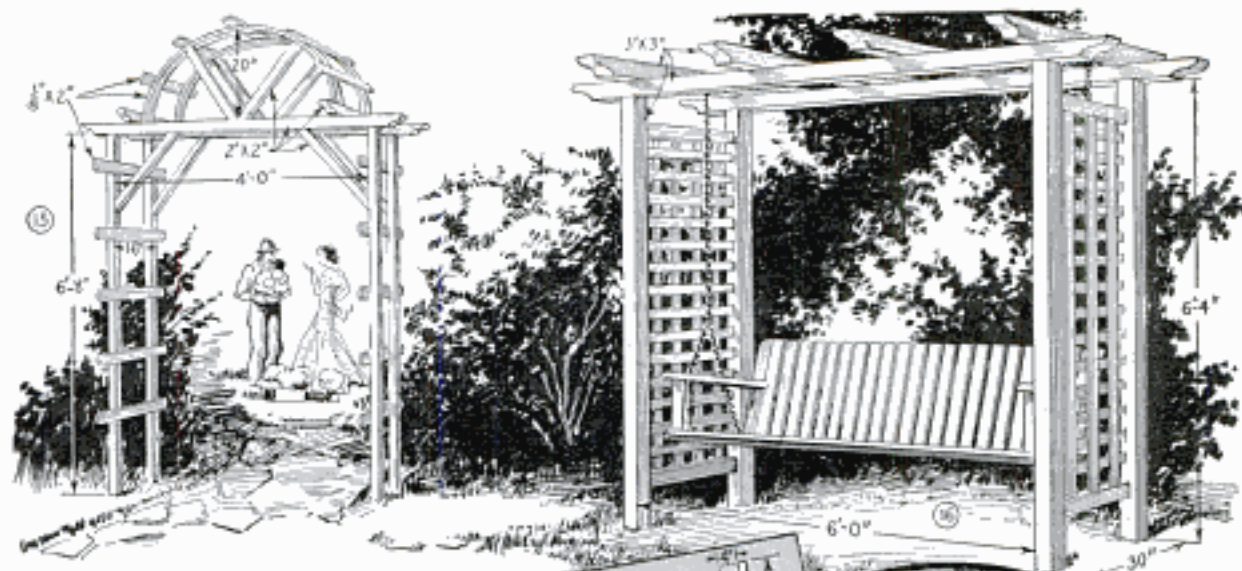
A two-seat lawn swing of the type shown in Figs. 6 to 10 inclusive, is always popular. An added feature of this swing is the cloth canopy to shelter the occupants from the sun. If possible, all parts that must support considerable weight should be of hardwood such as oak or maple, and copper rivets should be



put through the wood at all points of strain, as indicated. A sound hardwood dowel, 1 in. in diameter, will do to support all parts that pivot, but for added strength iron conduit or pipe of the same dimension should be used. The braces on all sides should be $\frac{1}{4}$ by $1\frac{1}{4}$ -in. flat iron, and the bolts should be a close fit in the holes through the wood to prevent any movement due to sudden strain. Angle iron is indicated as a part of the frame supporting the canopy, but $\frac{3}{4}$ by $1\frac{1}{2}$ -in. strips of hardwood may be used instead. These should be riveted to the swinging uprights, the rivets being left sufficiently slack to allow movement as the canopy frame moves with the swing. Also, be sure to leave enough space between the canopy and the crosspieces of the frame. The seat backs may be made of $\frac{1}{2}$ -in. slats, but the seat bottoms and the platform slats should be $\frac{3}{4}$ -in. stock. The seat frames are riveted at all points indicated. The iron braces may be painted red, and hardwood parts

given two coats of spar varnish. Shaded swings of the single-seat variety are shown in Figs. 11, 12, 13, 14 and 16. You can purchase or make an ordinary porch swing and build a frame to hold a colorful canvas canopy. Two methods of building this frame are shown, using either angle iron or pipe in the construction. The ends are cut to the proper shape and sewed to the center piece. The lower edges may be scalloped and fringed as desired, and loops and buttons are provided to hold the canopy on the frame. The seat is hung from two stout hooks screwed into the beam from the lower edge. All iron parts should be painted green or red, and the woodwork given two coats of spar varnish to protect it from dampness. Fig. 16 shows a type of lawn swing of the pergola class, which is intended as a permanent feature of the lawn or garden. It is built of 3 by 3-in. pine stock with latticed ends, and the uprights are anchored in cement. It is set against a hedge or background of shrubbery with a trailing vine to provide the shade for the seat.

Trees on the lawn provide the setting for the tree seat shown in Figs. 17 and 18. For structural strength and durability the parts of this seat must be fitted with considerable care. It is built according to the measurements of the tree trunk and therefore the dimensions are subject to alteration. The back legs may be sawed out of

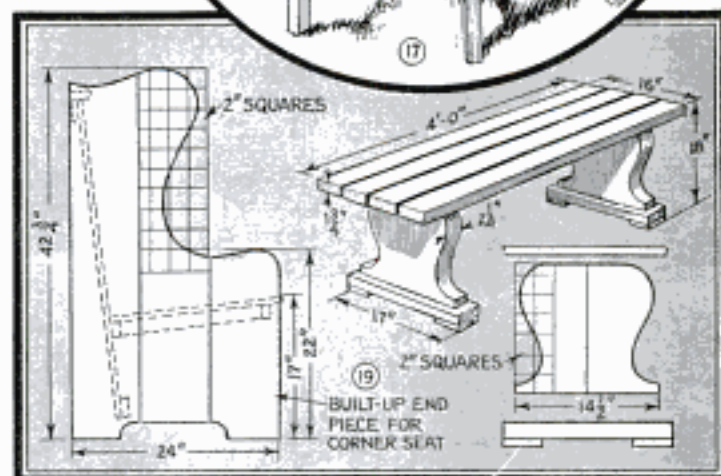
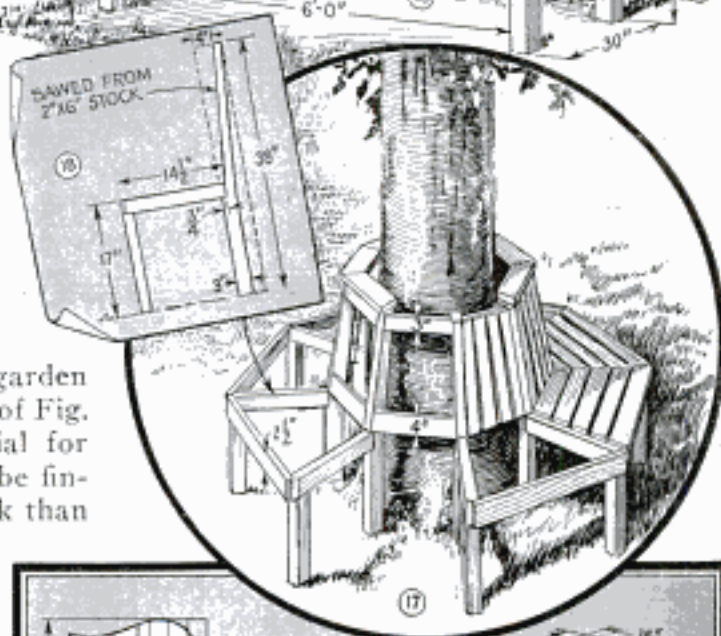


2 by 6-in. stock, while 2-in. square stock is used for the front legs and stretchers. The front seat rails are to be cut from $\frac{3}{4}$ -in. stock but the back rails, top and bottom, should be cut from $\frac{1}{8}$ -in. material. The seats, backs and the capping may be of $\frac{3}{4}$ -in. stock.

Another useful piece of outdoor furniture is the Roman type of garden seat shown in the right-hand details of Fig. 19. White pine is the best material for this type of construction as it can be finished more smoothly with less work than cypress, and, as there is considerable flat area exposed, it is best that this be finished with some care in order to provide a smooth surface for painting.

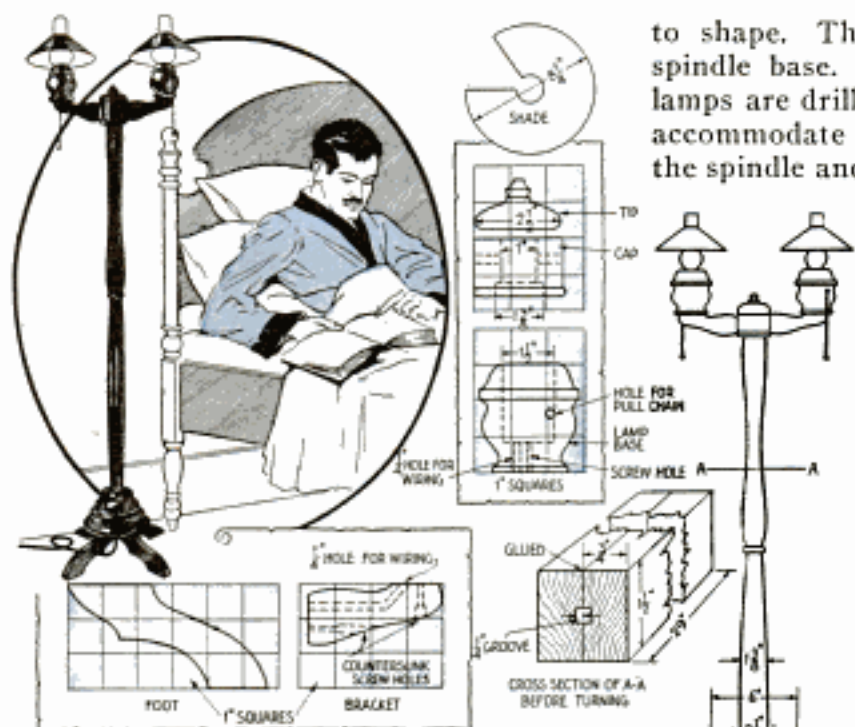
The gateway or sidewalk arch shown in Fig. 15 is particularly effective at the side of the house over the walk leading to the rear. Although the arch is curved, it will be seen that there is no difficult sawing to do as these parts are simply bent to shape over diagonal supports. About the only requirements for building a piece of this kind are suitable materials and careful use of the saw and hammer.

When making up any of these pieces of outdoor furniture, it is best to give the parts a priming coat of paint before assembling as this prevents absorption of moisture in the unprimed joints. After setting the parts up, they should be given at least two coats of outside lead and oil paint. White is generally the preferred



color although green is occasionally used with good effect. It is best not to use a pure white as it is apt to show the oil after a time. It is better to use white tinted to a light ivory by adding a small amount of raw sienna and stirring it in thoroughly. If a glossy finish is desired on either painted or unpainted work, a coat of spar varnish is applied.

Colonial Floor Lamp Turned on Your Lathe



This floor lamp of distinctly colonial design may be adapted to use in either the living room or bedroom and the dimensions may be varied somewhat as long as the general lines are followed, so that the lamp will be suitable for either purpose. First make the spindle up from two pieces, which are grooved to take lampcord, after which they are glued together and turned

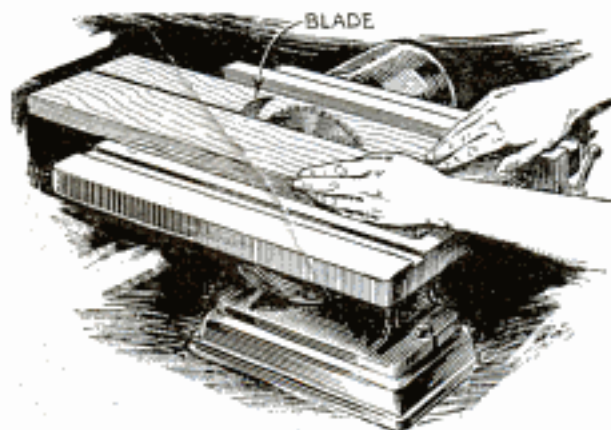
to shape. The feet are screwed to the spindle base. Brackets that support the lamps are drilled, as shown in a detail, to accommodate wiring, and are screwed to the spindle and lamp bases. The latter are

made up from four 3-in. disks cut from $\frac{3}{4}$ -in. stock. Holes for the sockets are drilled in three of the pieces before cutting them out. The four pieces are then glued together and they can then be fastened to the lathe faceplate for turning. Grain of the wood in the feet and brackets should run lengthwise. It is a good idea to assemble the lamp before wiring to make sure that all the holes match up. Pull-chain sockets are used and it will be necessary to remove the bell through

which the chain runs so that the socket will fit the hole left at the base for this purpose. Copper or brass shades add considerably to the appearance of the lamp, and are supported by the glass chimneys.—Ray K. Taylor, South Gate, Calif.

Blade Prevents Work from Binding on Circular Saw

To keep work from binding on a circular saw, a short blade of the same thickness as the saw cut can be rigidly fastened



Blade Attached to Table Behind Circular Saw Keeps the Work from Pinching It

so that it will project above the table into the saw cut to keep the wood from pinching. The blade should be ground to a slight taper at the front edge.

Shut-Off for the Water Hose

During the summer months when the lawn and garden require sprinkling, many steps can be saved in running back and forth to shut off the faucet at the house by providing an iron clamp and slipping it over the hose at a convenient distance from the sprinkler. This will squeeze the hose together at that point and allow moving the sprinkler without getting wet.

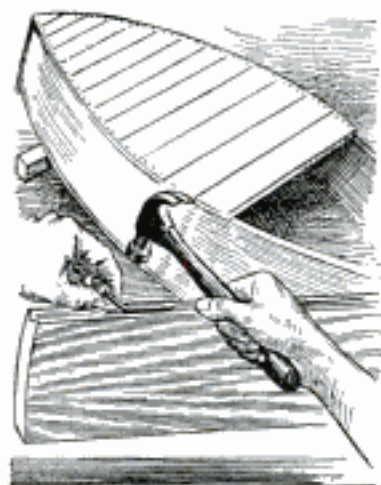
☛ Dry flies can be restored to their original shape by steaming them. This softens the hackle so that it can be forced into place and the wings set at correct angle.

Hints on Cleaning Upholstery

In cleaning upholstered furniture, care should be taken not to get the padding wet as it is difficult to dry, and may become musty. Strong chemicals should not be used, as they cannot be rinsed out thoroughly. A sponging with carbon tetrachloride will usually remove grease spots, and any excess chemical that cannot be wiped off will soon evaporate. When water is used, the sponging cloth should be well rung out, repeating the operation as many times as necessary. Before cleaning upholstery, it is a good idea to test the material for color fastness by sponging a hidden portion with a white cloth. Water mats the nap on velours and mohair and causes spots, but these can be removed by running a warm iron over a damp cloth placed over the spot. Be careful not to press down the nap, and brush it carefully with a stiff-bristled brush afterward. Leather dries out easily and may be rubbed with castor oil to restore it.

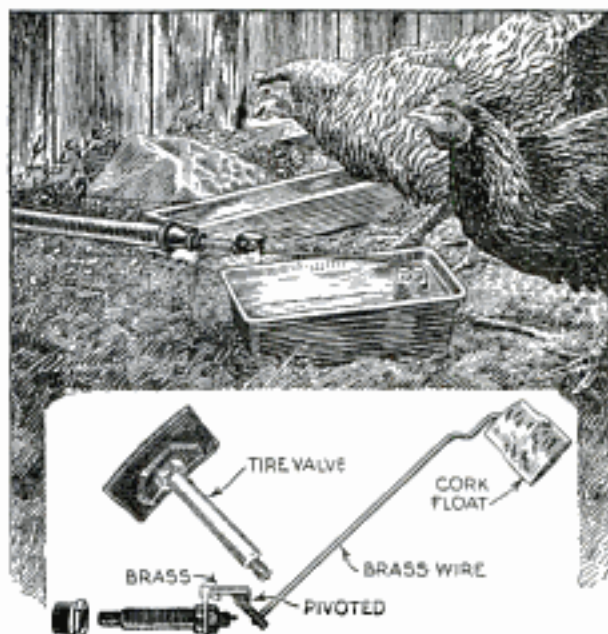
Making Rowboat Seams Watertight

To make the bottom of a rowboat on which the planking runs crosswise watertight, a groove was hammered on the edge of each piece by means of a bent spike as shown in the drawing. After making the groove, the high spots were removed by running a plane over the edge to make a good fit. The joining edges swell together.



Gasoline Kills Weeds in Lawn

According to experiments carried on by federal experts, an effective method of killing plantain is to daub the weed with gasoline. A paintbrush is handy for this purpose. The best time to do the work is when the ground is dry. It is a good idea to tie the brush to a long handle so the work can be done without stooping.



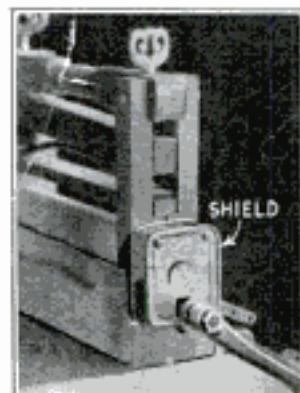
Automatic Control for Chicken Water Pan Made from Old Tire-Valve Assembly and Pipe Reducers

Automatic Chicken Waterer Made from Tire Valve and Pipe

Attached to the end of a water-supply pipe, an old tire-valve assembly can be used to automatically keep the pan filled. Cut off the base of the valve stem and attach it to the end of the pipe by means of reducers. Then drill one end of a strip of sheet brass, bending it at right angles, and attach it to the valve end of the stem with locknuts. Hinge a brass plate to the strip and solder a brass-wire arm, with a cork float fastened at one end, to the plate so that it will operate the valve, as shown in the detail.

Shield for Clothes-Wringer Gears

Fingers and clothes may be protected from the oil-covered gears of a clothes wringer with a shield made from a square can as shown. Cut the can in two so that it is wide enough to cover the gears, and slot the bottom for the passage of the handle shaft. Nails or long screws driven through the corners of the can hold it securely to the wringer frame. —L. Mitchell, San Francisco, Calif.





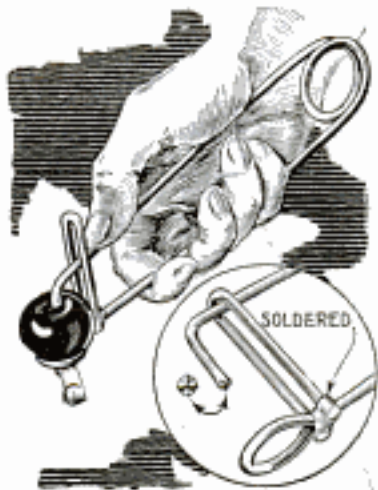
Location of Oarlocks Determined by Measuring from Edge of Rowing Seat with Forearm

Locating Boat Oarlocks Correctly

This method of fitting the oarlocks of a boat in the proper place eliminates guesswork. Put your elbow on top of the boat in line with the edge of the rowing seat, and extend the forearm along the side with the hand closed. The correct location for mounting the oarlock will be at the end of the knuckles.

Cherry Stoner Made of Wire

An efficient cherry stoner can be made from a piece of heavy spring wire by bending it as shown in the drawing. A loop large enough to hold a cherry is made on one end, and a coil is formed in the center. The other end is bent at right angles and is filed crosswise to form four points. The punch is guided by a 4-in. length of wire bent to a U-shape and soldered close to the loop on the other end.

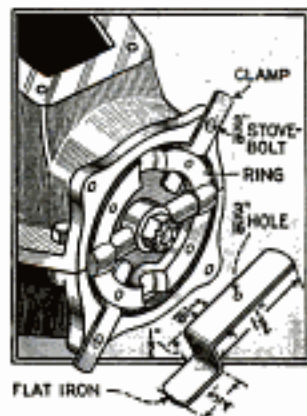


Keeping Ants Out of Beehives

After trying several ways of ridding my beehives of ants, I found the following method effective: All of the hives were moved a few feet away from the ant nests, which were directly under the hives. Spikes were driven part way into the underside of the corners of some spare bottoms I had on hand, and the hives were transferred to them. The spikes were set in shallow tins, which were partly filled with water and then filled up with old crankcase oil to prevent evaporation. This method has successfully kept my hives free of ants.—P. H. Ashby, Edmonton, Alta., Canada.

Clamps for Assembling Universal Joints in Cars

Universal joints on some cars are difficult to assemble, because half of the joint fits into the housing so that it slips out of line when an attempt is made to fasten the other half to it. To overcome this trouble, two flat-iron clamps can be screwed to the housing as shown, to hold one half of the joint in position while attaching the other half.—Lemuel Harris, Nogales, Ariz.

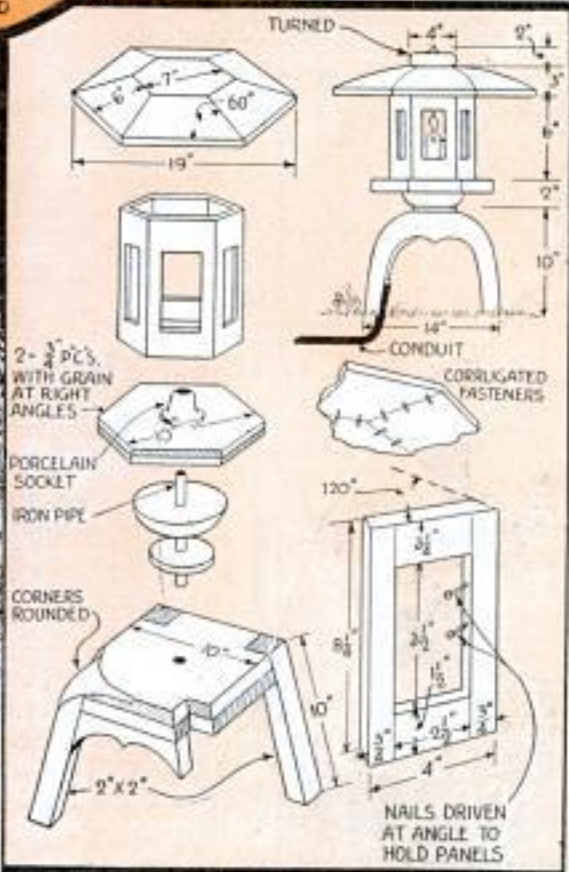
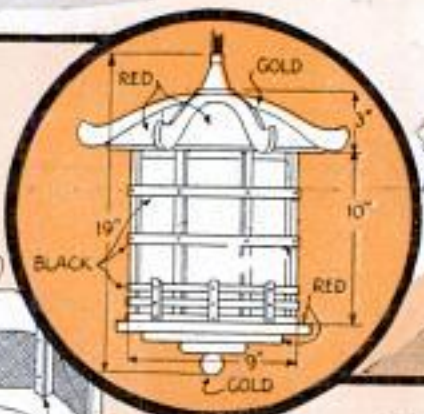
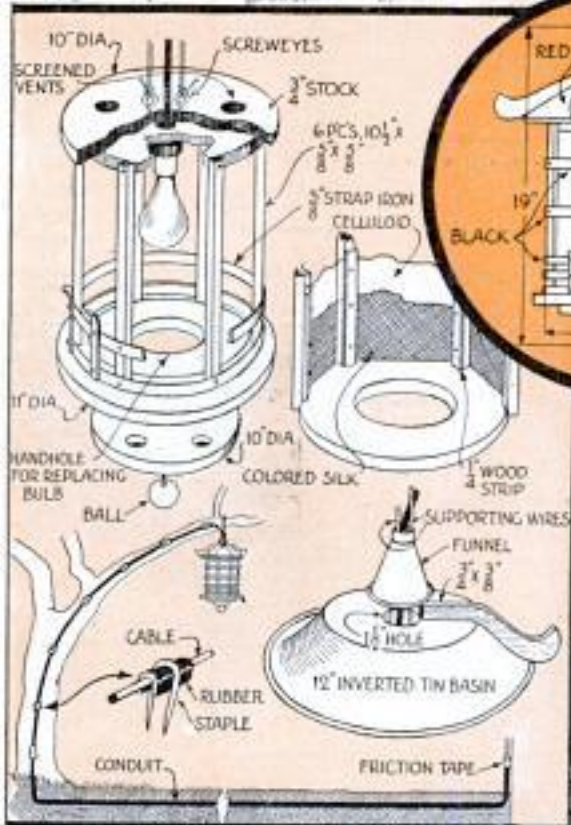


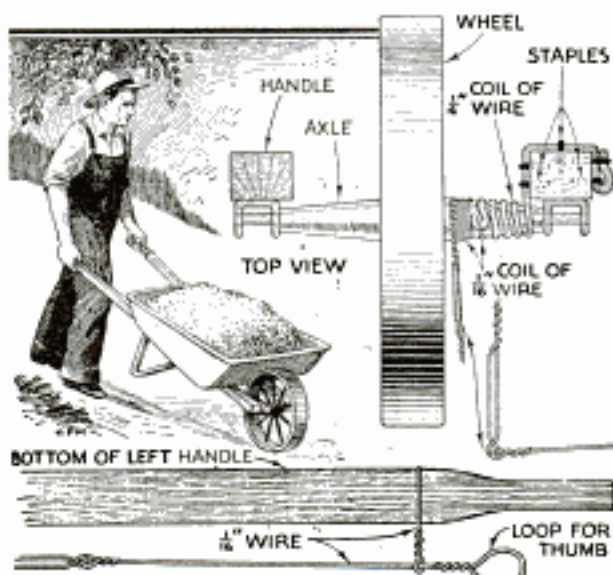
Checking Up Exhaust and Intake Valves

When in doubt as to which is the intake and which the exhaust valve in an auto, crank the motor until both valves in No. 1 cylinder are closed. Then continue cranking slowly until one of them opens. This one is the exhaust valve, and the other, of course, is the intake valve, as it always follows the exhaust. A simple method of checking the valves for leakage is to let the motor run at idling speed and hold your hand close to the rear end of the exhaust pipe. If a suction is felt, the valves are leaking.

☛ Car windows that stick can be lubricated by rubbing the slides with the lead of a large carpenter's pencil.

Two UNUSUAL LAMPS for Your Garden





Brake Made by Coiling Wire around Axle Holds Wheelbarrow When Going Downgrade

Brake on Wheelbarrow Controlled from Handle by Thumb

You can equip your wheelbarrow with a simple brake that will be handy when taking heavy loads downgrade. Fasten one end of an 18-in. length of $\frac{1}{4}$ -in. wire to the wheelbarrow frame and coil the remainder around the axle. Then tie a 2-ft. length of $\frac{1}{16}$ -in. wire to the end of the larger wire and coil the remainder around the axle as shown. Make an eye on the free end and fasten this to a small rod or a heavy wire, looped at one end for the thumb. This piece is fastened to one handle of the barrow by means of staples in which it slides. A slight pull on the loop with the thumb will tighten the wire coils on the axle and produce a braking action. —Grayland Larsen, Daggett, Mich.

Coffee Can Holds Spare Tube



To keep a spare inner tube from being damaged by rubbing against tools in a car, make a carrying case from an old coffee can. The only alteration of the can necessary is to cut a slot in the side so that the valve stem projects as shown.

Cause of Excessive Oil Consumption in Model-A Ford

In one case, excessive loss of oil in a model-A Ford was traced to the drain hole beneath the flywheel housing. Normally the hole is partly closed by a cotter key to prevent entrance of dirt, but still permit drainage from the flywheel and clutch housing. The key became bent so that it allowed oil to leak past the pin, but prevented air from entering, which tended to create a vacuum in the housing, and to draw oil out of the crankcase through the rear main bearing. The car owner aggravated this condition by pressing the oil-filler cap too tightly on the filler pipe, which also serves as a crankcase breather. This caused a slight pressure to be built up in the crankcase, and it was drained completely within a short time through the combined agency of these two faults. The remedy for this condition is, of course, to straighten the key so that it fits loosely and to see that the filler cap is not pressed on too tightly.

Oilcloth Keeps Rugs from Slipping

To prevent accidents caused by rugs slipping on highly polished floors, sew a piece of oilcloth to the underside of the rug so that the shiny side of the oilcloth is next to the floor. Rubber from old inner tubes can also be used for this purpose.



Taking Photos Overhead in Crowd

"Pole" photography may be used in crowds or any place where it is necessary to have the camera raised above the head. Any small camera fitted with a trip lever on the shutter can be used. The camera is fastened to the end of a slender pole, with a string leading from the trip lever so that the operator below can snap the pictures. The pole may consist of several sections, in which case brass sleeves, such as are used on fishing rods, will be found handy for joining them. First focus the

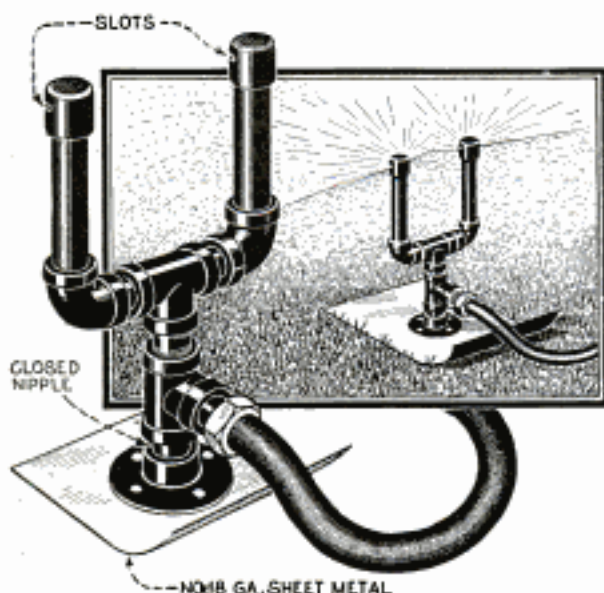
camera carefully on the scene, then set the shutter and tie a string to the trip, after which the camera is mounted on the pole. Hold the pole in a vertical position and when the scene is right to be photographed, trip the shutter.

A Substitute for Typewriter Ribbon

In an emergency, carbon paper makes a good substitute for a typewriter ribbon. The latter is removed and the carbon paper is inserted between a sheet of thin paper and the sheet upon which the typing is to be done. Different-colored carbon paper can also be used for writing letters in different colors by inserting the colored strips of paper where they are needed. It is best to use new carbon paper for this purpose to assure clear impressions.—L. M. A. Roy, Berniker, N. H.

Flower Sprinkler Made of Pipe and Fittings

For spraying flowers that are often damaged by a direct stream of water, this sprinkler throws a finely divided spray, which falls on the plants without damaging them. It is made of pipe fittings with the exception of the base, which is a piece of sheet metal curved up at one edge to permit the sprinkler to be moved without raising it off the ground. The water is forced out through narrow slots sawed in the pipe caps screwed to the top of the sprinkler.—J. Downie, San Antonio, Tex.



This Sprinkler Throws a Horizontal Spray, Which Falls on Flowers without Damaging Them



Guards of Rubber or Metal Help to Prevent Locking of Car Bumpers

Guards Prevent Locking of Bumpers

To prevent his bumpers from locking with those of another car, one owner put short sections of tire casing on them, fastening the sections with wire clips. Another method is to clamp two short pieces of flat iron to the bumper. The pieces may be enameled or chromiumplated.

Vibration Drives Moles Out of Garden

After trying several methods of ridding my garden of moles, I used the following one successfully: Several weathervanes, fitted with propellers, were mounted on poles set at frequent intervals about the garden. The wind turning the propellers caused a vibration, which was transmitted through the poles to the ground, and the moles, being sensitive animals, soon vacated the premises. The weathervanes also serve as ornaments in the garden.—Howard H. Campbell, West Toledo, Ohio.

¶ To sand large surfaces easily, place a flatiron in the center of a sheet of sandpaper, grasping two sides of the paper to the iron handle. The weight of the iron makes it unnecessary to apply pressure.

You Can Install This Invisible Car Antenna



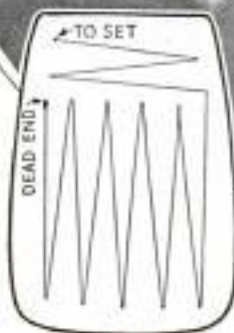
If you have a radio receiver in your car, and are in doubt as to the efficiency of the antenna, disconnect the wire from the set antenna post and grasp this post with one hand. Sitting in the car, tune in a station at normal volume; your body is now acting as an antenna. If you thrust your free arm out of the window you will note an immediate increase in volume. This indicates that your arm outside the car is more effective in picking up programs than your entire body inside. This 50-ft. invisible antenna lies flat on the roof outside of the car and the increased pick-up thus obtained is well worth while. Distant stations, that you were unable to receive before, will come in with good clarity and volume. The antenna consists of very fine enameled-copper wire, run in zigzag fashion over the roof, and at no point is it closer than 6 in. to the metal body of the car, as shown in the sketch.

To install the antenna, be sure that the car top is clean and dry. About 50 ft. of

No. 36 enameled wire is provided, and a 3-ft. length of No. 24 enameled wire is soldered to one end for the lead-in to the set. At a point on the roof directly over the receiver, and where no part of the roof structure interferes, a hole is punched with a needle or pin, as shown in the upper photo. The hole size is just sufficient to permit the insertion of the length of No. 24 wire. This wire is pushed down through the roof into the passenger compartment, leaving about $\frac{1}{4}$ in., to which the smaller wire is soldered, extending above the roof. This short

end is bent over at right angles and the fine wire is run back and forth across the roof in the design shown in the diagram. The wire is held down temporarily with small pieces of adhesive tape in the manner shown in the photo at center.

It is now painted



other with brushing lacquer, as shown in the lower photo, except where it is held down with the adhesive patches. Thin waterproof glue or top dressing may be used but lacquer dries quicker. When dry, and the wire is held firmly, remove the patches

(Continued to page 118A)

FIVE-METER Receiver from JUNK-BOX PARTS

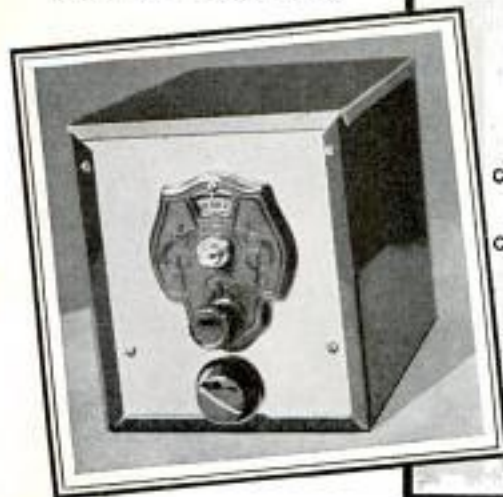
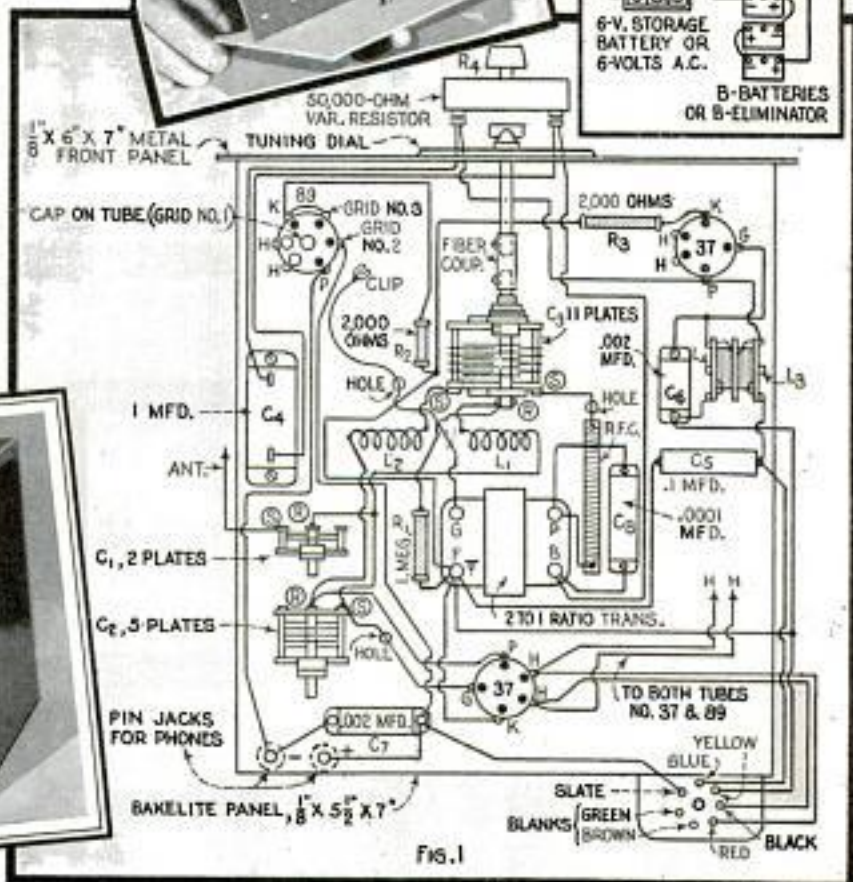
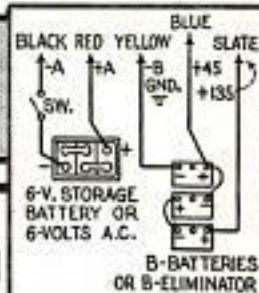
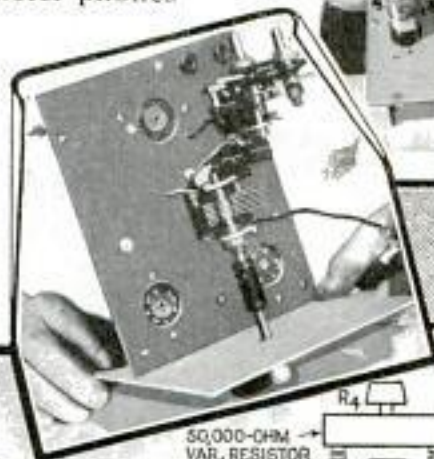
PART I

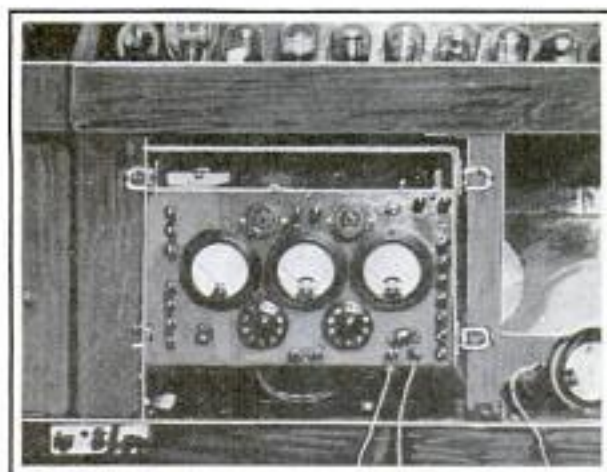
WAVELENGTHS below 10 meters offer an interesting field to the experimenter. These ultra short waves, until recently thought to be useless, have been found ideal for short-distance work and comparatively free from many of the longer-wave handicaps. They act something like light as they travel in a more or less straight line and do not follow the curvature of the earth, or bend around obstacles, as do the longer broadcast frequencies.

Amateurs are now operating 5-meter phones in and near the larger cities and it is understood that regular television programs will eventually be broadcast on wavelengths below 10 meters. Very little power is required and ranges up to 50 miles are practical. Distance, however, depends on the height of the transmitter above the earth for the same reason that a lighthouse must be high in order to serve the widest possible area.

The little 5-meter receiver, to be described, can be built from odds and ends, and the construction details for a simple transmitter using receiving-type tubes will

(Continued to page 116A)





Hooks at Rear of Workbench Support Test Set by Its Cover Clips

Bench Mounting for Radio Test Set

Radio test sets, in common use about the workbench, are usually of the flat type that take up much-needed room on the bench. In this position they are subject to damage and the test leads are often tangled up with other apparatus. Most of these instruments are of the portable variety with a removable cover that is held in position with clips. The photo shows how these clips may be used to hang the test set on hooks at the rear of the bench. In this position it is out of the way but easily accessible for immediate use, and the meters are protected.—Ronald L. Ives, Upper Montclair, N. J.

Midget Receiver Includes Phonograph

This 7-tube midget superheterodyne radio receiver, with built-in phonograph turntable and pick-up, enables the owner to enjoy either radio programs or electrically cut phonograph records of the new long-playing type. These records are

reproduced through the audio amplifier and dynamic speaker. The receiver circuit includes the new type-55, 56 and 58 tubes, with a 47-pentode for the audio output; the rectifier is a 280. With the top of the cabinet down, the turntable is completely hidden.

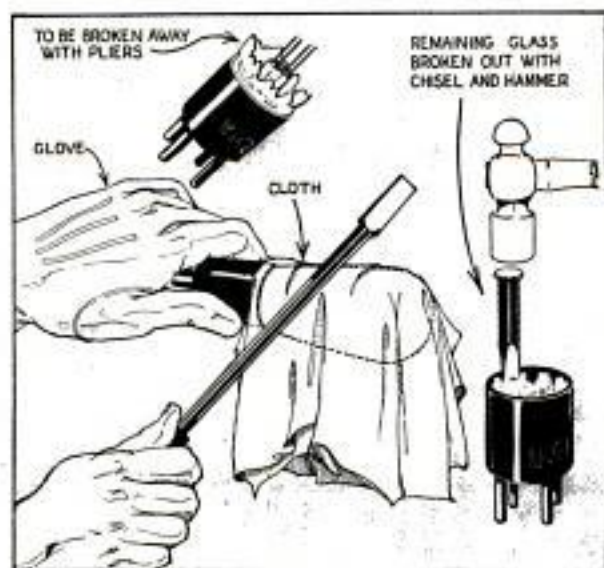


Wholesale Radio Service Co. Inc. 100

6th Ave New York

Removing Glass from Tube Bases

Bases salvaged from old radio tubes make excellent forms for winding short-wave plug-in coils. The usual method of placing the tube in boiling water to soften the cement, used to seal the glass bulb in the base, does not work so well with the later types of tubes. The cement is difficult to soften and the hot water damages the appearance of the base. Bases removed in this manner must also be thoroughly dried before they are suitable for use as coil forms. A better method is shown in the sketch. The cloth is wrapped around the bulb, which is broken by a sharp blow with a heavy screwdriver. Most of the remaining glass may be broken away with a pair of pliers, and a small chisel can be used to complete the job. The wire leads are easily removed by heating the prongs with a soldering iron.



Bases Removed from Discarded Tubes Make Good Plug-In Coil Forms

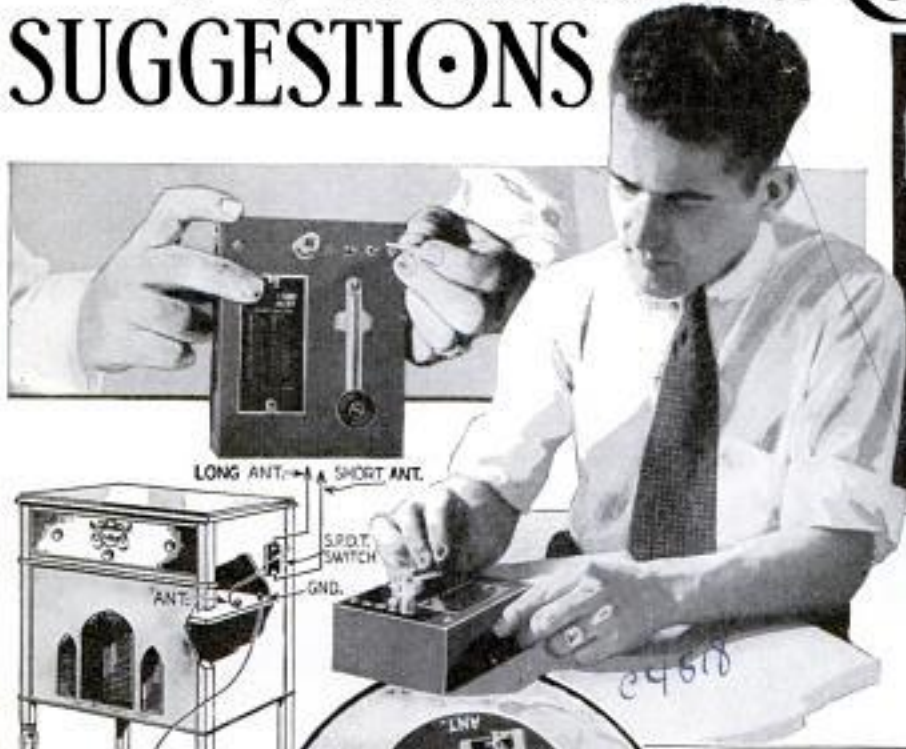
Soldering Phone-Cord Tips

The small connecting tips on the ends of phone, or loud-speaker cords, are held in place by means of a few drops of solder. When these connections break, the average set owner has difficulty in resoldering them. This may be simplified by drilling a small hole in the side of the tip. The wire is then inserted and the end brought out through the hole. When held in this manner, the solder is easily flowed into the tip, thus making a good mechanical and electrical connection.

*General Radio Co
30 State St
Cambridge
Mass*

Practical Radio

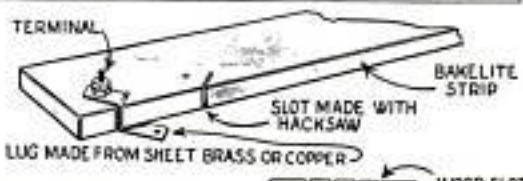
SUGGESTIONS



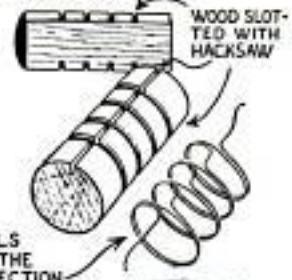
Molded Porcelain Coil Form Is Complete with Plug and Jack Plates; Left, Boy Scout Triple-Signal Code Set Includes Radio, Telegraph and Night-Blinker Signal Units



Above, Switch for Changing from Indoor to Outdoor Antenna Post; Right, R.F. Filter for Shielded Antenna Lead-In Prevents Signal Losses at Receiver



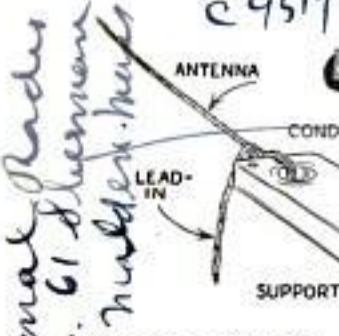
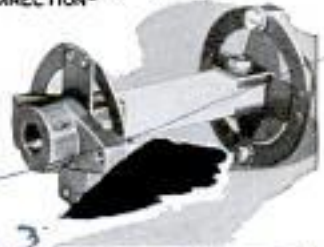
Above, Non-Slip Soldering Lug for Homemade Terminal Strips; Right, R.F. Choke-Coil Form Made from Broom Stick; Slots Are 3/4 In. Apart



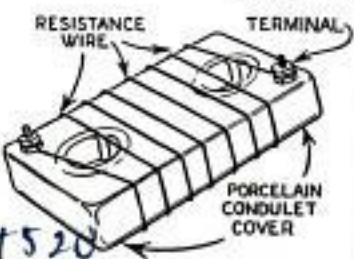
ALL COILS WOUND IN THE SAME DIRECTION



Left, Full-Vision Dial for Short-Wave Receiver Insures Accurate Reading Necessary for Tuning in Distant Stations; Right, Insulated Shaft Coupling Has Two Universal Joints



Discarded Porcelain Conduit Box Covers Make Good Antenna Insulators, Also Useful for Winding Heavy-Duty Resistors to Reduce Filament Transformer Output; Extreme Right, Handy Touch-Up Kit Removes Scratches from Radio Cabinets



*John H. Blentchman
C. Canton Mass*

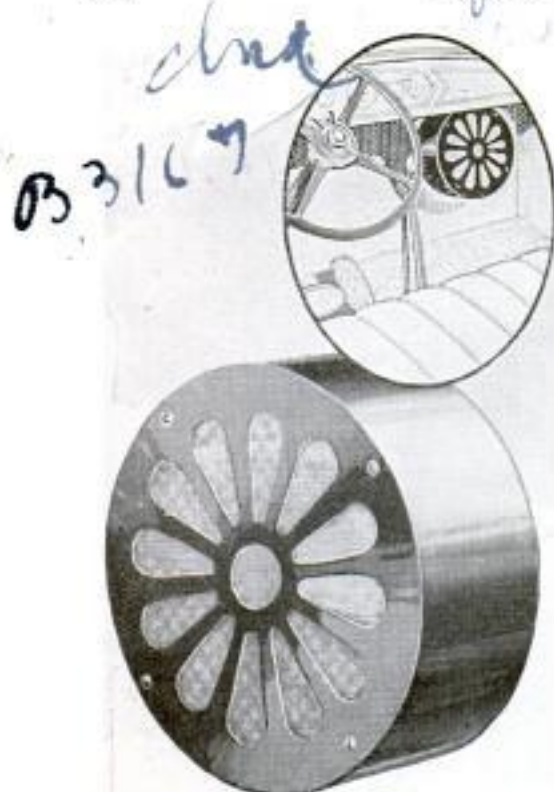
National Radio Co. Inc. 61 Sherman St. Malden Mass

*John P. Ryan
221 N. 23rd St
Chicago*

*National Radio Co
Inc. 61 Sherman*

Malden Mass

Radiolec Co, 601 W Randolph St, Chicago



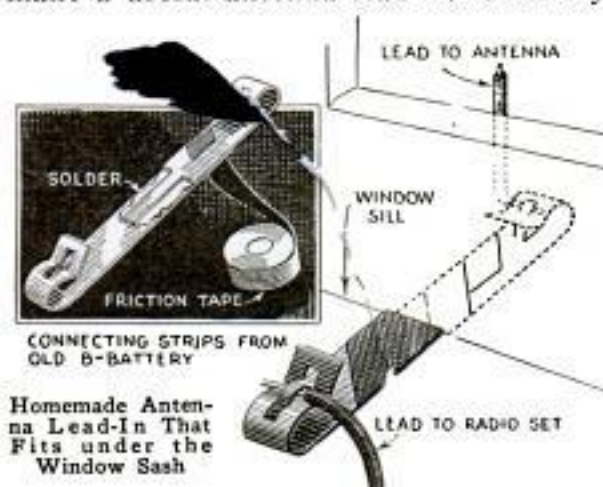
Dynamic Speaker for Autos; Method of Installation Is Indicated Above

Auto Speaker with Single-Stud Mounting

Only one hole in the fire board under the dash is necessary for mounting this dynamic speaker. Bracket mountings are also available if desired. The rugged assembly and dustproof design enable the speaker to withstand rough usage. The unit is designed to meet the tone problems in auto installations and takes up very little room under the dash.

Antenna Lead-In from Battery Strips

Two of the large connecting strips taken from a discarded B-battery, of the layer-built type, may be soldered together to make a useful antenna lead-in. Ordinary

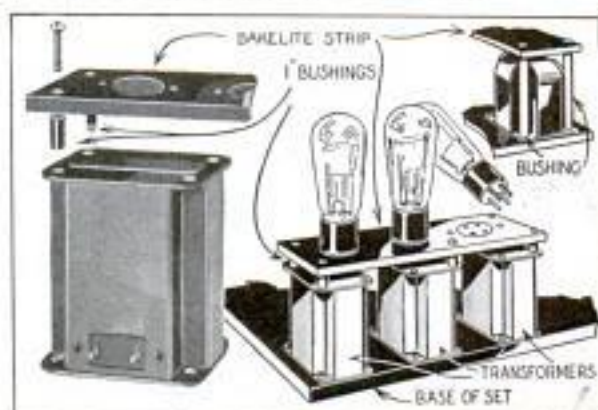


Homemade Antenna Lead-In That Fits under the Window Sash

friction tape is wound around the portion that comes in contact with the window sill. These connecting strips terminate in handy spring clips, and the connections are made as shown in the sketch.

Compact Audio-Amplifier Assembly

When laying out the parts for a midget receiver, the writer found that considerable space could be saved by mounting the audio-amplifier tubes on a bakelite strip above the transformers. Several manufacturers house their audio transformers in flat-top cases of the type shown in the sketch. The top and bottom plates are drilled for mounting screws, and all that is necessary is to provide bushings of sufficient length to raise the bakelite strip so that the tube-socket terminals will clear. The sketch at upper right shows how the same idea may be applied to round-top transformers. In this case longer bushings are mounted directly on the subpanel. —H. Radzinsky, New York City.



Tubes Mounted above Audio Transformers Conserve Space in Midget Receiver

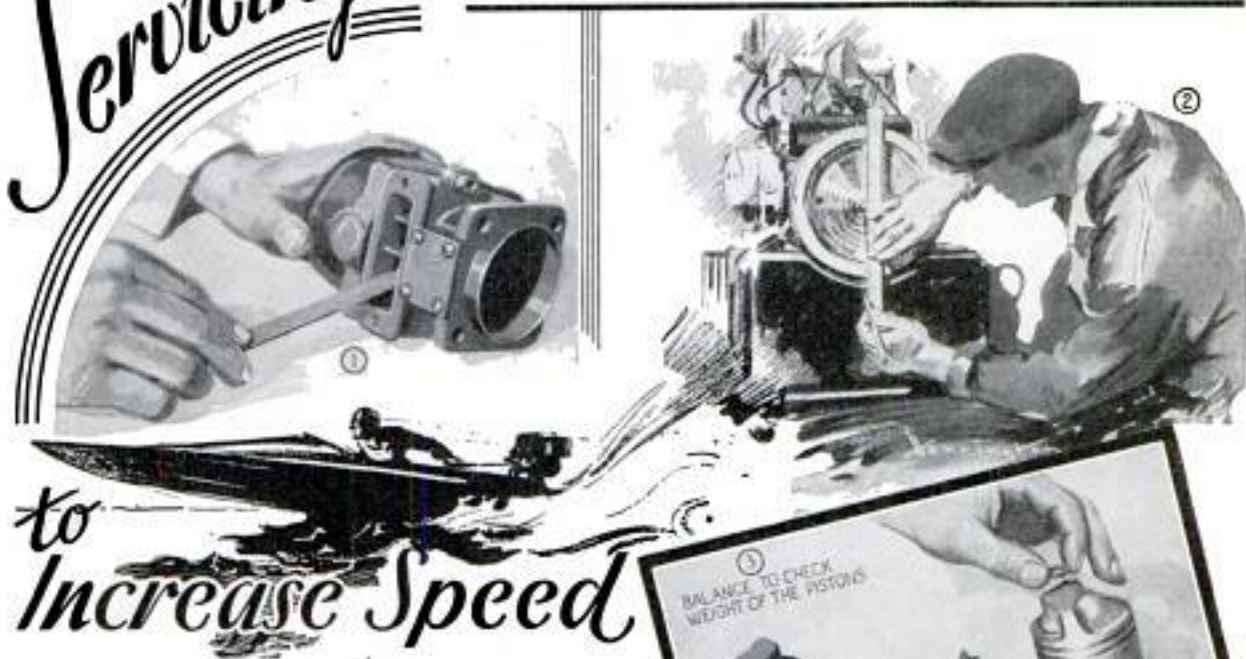
Improving Tone of Old Receivers

In many of the older receivers, the plate of the detector tube was by-passed with a fixed condenser of rather large capacity, usually .001 mfd. The result was that most of the higher tones were not permitted to enter the audio amplifier. If a smaller condenser is substituted, the improvement in tone will be well worth while.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; when material lists are not included in the articles, these are available without charge on receipt of postage.



Servicing OUTBOARD MOTORS



OF the two classes of outboard motors, those for service and those for speed, a service motor cannot be expected to show the speed of a racing job. Neither should you expect to get the endurance and reliability from a racing motor that a service motor will give.

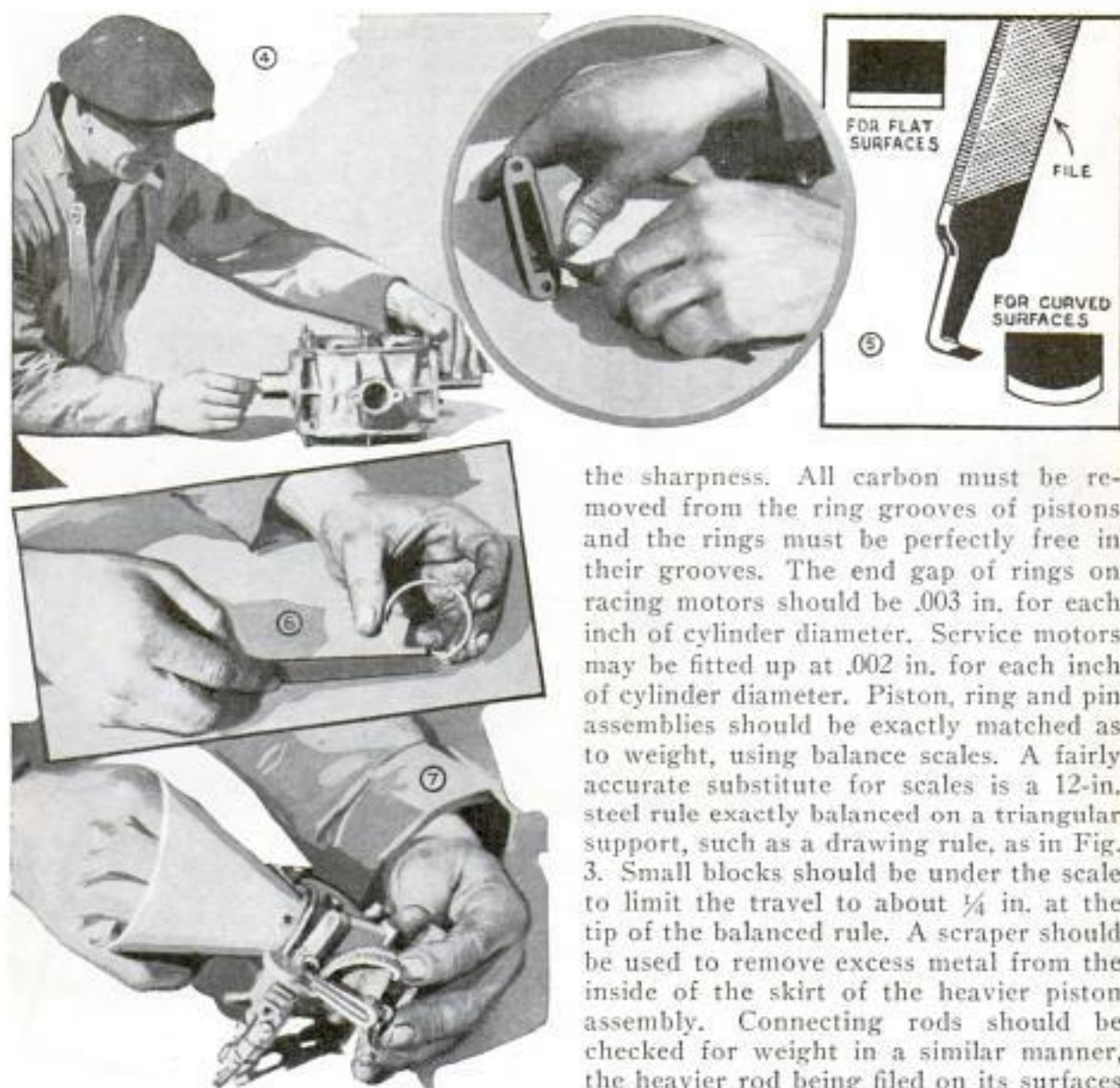
For maximum performance, a motor must be perfectly free. To hasten the breaking-in process, many racing drivers remove all fittings from the block and crankcase assembly, and run the "power head" in with the aid of a lathe, electric drill, or small motor. While running this part in, a thin mixture of light oil and Bon Ami is introduced through the intake and allowed to work out of the exhaust ports. On some motors it may be more convenient to let the mixture enter the exhaust ports. The object is to get most of the mixture on the pistons and rings. Drippings may be caught in a pan and



by C. E. PACKER

used over and over again. As the action of this mixture is very slow, it will take about four hours of running with the engine turning over in the neighborhood of 400 r.p.m. to free it sufficiently. At the end of the run, the power head should be completely dismantled and thoroughly washed with gasoline.

When the crankshaft is assembled in the crankcase, the shaft should turn so freely that it can be spun between the thumb and fingers as in Fig. 4. If it binds in any place, a very fine file may be used to remove any possible high spot from the shaft, or a scraper may be used on the

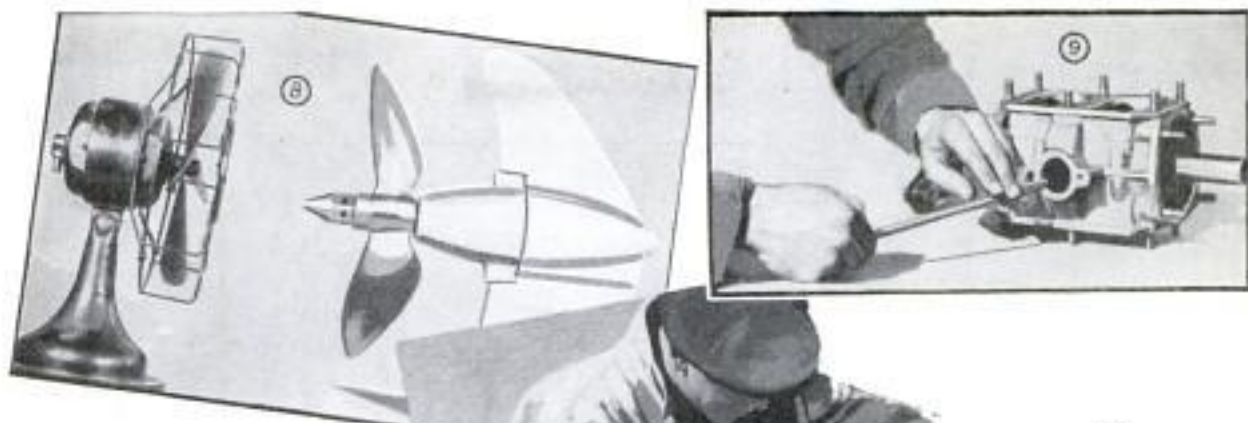


bearings. The ideal wristpin fit is one that shows no up-and-down play yet is free enough so that when the rod is held vertically in the hand and moved gently from side to side the piston will "flop" from side to side. For racing, connecting-rod bearings are fitted very loosely on the crankshaft. Fitting them so that they are just snug but not tight, when a single thickness of newspaper is surrounding the shaft, will give about the right clearance when the paper is removed. For service use, rods are fitted so that they are perfectly free yet not noticeably loose. The razorlike edge that develops on piston rings should be removed by gently stroking the ring with a fine flat file as in Fig. 6. The edge should not be appreciably rounded, but just touched with a file to remove

the sharpness. All carbon must be removed from the ring grooves of pistons and the rings must be perfectly free in their grooves. The end gap of rings on racing motors should be .003 in. for each inch of cylinder diameter. Service motors may be fitted up at .002 in. for each inch of cylinder diameter. Piston, ring and pin assemblies should be exactly matched as to weight, using balance scales. A fairly accurate substitute for scales is a 12-in. steel rule exactly balanced on a triangular support, such as a drawing rule, as in Fig. 3. Small blocks should be under the scale to limit the travel to about $\frac{1}{4}$ in. at the tip of the balanced rule. A scraper should be used to remove excess metal from the inside of the skirt of the heavier piston assembly. Connecting rods should be checked for weight in a similar manner, the heavier rod being filed on its surfaces to reduce its weight.

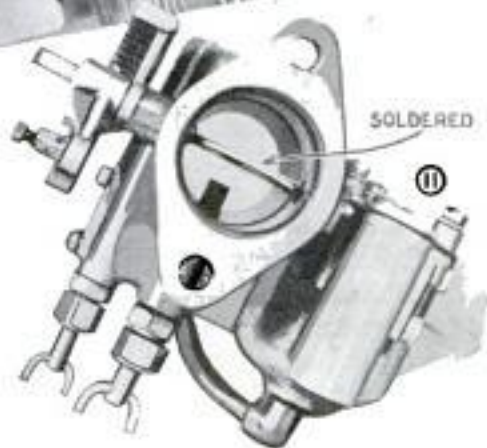
In regulated racing, no material change in motors is permitted, that is, no change may be made that will alter the original factory design materially. All that may be done is to perfect but not alter. Metal may be removed merely to polish surfaces—not change dimensions; to balance parts that should be of the same weight—not change the intended weight of both; to smooth up ports and openings—not materially enlarge them.

Cylinder ports should be filed smooth as in Fig. 1. The center struts in these ports should be streamlined so that the outer edge will be like a knife blade. This will help to increase the speed with which gas can enter and leave the cylinders. Similarly, all passages from carburetor air intake to exhaust tail pipe should be pol-



ished. Much of this work can be done with scrapers made from the tangs of old flat files, as in Fig. 5. If the inside of the carburetor air horn is rough, scrape the inside smooth. In the same way, take care of the carburetor at both ends. This, however, will probably be smooth enough except for a sharp edge at each end. Smooth this edge down with fine emery cloth held over a child's ordinary spinning top or similar conical piece of material, as in Fig. 7. Follow the same method with the intake manifold, if there is one, and the exhaust connections. It is especially important to see that there is no ridge where the carburetor joins the manifold or crankcase. Such a ridge might be formed by a poorly fitted gasket projecting into the air passage or by lack of alinement between the two parts. The latter condition can be corrected by making the bolt holes egg-shaped and lining up the parts, after which the nuts are tightened. The better way is to use a scraper to smooth up the joining surfaces so that there is a perfectly uniform surface, as in Fig. 9. As the gases must pass through the crankcase, it is important that the inside of this member be scraped smooth, too. Scrape as far as possible into the passages of the cylinder castings. Also smooth up all muffler surfaces, leaving out the inside baffles for racing. However, outboard motors without mufflers are illegal in most states except during races, and during approved tune-up periods before the events.

About the only carburetor change aside from buying a racing carburetor, is to



sweat-solder the butterfly or throttle valve to its shaft, Fig. 11. Then, with a fine file, cut down the shaft on each side of the valve so that it offers the least resistance to air. An old pressure gauge that reads up to 50 lb. for service motors and 100 lb. for racing motors, can be used to check the compression of the cylinders, as in Fig. 10. The important point is to see that all cylinders reach the same pressure within a couple of pounds, and that the pressure drops at about the same rate in each cylinder. By tapping the crankcase for a $\frac{1}{8}$ -in. fitting, the gauge can also be used to check crankcase compression. Lack of compression or fast-dropping pressure in the cylinders may be due to worn cylinders, rings or pistons. A similar condition



in the crankcase may be due to the conditions just mentioned, to worn main bearings or leaking crankcase gaskets.

Four-cylinder motors have in effect two ignition systems and these systems must be in perfect synchronism for best results. To check the ignition of a "four," bring one piston to top dead center as indicated by a steel scale or dial gauge. Then lay a straightedge across the flywheel so that it just touches the center of the shaft, as in Fig. 2. Make a scratch on the gasoline tank and two on the flywheel, which will be exactly 180° apart. By means of a test light in series with the pair of points that fire the cylinder which is on top center, move the spark lever until the points just open. See that the lever does not move again as you turn the flywheel 180° so that the other pair of pistons are on top center, as indicated by the second mark. At this point the second pair of breaker points should just open, indicated by the test light, which has been transferred to this circuit. If the breaker points do not open exactly 180° they can be made to do so in the following manner: Reduce the gap between the points to make them open later, and increase the gap to make them open earlier. The final setting should have the points opening as close as possible to factory specifications, but to open exactly 180° apart is more important than the distance they open.

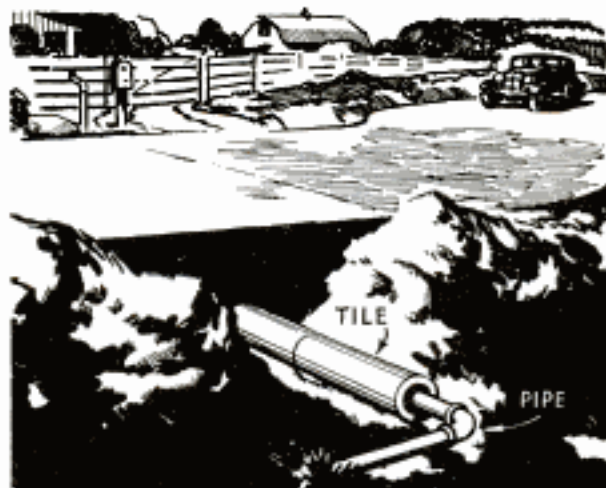
The lower unit should be so adjusted that there is no appreciable "slop" in the gears, and yet no binding. When doing this don't be fooled by a loose propeller shear pin. The first step is to wash out all the old lubricant. Inspect the bearings for wear or chips and replace faulty bearings. Set the unit up and test for high spots on

the gears. If any appear, as indicated either by bright spots or binding, the unit can be belted to a small motor or coupled to an electric drill to be run in. While running, fine valve-grinding compound should be fed into the gears, taking care to keep the compound out of the bearings. With the gears so run in, the assembled unit should be free enough to continue to run after being started by hand, when

the propeller is in the draft of a small electric fan as in Fig. 8. However, this is the extreme test of free running. For ordinary running, a light gear oil is used in the lower unit but for racing, a light engine oil is used. Light oil leaks out and must be renewed after every heat.

Piping Water under Roadbed

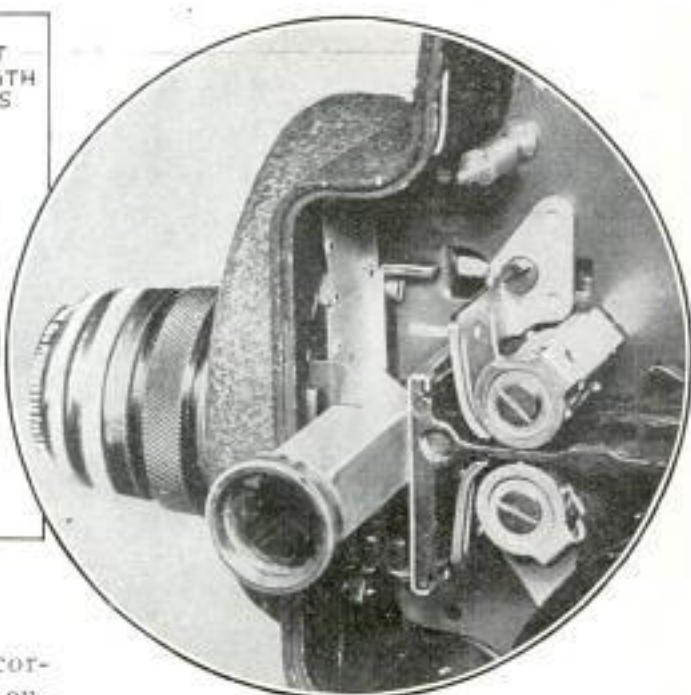
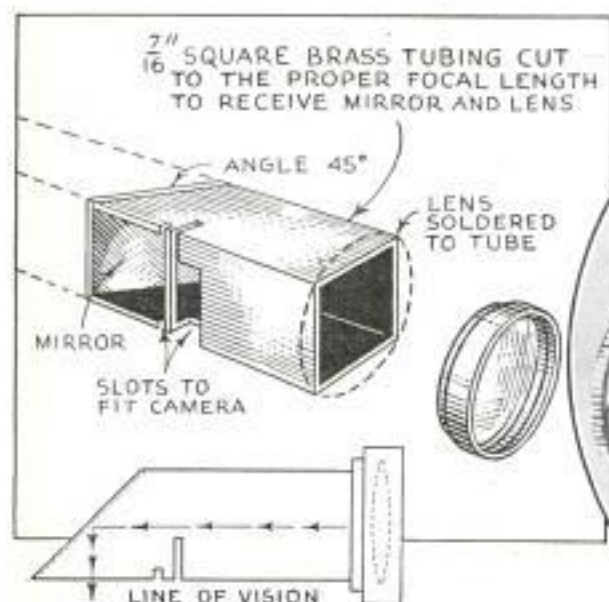
Where water is piped under a road, it is a good idea to provide a sleeve that will make it easy to remove the pipe, when in need of repair, without digging down through the surface of the road. This can be done when installing the pipe by first laying tile under the road and then running the pipe through it. The pipe can then be pulled out at any time without



Tile under Road Enables Water Pipe to Be Removed without Disturbing Road Surface Above

disturbing the road surface. The tile should be plugged at both ends and covered with dirt to prevent water from getting inside and freezing in cold weather. —James R. Ward, Chicago.

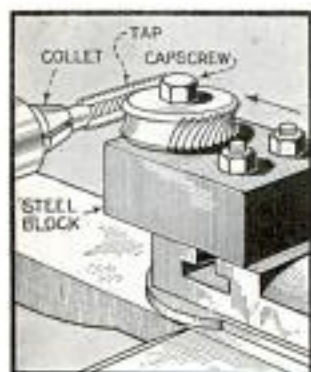
Visual Focusing Device for Movie Cameras



Here is a simple device that aids in correctly lining up movie-title cards, and enables you to visually focus directly in the photographing aperture of the camera. The device is a piece of $\frac{7}{16}$ -in. square brass tubing with one end cut off at a 45° angle and fitted with a mirror, the side of the tube above the mirror being removed so that the image can be shown on the glass. The length of the tubing depends on the focal length of the lens used, the frame of which is soldered to the square end of the tubing. A slight deviation from the drawing may be necessary to make the device fit your particular camera.

Gear Teeth Cut on Small Worm Wheel with Tap

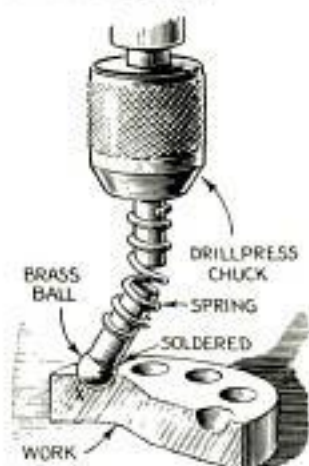
While working in a machine shop, I had to make a small worm gear, and lacking the facilities for cutting the teeth on it, I improvised a means of doing it in a lathe with an ordinary tap. A steel block, of a thickness to raise the center of the wheel in line with the center of the lathe spindle, was tapped for a cap screw upon which the wheel revolved. The assembly was clamped



to the cross slide of the lathe. Then, with the tap held in the lathe collet, as shown, I slowly fed the wheel into the tap. This caused the wheel to revolve and, at the same time, cut the teeth. The diameter of wheel must be correct, or stripping will occur.—Charles Kugler, Philadelphia.

Lapping Spherical Pockets

In making a forming die for ball retainers, it was necessary to lap the spherical pockets after hardening them, which was done by means of a brass ball soldered to a short piece of drill rod. A rigid setup in the drillpress was found unsuccessful as the center point of the lower surface of the ball, at X, would not cut. To overcome this trouble, another piece of drill rod was chucked into the drillpress and fastened to the rod holding the ball, by means of a spring as shown. This arrangement permitted the work to be shifted so that the entire surface of the pockets could be lapped.





Farm Gate Pivoted to Lever Arrangement Is Easily Raised or Lowered to Permit Small Animals to Walk under It

Adjustable Gate for Stock Pens Operated by Lever

This lever arrangement on a farm gate permits it to be raised or lowered so that young stock can walk under it and be fed in pens separated from the older animals. A piece of $1\frac{1}{4}$ -in. pipe is pivoted to the gate post by means of large eyebolts. A smaller pipe is inserted inside the larger one and is held in place by a bolt which rests on top of the lower eyebolt. The gate is then pivoted to the outside pipe by means of two more eyebolts. A lever is next pivoted to the gate and is also pivoted to a curved piece, which is bolted to the top of the inside pipe. After bolting a notched piece to the gate for the tongue of the lever to engage, the gate is easily raised and lowered as desired.—A. Binggeli, Hartford, So. Dak.

Strong Cabinet Clamps from Pipe and Fittings

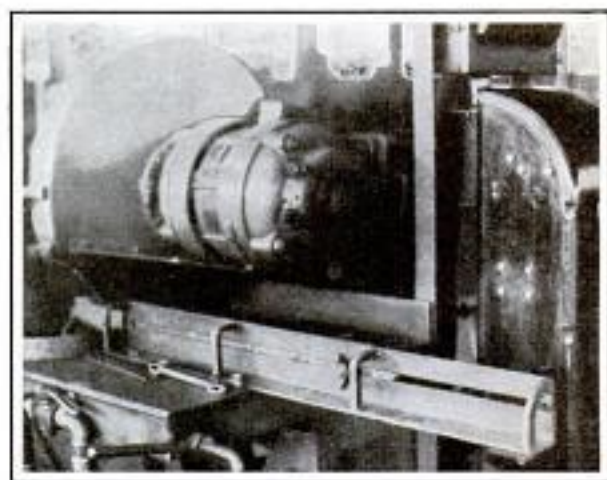
Strong cabinet clamps can be made from pipe and fittings. First screw an elbow onto a length of 1-in. pipe and screw the bull-headed opening of a tee onto the ell. The straight outlets of the tee are then lined up with the pipe, and two pieces of rod are threaded to serve as plugs in the openings of the tee, one being drilled to take a $\frac{3}{4}$ -in. rod, and the other drilled and tapped with a standard $\frac{3}{4}$ -in. tap. A piece of $\frac{3}{4}$ -in. rod is threaded with a similar die

for a length of 6 in. Before it is screwed in place from the end of the tee away from the pipe, a hole is drilled through its unthreaded end to take a $\frac{1}{2}$ -in. steel rod which is to be used as a tightening lever. When the screw has been put through the tee, a loose pipe flange is slipped over the end to furnish a moving, but not a turning surface, to contact with the work to be clamped. This flange, as well as the one to be used on the other arm of the clamp, may have a block of wood attached to its face so as to prevent

marring the work. The sliding stop is made by screwing an elbow into the bull-headed opening of a $1\frac{1}{4}$ -in. pipe tee. This size will slide over the pipe, but will lock by friction in any position when pressure is applied to the male flange, which is screwed into the opening of the elbow adjusted to face the tightening clamp.

Improved Length Gauge for Cold Saw

A length gauge for use on a cold saw can be made from a 42-in. section of 2 by 3-in. angle iron, and a similar length of $\frac{1}{4}$ by $1\frac{1}{2}$ -in. flat iron. The two pieces are joined, with a $\frac{3}{4}$ -in. gap between them, by three curved pieces of $\frac{3}{4}$ -in. square rod, welded at each end. The wide side of the



This Length Gauge for a Cold Saw Is Made from Angle and Flat Iron

angle is bolted to the bed of the machine. A stop is made from a piece of angle iron by welding a smaller piece on it to project through the gap. This piece is drilled and tapped for a stud, which is fitted with a washer and wingnut for adjustment of the stop.

Inserting Small Screws in Carburetor

The insertion of small channel-plug screws commonly used in modern plain-tube carburetors is easy when a few simple rules are followed. If a short screwdriver is available, the screw is held on the end of the blade with the third finger of the right hand. The index finger of the same hand is placed on top of the handle to press the screw into its hole while the blade is rotated between the thumb and the middle finger. Use of a longer screwdriver makes the operation slightly more difficult, as it is then necessary to stretch the fingers further apart.—A. H. Vance, Harshaw, Wis.

Rubber Hose Protects Scythe Blade

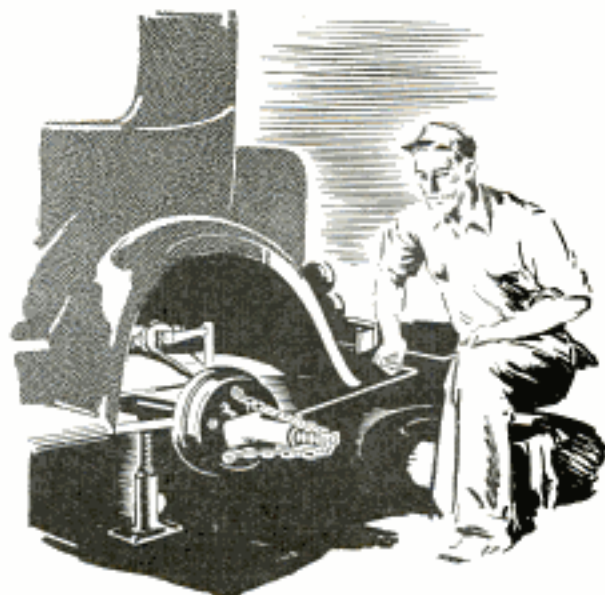


SLIT GARDEN HOSE

To protect the cutting edge of a scythe, a section of rubber hose is slit along one side and slipped over the blade as shown. This also eliminates the risk that someone may cut his legs when hauling the scythe in a car.

Suction Cups Help in Moving Large Plate-Glass Windows

An easy way to remove plate glass or window glass where the position of the worker is such that it is hard to push the glass from its place, is to apply rubber suction cups, such as are used to hold ash trays on windshields. A suitable handle may be fastened to the small bolts in the cups, after which they are stuck to the window. If the bottom edges of the cups are moistened before putting them on the glass, they will hold better.—Wilfrid L. Dawsey, Washington, D. C.



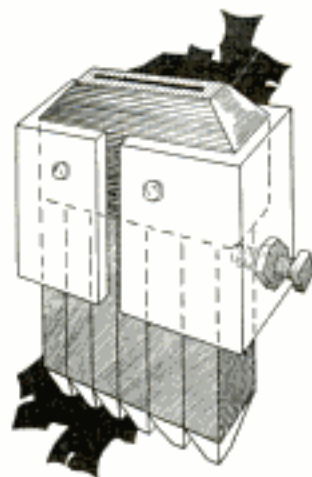
Effective Auto-Wheel Puller Improvised from a Jack and a Length of Chain

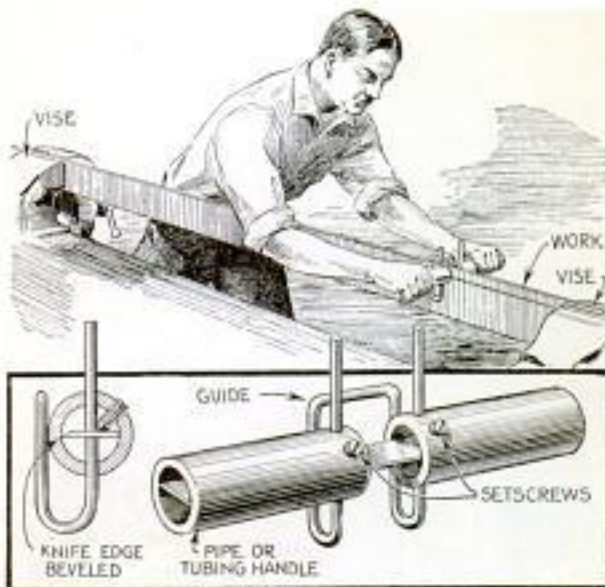
Auto Jack Serves as Wheel Puller

In the absence of a puller for removing the rear wheels of a car, you can use a jack and a length of chain. After removing the retaining nuts, the base of the jack is held against the end of the axle, the chain is run over the top of the jack, and the ends are fastened under two of the wheel nuts in the brake housing. By working the jack with the handle in the regular way, the wheel will be loosened.—L. Mitchell, San Francisco, Calif.

Holder for Metal-Marking Stamps

Made to hold six metal stamps, this holder is handy where work is to be stamped with a number of letters or figures. It is made by bending a piece of $\frac{3}{16}$ -in. flat steel around a steel block of the same length and thickness as that of the six stamps combined. The top of the block is beveled and fastened to the flat piece with steel pins. A setscrew and locknut hold the stamps in position. It may be necessary to grind the tops of the stamps a little, so that they are all of an equal length.





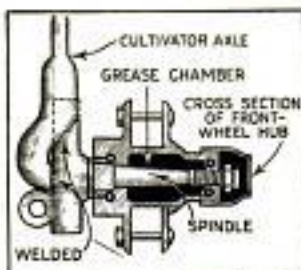
Old Saw Blade Clamped in Sleeve Handles Provides Handy Tool for Slicing Belts

Improved Knife for Slicing Belts

To reduce the width of belts, or to cut them in two along their entire length, a knife can be made from a machine-saw blade. A piece of pipe or tubing is fitted over each end for handles, and an adjustable guide, made of iron rod, slides up or down in holes drilled through the handles and blade. Pointed screws, set at an angle in the handles, clamp the assembly together. Care should be taken to bevel the cutting edge of the blade as shown. In using the knife, the work is first stretched tightly between two vises, after which the guide is set so that it touches the top side of the belt when the blade is in a position to cut the required width. The work is then cut evenly along its length by pulling the knife with both hands, using a slight pressure to keep the guide in contact with the edge of the belt.

Car Spindles and Hubs Adapted to Cultivator

When the axles and wheel hubs of my cultivator became worn, I cut off the worn ends and welded the front-wheel spindles



of an old car on each end of the axle, and adapted the car hubs for use on the cultivator wheels. As the car hubs are fitted with roller bearings, it takes

less effort to pull the cultivator, and the wheels do not require frequent greasing as the dirt cannot get inside the hub.—Angus Banting, Alliston, Ont., Can.

Alternating Taper and Bottom Taps Prevents Breakage

When tapping holes in steel or brass with small taps that are easily broken, I have found it best to use a taper tap and a bottom tap alternately. This keeps them from cutting only a small amount at a time. Start with a taper tap, and as soon as it starts to turn hard, back it out and change to the bottom tap. This will cut easily for a few turns, and when it turns hard, change to the taper tap again, repeating this procedure until the work is finished. Time lost in changing the taps is less than that required to tap a hole with the taper tap alone, which requires extreme care to prevent breakage.—R. H. Cooley, Oakland, Calif.

Magnet Helps Solder Sheet Iron

When two small pieces of sheet iron are to be soldered, a horseshoe magnet can be used to keep them in position. A wooden frame is made to hold the magnet vertically, and the work is laid across the poles as shown.

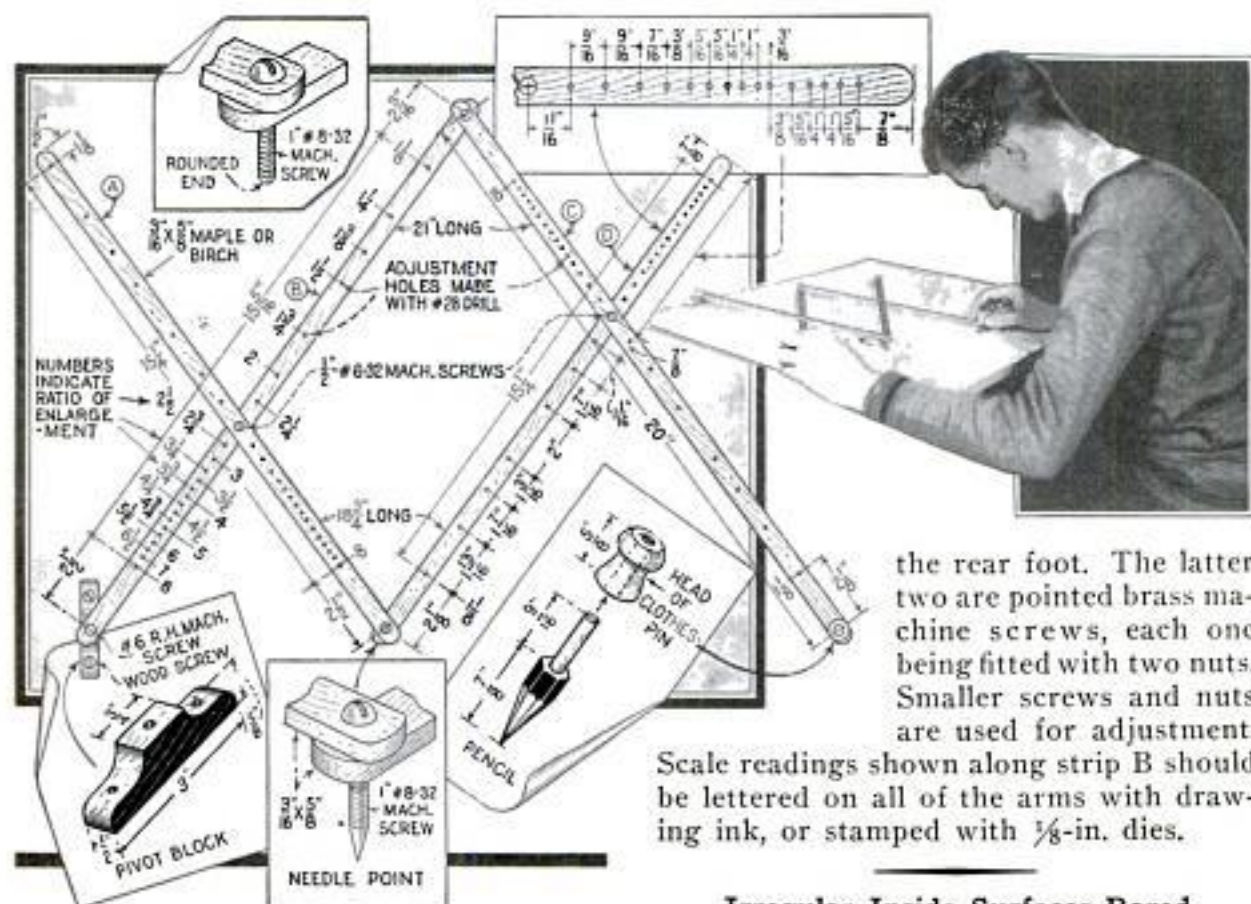


Magnets taken from the magneto of an old model-T Ford can be used for this purpose.—M. D. Wendel, Lockport, N. Y.

Increasing Size of Reamer Pilot

It is sometimes desired to use a reamer or other tool having a pilot, in an opening that is too large. The size of the pilot can be increased a reasonable amount for temporary use by wrapping it with friction tape. This is applied hot, and is wound in smooth layers, which do not overlap. It is also wound in the direction the tool turns, after which the wrapping is coated with cup grease.

Pantograph Has Wide Range of Adjustment



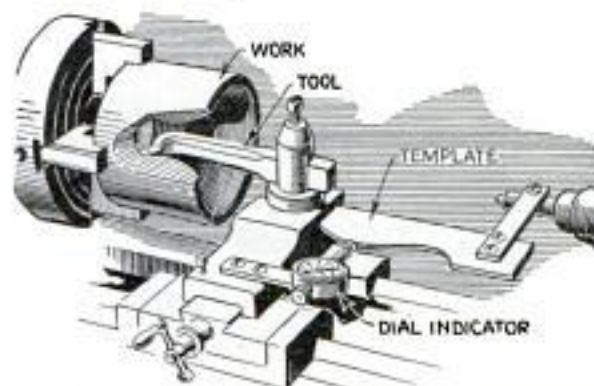
the rear foot. The latter two are pointed brass machine screws, each one being fitted with two nuts. Smaller screws and nuts are used for adjustment.

Scale readings shown along strip B should be lettered on all of the arms with drawing ink, or stamped with $\frac{1}{8}$ -in. dies.

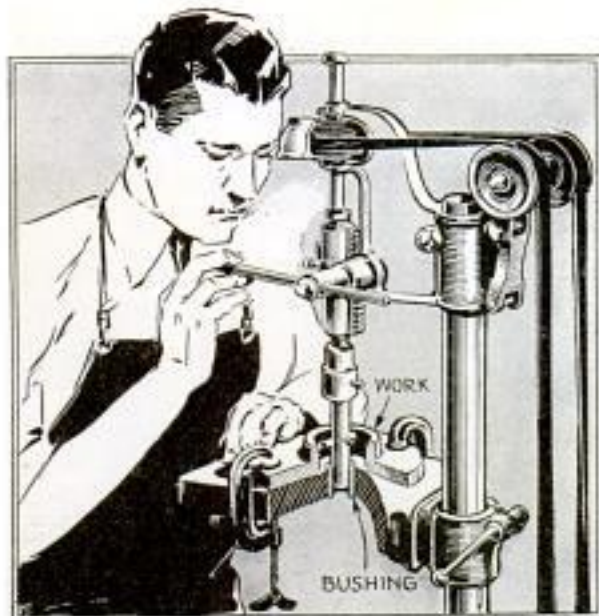
Constructed from four strips of hard maple or birch pivoted together by means of brass machine screws, this pantograph is fairly accurate for making enlargements of drawings, maps, diagrams, or for tracing enlargements of woodwork patterns. The holes for the needle, pencil, pivot screw, and the pivot hole through strips B and C, are drilled $\frac{1}{2}$ in. from the ends of the strips. Spacing of the adjustment-screw holes is identical on all of the strips, except that the first one starts $2\frac{1}{2}$ in. from the center of the larger hole on strips A and B, and $2\frac{3}{8}$ in. for C and D. Also note that the scale reads $\frac{1}{8}$ in. to the inch at the bottom on the latter two, and the top on the former. After marking the beginning of the adjustment scale, the strips may be clamped together and all drilled at one time. The accuracy of the instrument depends on the correctness of hole spacing. However, for most work a slight difference in the ratio of enlargement or reduction is of little consequence. The detailed drawings show the construction of the pivot block, pencil, needle point, and

Irregular Inside Surfaces Bored on Lathe

The irregular inside surface of the work shown in the drawing was bored out in a lathe in the following manner: A flat template was made to correspond to the desired shape of the work, and was attached to the tailstock spindle with three bolts. A guide bar, bolted to the cross slide, supports a dial indicator, which is made to follow the outline of the template by operating the slide as the tool is fed into the work by means of the lead screw.



Template and Dial Indicator Enable Irregular Inside Surfaces to Be Bored Out on a Lathe



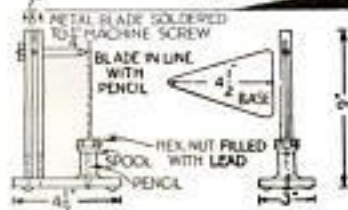
With This Attachment You Can Do Light Boring Work on Your Drillpress

Boring Attachment for Drillpress

Light boring jobs can be done on a drillpress with this attachment. A boring tool is clamped in the chuck, a hole having first been drilled in the table and bushed to fit the end of the tool. The tool is fed into the work in the usual manner, the latter being clamped to the drillpress table by means of C-clamps.

Device Copies Irregular-Shaped Work on Paper

This device will be found useful in shops where the contour of work, such as table legs and chair spindles, is copied on paper. A slotted vertical piece, containing a pointer, is screwed to a triangular base, which is drilled directly under the end of



the pointer for a lead pencil. A spool is then tacked over the hole to serve as a holder for the pencil, a lead-filled nut being used as a weight to assure that the point of the pencil makes contact with the paper.

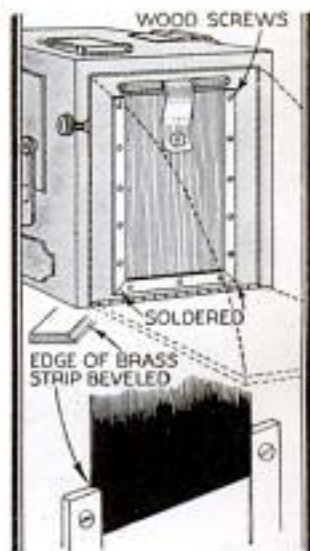
Thumbtacks, driven into the bottom near each corner, allow the base to slide easily. In use, the pointer is adjusted to the proper height and is moved along the contour of the work, the pencil tracing an exact outline on the paper over which it slides. —E. E. Scott, Pittsfield, Mass.

Lead Arsenate Controls White Grubs

White grubs can be controlled in strawberry beds with lead arsenate, (poison) by using 8 oz. of the lead to each 100 sq. ft. of bed. This is best applied by mixing it with fine dry soil or sand, which is dusted evenly over the bed and worked into the surface of the soil. A grub-infested lawn may be treated in a similar manner, using 12 oz. of the lead arsenate for each 100 sq. ft. of lawn, after which it is well watered. When lead arsenate is applied to soil, it is best not to use lime or fertilizers containing phosphorus.

Metal Pocket on Plate Camera Holds Dark Slide

Screwed to the back of a camera, a metal pocket provides a safe place for the dark slide while the camera is in use. It also assures the slide being at hand when wanted. The pocket is made from three strips of brass, $\frac{1}{32}$ in. thick by $\frac{1}{4}$ in. wide. The corners are mitered, and a rabbet is filed on the inside edges to provide a groove for the slide, which should have a leather grip.



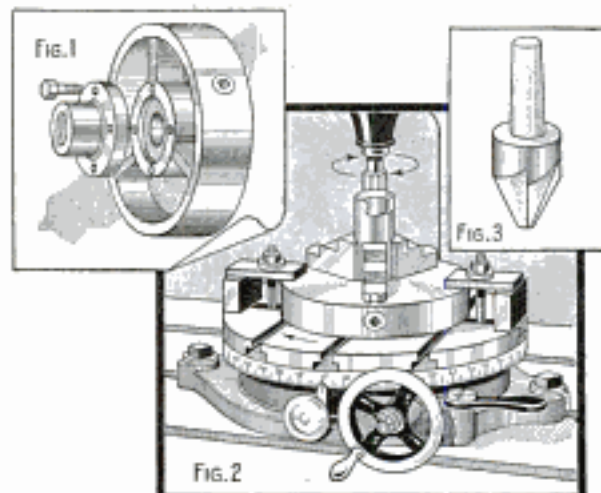
Gold Plating without Electricity

Gold may be plated on metal articles by heating them in an aluminum pan containing a gilding solution, which is made by dissolving potassium ferrocyanide, 1 oz., (poison) in a quart of water. Heat should be used to speed the solution of ferrocyanide. When dissolved, add potassium hydroxide, 1 oz., and heat the solu-

tion to a boiling temperature, then add common salt, 1 oz., and gold chloride, 54 gr. It will be necessary to boil the solution for an hour to dissolve the gold chloride, adding water from time to time to replace that which evaporates during the heating. This solution is very poisonous and should be handled accordingly. Any corrosion on the work to be plated can be removed with steel wool or emery paper, after which it should be boiled in a strong lye solution to remove all grease. While cleaning and plating, the articles should be handled with copper wires to avoid stains and oil from the skin. The gold plate will be thin and will show every defect in the original work, and for this reason, it should be buffed to a bright luster before plating. The cleaned work will acquire a plate after a few minutes of boiling.

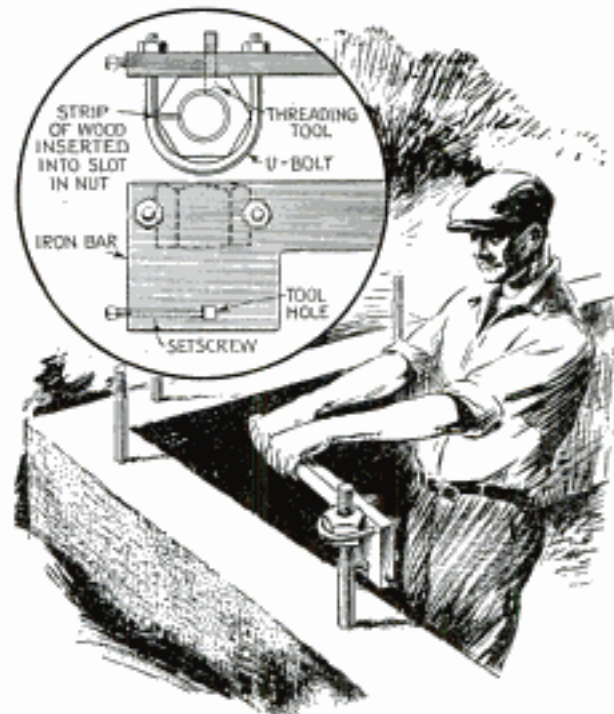
Adapting Lathe Chucks to Other Shop Machines

A three or four-jaw lathe chuck can be readily adapted for use on other shop machines by removing the threaded flange, as shown in Fig. 1. This makes it possible to clamp work in the chuck and take it from one machine to another for turning, milling, drilling, shaping, etc., without resetting it in each machine. In Fig. 2, the chuck is clamped to a revolving table, which is, in turn, fastened to the straight table of a milling machine for machining the special leather cutter shown in Fig. 3. On a lathe, a three-jaw chuck can be used for turning eccentric jobs by attaching it to a faceplate.—Walt Wells, Newark, N. J.



Removal of Threaded Flange on Lathe Chuck Makes It Adaptable to Other Shop Machines

Lengthening Thread on Bolts with Improved Tool



Tool Improvised from Nut and Iron Bar Used to Thread Bolts Anchored in Concrete Foundation

It was found that bolts anchored in a concrete foundation were too long for their intended use, which made it necessary to cut them off and to run the thread farther down. No stock and die being available, the threading was done by an improvised tool. A nut was slotted, and a piece of wood was inserted in the slot, as shown, to make the nut fit tightly on the bolt. An iron bar, with a sharpened bit or threading tool, held in place by means of a setscrew, completes the device. In use, the nut was started on the threads on the bolt, and was turned by means of the bar, the depth of the cut being obtained by tapping the threading tool with a hammer.

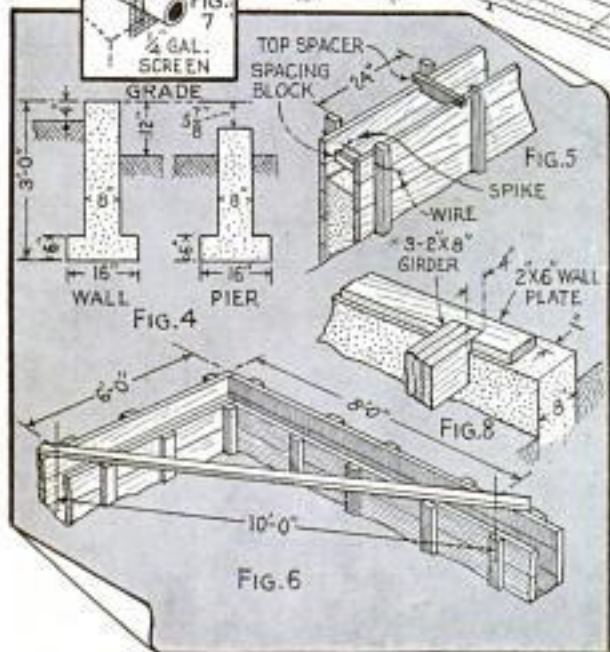
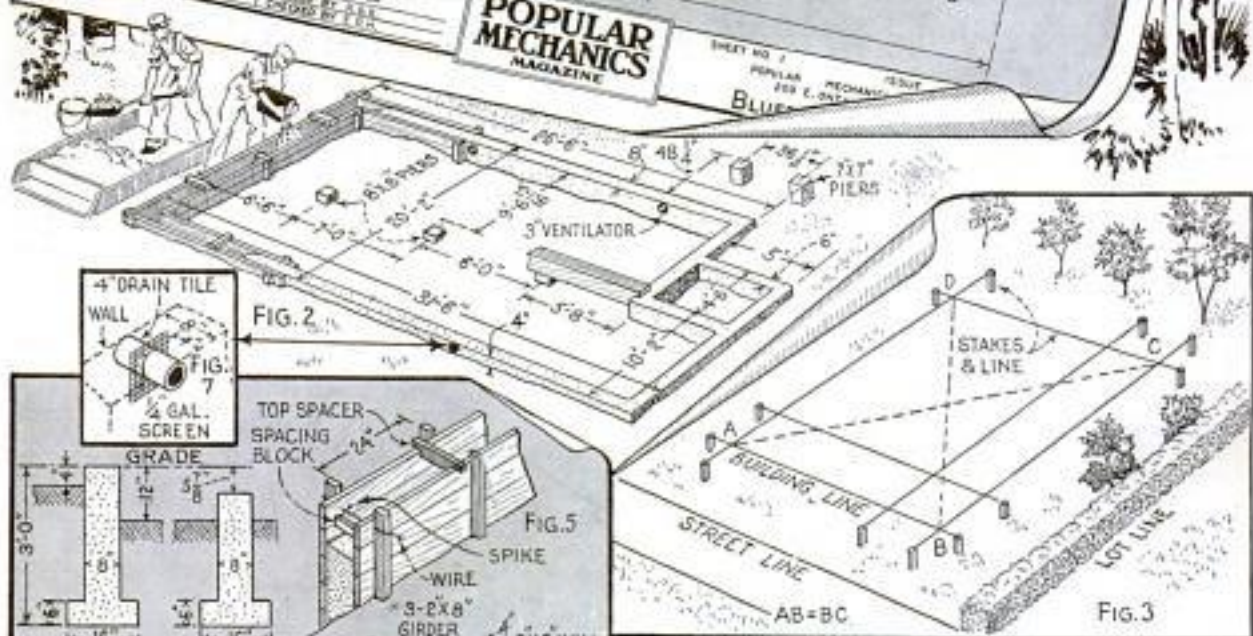
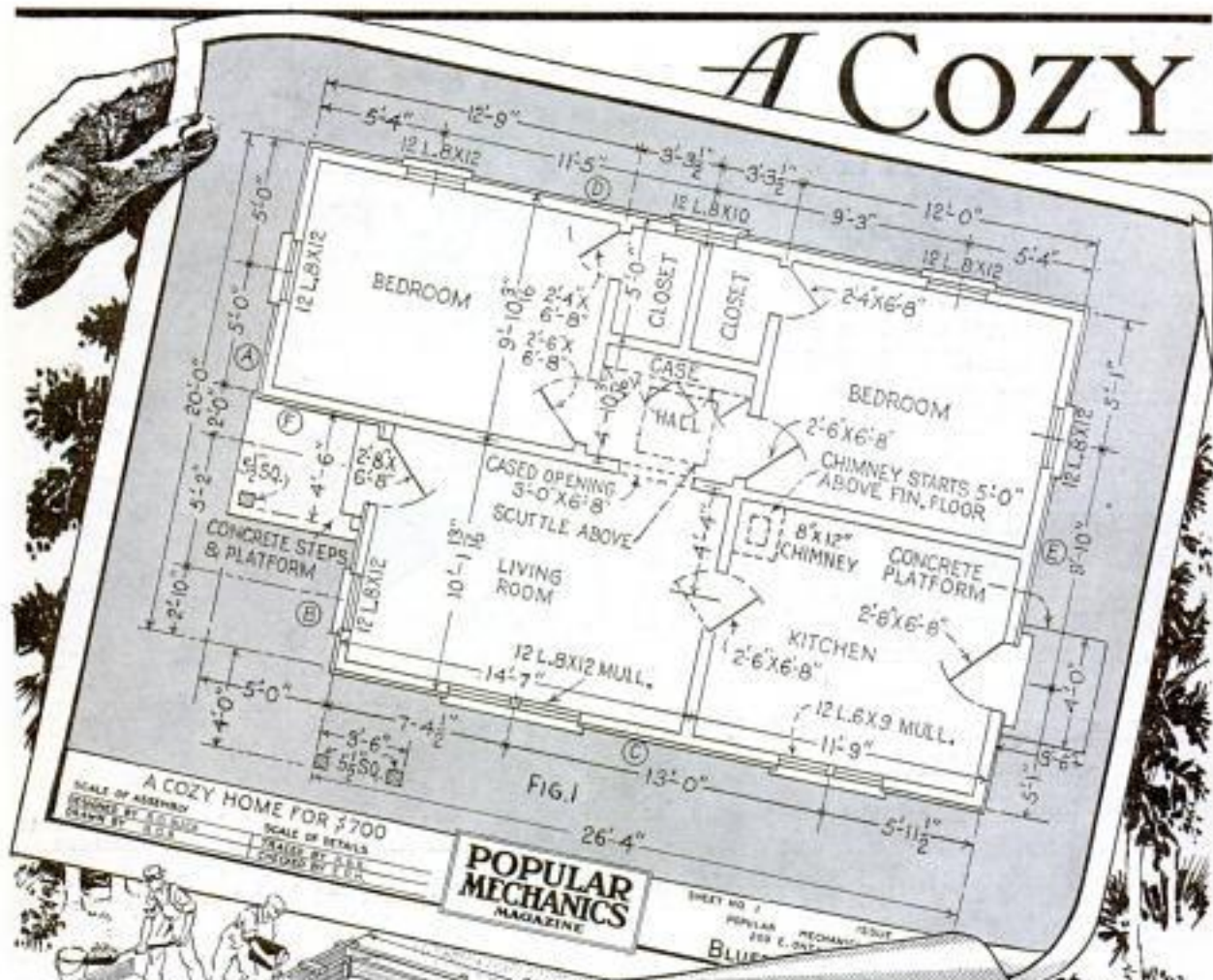
Rubber Protects Tree against Insulators

Insulators for electric wires are sometimes temporarily fastened to trees. When this is done, it is a good idea to place a small piece of old auto casing between the insulator and the tree. The rubber serves as a cushion and prevents the bark of the tree from being damaged.

☛ A small piece of an old cylinder hone will make a good stone for smoothing down burned and pitted ignition points.

6 blueprints \$1.00
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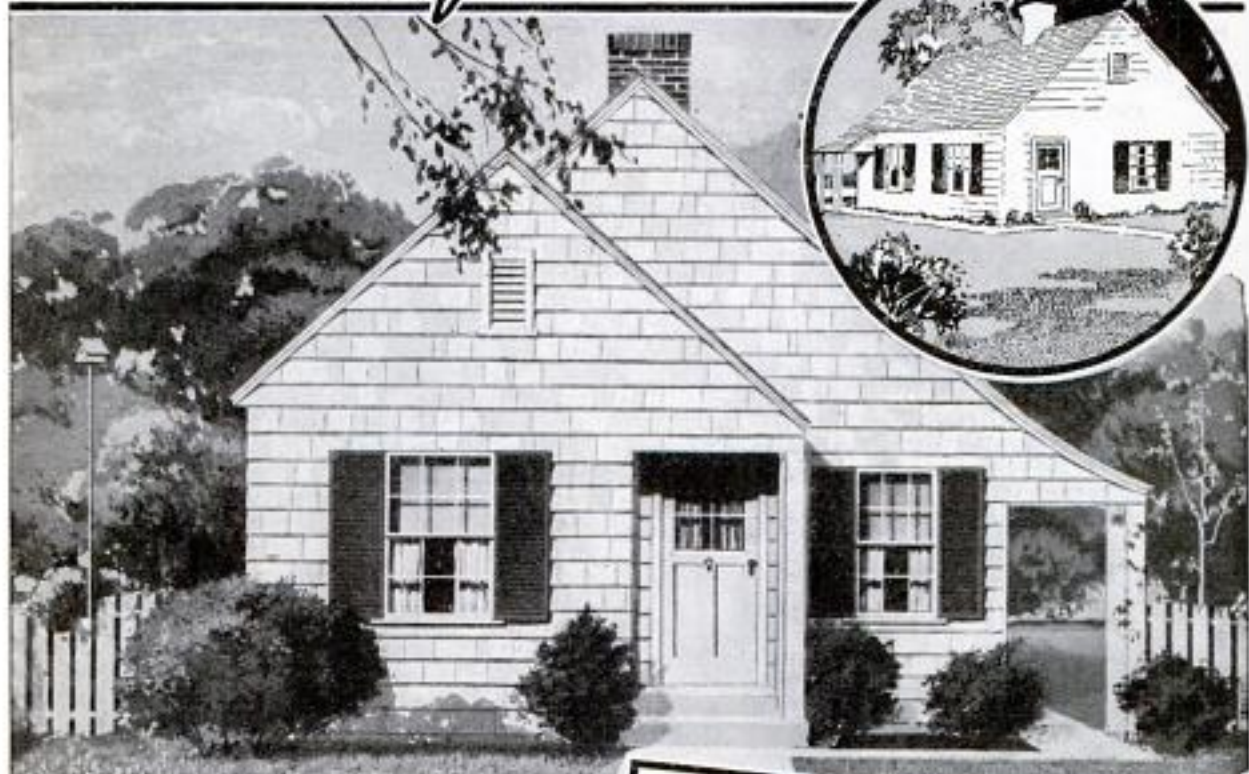
A COZY



PART I

PRESENT low prices of materials make it possible for you to build this warm, livable four-room house for 700 dollars. As every operation will be described in detail you need only follow directions. Another advantage which makes the plan even more practical is the fact that all of the framing material can be obtained cut to size, so that you are spared most of the

HOME for \$700



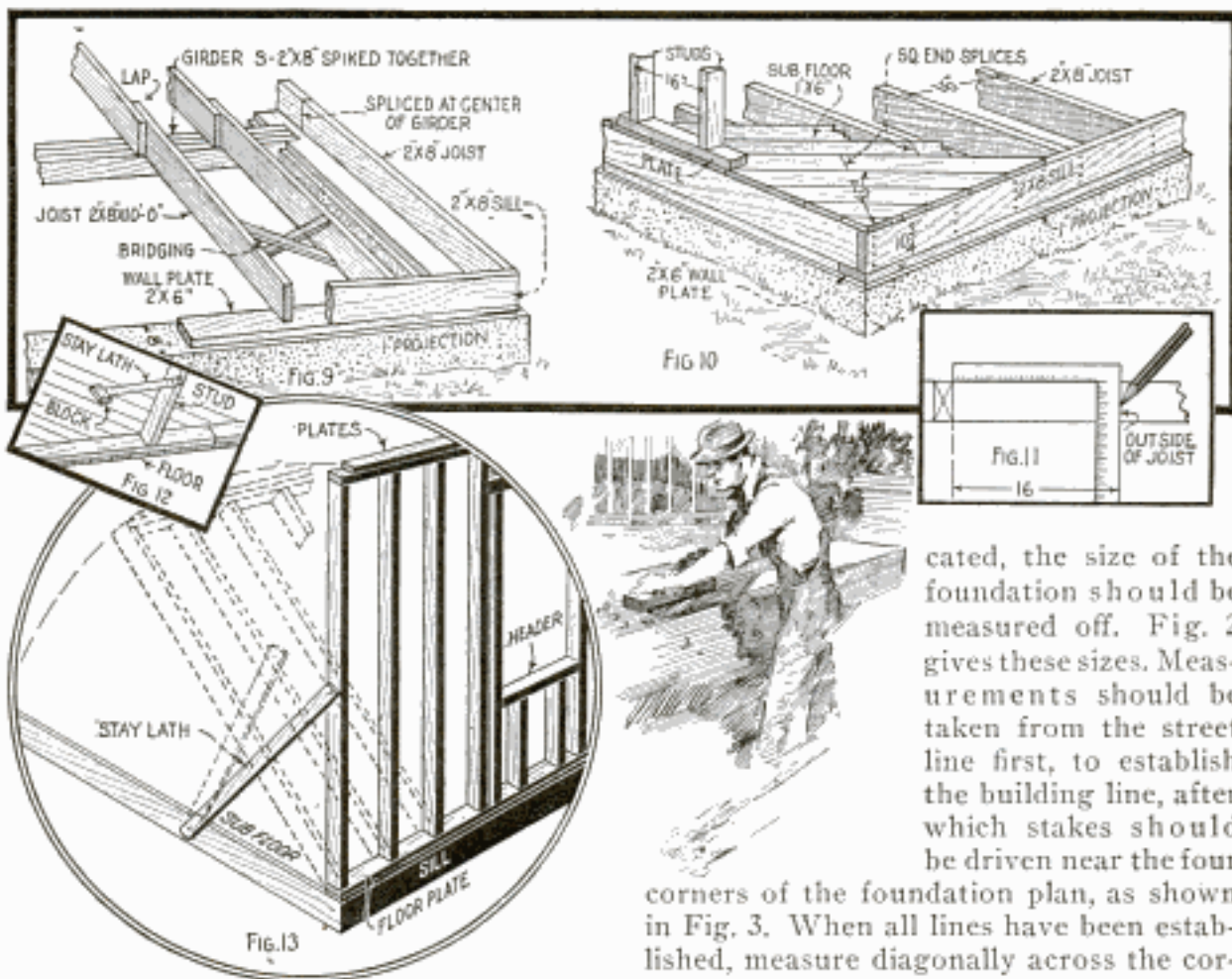
R. O. BUCK
Lane Technical High School, Chicago

heavy sawing. The construction of the house is standard throughout. It is neither practical nor wise, even for the sake of economy, to resort to light or cheap construction, for such property is unsalable and often untenable in cold weather. The floor is double, with paper between, and the outside walls are covered with ship-lap sheathing, paper and wood shingles. Wood shingles for roof and siding give the necessary insulation, wearing quality and the best appearance for the money. Another advantage is that they do not require painting. A dip coat and one brush coat of stain are sufficient to last for five or six years.

A study of the floor plan, Fig. 1, will convince you that this is a real home for

Designed to be built at the lowest possible cost without sacrificing adequate strength and necessary insulation, this comfortable, four-room bungalow can be constructed by anyone who carefully follows the plans and instructions as given in this article, published in two installments. The price, between 600 and 700 dollars, depending on location, includes all material except masonry, heating plant, plumbing, and freight. If desired, you may arrange to distribute the payments over a long-term financing plan so that you can start building at once. For more particulars, write to our Small-House Editor.

year-around occupancy. The living room is of good size and well lighted, the kitchen is large enough to serve as a dining room as well, and has plenty of room for kitchen cabinets, etc. Or if the family is large, you may have a combination living and dining room. The two good-sized bedrooms are provided with adequate closet space, and in addition, a large storage case opens into the hall connecting the bedrooms. The window for the closets is placed midway between them so



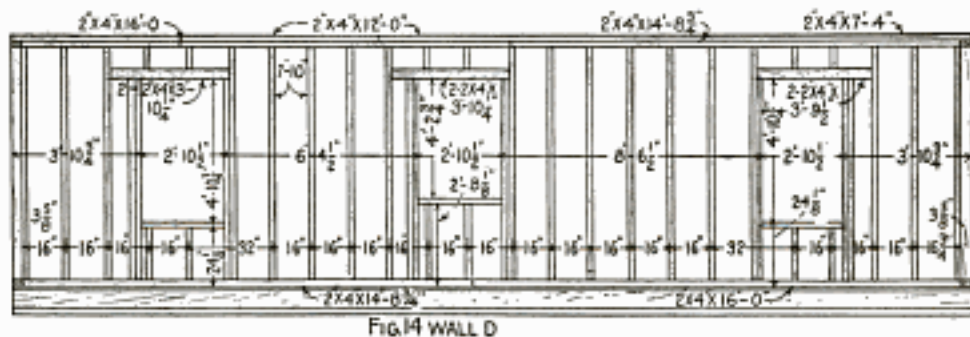
that it provides light for both. This arrangement was used so that if later you wish to install a bathroom, it can be more easily arranged. In the second installment of this article a floor plan and scheme for making this change will be given. As semitransparent glass is used in bathroom windows, the closet partition will be hardly visible from outside.

Such attractive coal or oil heaters are available these days that a stove-heated house need not be considered a hardship, even if you have been accustomed to a heating plant. The proper location for the stove is in the corner of the living room nearest the chimney, as this will give the best distribution of heat.

After clearing off the weeds and leveling up the portion of your lot where the house is to be lo-

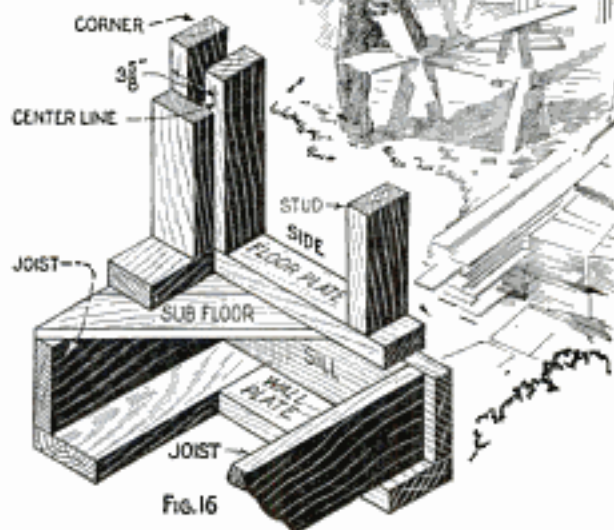
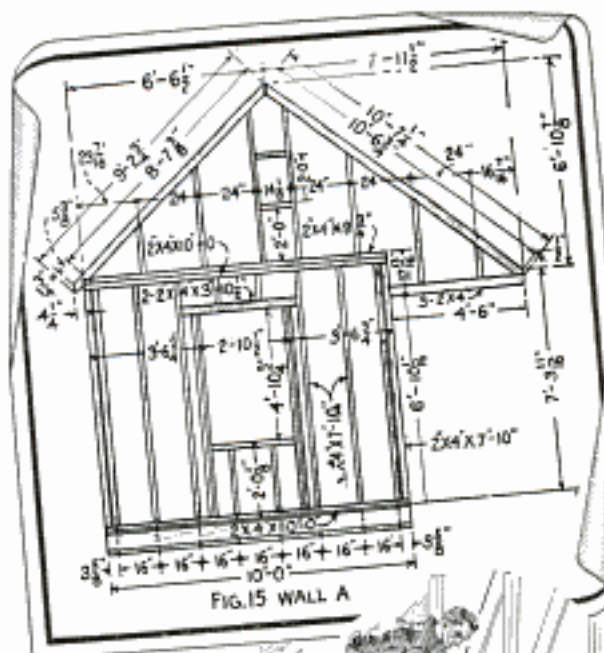
calated, the size of the foundation should be measured off. Fig. 2 gives these sizes. Measurements should be taken from the street line first, to establish the building line, after which stakes should be driven near the four corners of the foundation plan, as shown in Fig. 3.

When all lines have been established, measure diagonally across the corners as shown, to make sure that they are square. The lines stretched between the stakes serve as guides when digging the foundation trench. The inclosure within the wall should be dug out and leveled off enough so that all timbers will be at least 10 in. above ground, to prevent decay. The sectional drawing, Fig. 4, shows the size and depth of the wall and piers. These dimensions are a safe standard anywhere in the United States, but in the warmer states a shallower wall or even wood piles would serve. However, a heavier wall plate should be used for a piling foundation. An 8-in. concrete wall is made for the foundation and as this only goes down 3

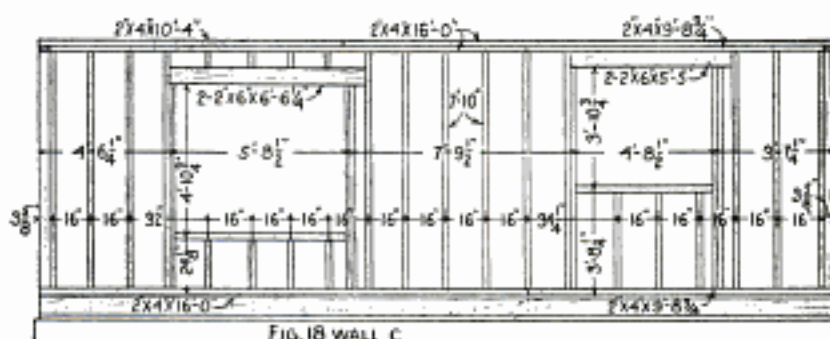
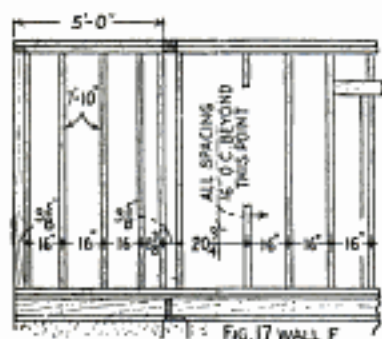


ft., the concrete can be mixed by hand. The 6-in. footing is made first and if the soil is clay or gravel, you will not need a form. Simply cut the sides as straight and smooth as possible and pour your concrete directly into the trench. Forms are used in the usual way for the wall. In setting up the forms, follow the suggestions given in Fig. 5. After all of the forms are in place, check for squareness by means of a 10-ft. pole held across the corners, as shown in Fig. 6. Be sure that your forms line up and are level, so that your wall will be the correct size as well as perfectly square and true. Mix the concrete in the proportions of one part of cement, two parts of sharp or "torpedo" sand and five parts of gravel or crushed stone. The concrete must be well mixed and tamped firmly in the forms if a good wall is to result. The cost of the material for the wall is approximately \$40.00. Vents must be left in the wall so that the timber will not become damp and decay. Fig. 7 shows such a vent, which will permit the circulation of air and still prevent small animals from getting under the house. Drain tile is readily cut by scoring a line around the tile with a chisel. The vents, of which four are suggested, are simply buried in the wall just below the top surface. In winter these openings are closed by means of a wood plug or pieces of cloth, to keep out the cold.

The first timber that goes into the structure is the girder. This member, which is built up, rests on the three piers and is housed 4 in. into the wall at the ends. The girder extends up above the wall $1\frac{5}{8}$ in., so that it is flush with the top of the sill, into which it is housed, as shown in Fig. 8. The laying of the wall plates is very important. A thin layer of rich cement or mortar is placed along the top of the wall and the plates are embedded in it. After



the pieces are squared and spaced on the wall, they should be leveled up by pounding down on them, to squeeze out the surplus mortar, until they are level, or shimming up the low spots by the addition of more mortar at these points. Notice that the plates are set in 1 in., as shown. The arrangement of the sills and joist is shown



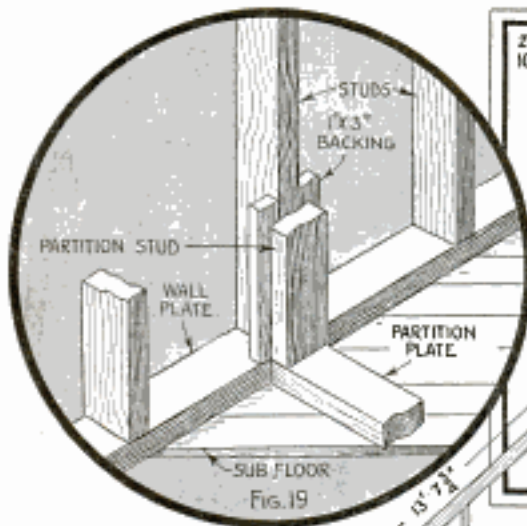


Fig. 19

in Fig. 9. The joist run the short way of the building and rest on the girder and wall plates. The lapped splice for these pieces occurs at the center of the girder. Start spacing the floor joist from the back of the building. The first spacing on the left side will be 8 in. from the outside of the sill to the center of the first joist. On the right, this distance should be $9\frac{5}{8}$ in. to compensate for the lapping of the joist, which are 10 ft. long. The spacing is 16 in. on center for the rest of the joist. If any of the joist timbers are bowed, be sure to put the bow up, so that the weight of the floor and partitions will level it out. A row of bridging is placed midway between the girder and sill on each side, to stiffen the floor. The bridging must, of course, be nailed into place securely before the floor is laid.

Fig. 10 shows how the subfloor is laid. The diagonal arrangement results in a stiffer construction at little additional cost. It also makes it possible to lay the finished floor in either direction, as desired. It is not necessary to miter the flooring at the joints, but they should be placed over a joist. By a little planning, the mitered cut on the piece cut off can be used to start the next course, as the material is not matched.

When the subfloor is laid we are ready to start framing. As nearly all of the studs are spaced a uniform 16 in. on center, the suggestion given in Fig. 11 will prove val-

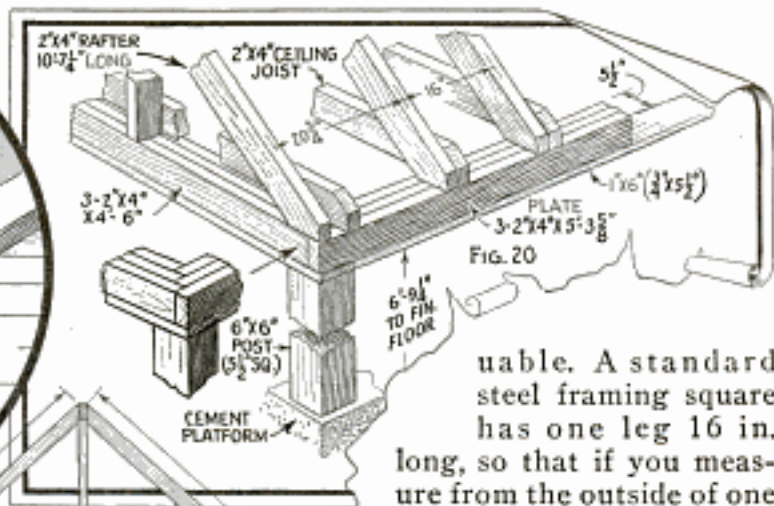


Fig. 20

uable. A standard steel framing square has one leg 16 in. long, so that if you measure from the outside of one stud to the outside of the next, you will be able to lay out your "sixteen inches on center" spacing, rapidly and accurately. Time will be saved also if

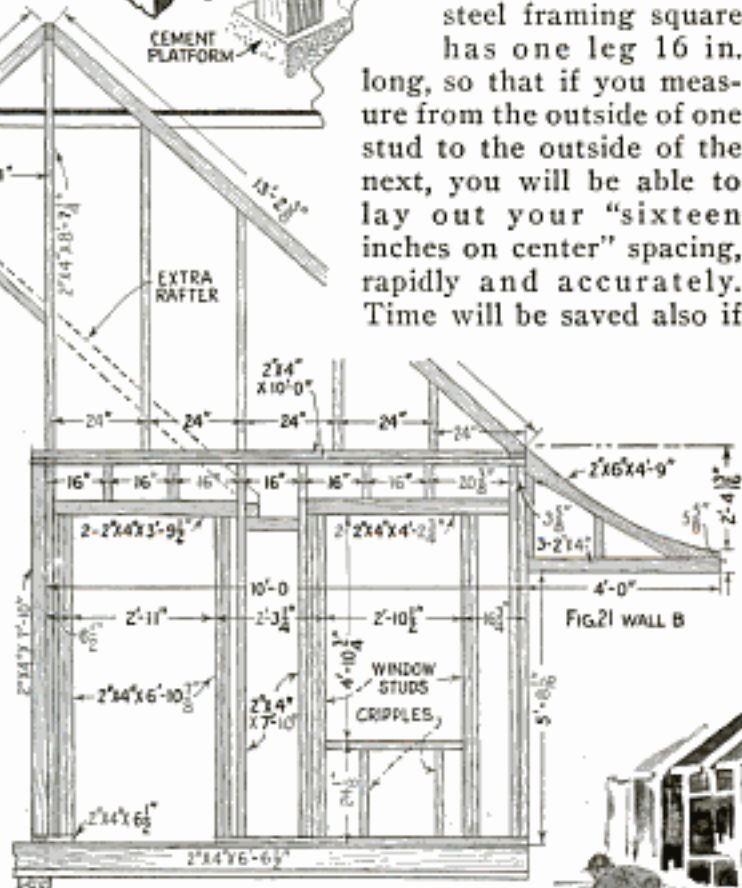


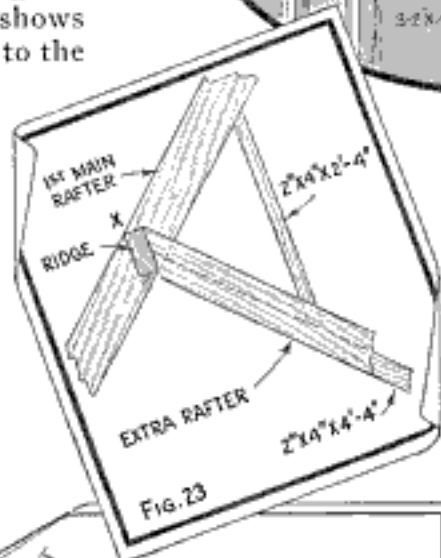
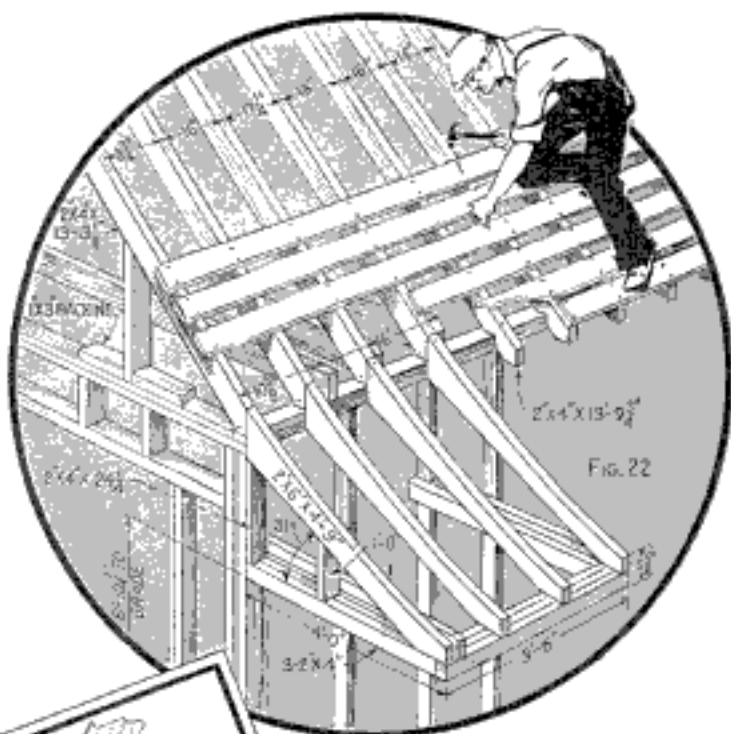
Fig. 21 WALL B

you mark the floor and lower top plate at the same time. The corners of the building form a sort of interlocking arrangement, as shown in Fig. 16, so that each of the walls can be framed on the floor, then swung up into position and nailed. Fig. 13 shows a portion of a side wall being raised. Stay lath are nailed to each side so that if first one side, then the other, is raised a few inches at a time, the wall can be raised by one man without aid. When framing the long side walls, the joints at the double upper plate should not be nailed until the wall is all erected, so that each section can be raised separately. Use 16-penny



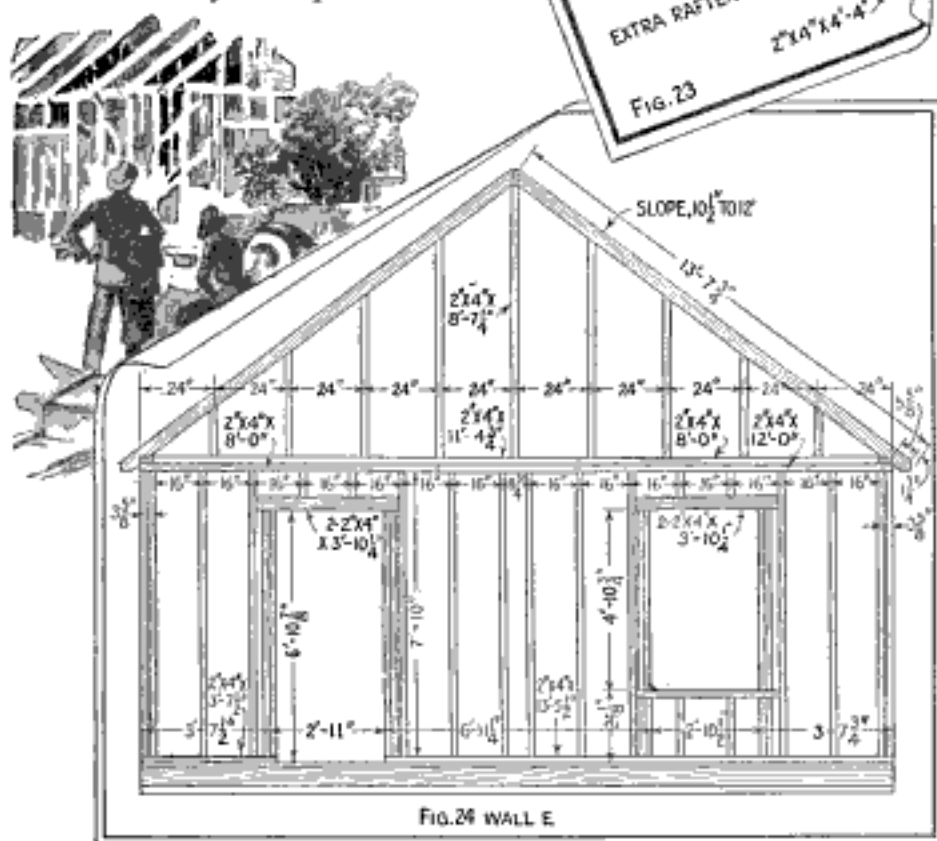
nails to spike the plates to the studs, which is customary.

The wall-framing elevations are shown in Figs. 14, 15, 17, 18, 21 and 24. By referring to the floor plan in Fig. 1 and the corresponding letters given on the elevations, you will be able to identify each one. Note that the wall F is simply a continuation of the long center or bearing partition, but only the part that is outside of the building is shown. The wall framing should start with the long side, followed by the short, the rear, then the main front wall, etc. Temporary bracing across corners and stay lath should be used to hold the structure together while erecting. Fig. 12 shows how small blocks are nailed to the subfloor to which stay lath are nailed. As far as possible, the stay lath should be left in place until all of the sheathing is in place and the ceiling joist installed. After all of the walls are up, check the corners to be sure that they are square. Al-



so see that the walls are plumb over their entire length, and that the distance across the building, from plate to plate, is equal the entire length. When this is accomplished, spike the corners and laps on the plates.

The recessed porch requires some special framing which, though shown on the framing elevation, is made somewhat clearer by Fig. 20. Notice that three pieces of 2 by 4-in. stock are spaced to make a width of 5½ in., which is the actual width of a 1 by 6-in. facing piece. The corner framing of these pieces is shown in the detail. The framing of the covered gateway is shown in Fig. 22. The plates are built up of three members in a manner similar to that used above the entrance. Pieces of 2 by 4-in. stock are nailed under the corners in lieu of the posts, for temporary support, until the finishing trim is applied.



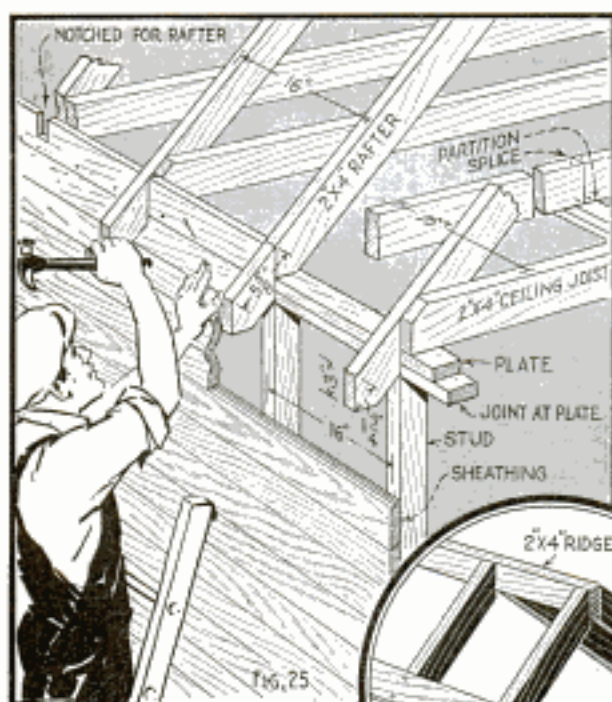


FIG. 25

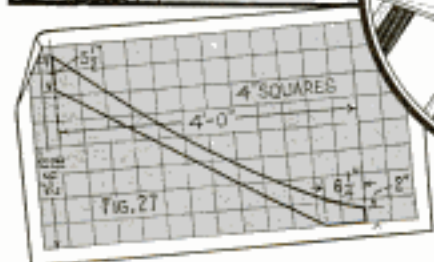


FIG. 27

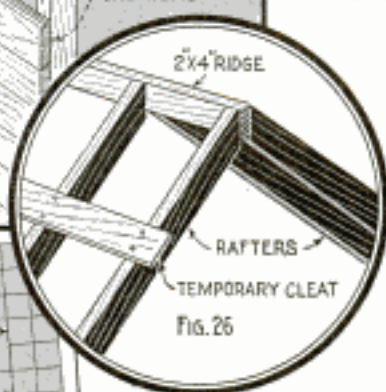


FIG. 26

After the outside walls are all up, the partitions should be erected so that they will stiffen the outside walls when sheathing. No detail drawings of the partitions are given, as the same general practice as used for the outside walls is followed. The spacing of the doorways can be found on the floor plan. Make the stud openings for all doors 6 ft. 10 $\frac{7}{8}$ in. high, measuring from the subfloor. The width of the openings should be 3 in. greater than the door width. Spacing of 16 in. on center is used for the partition studding also. The partitions are framed on the floor and swung into place just as the side walls were. Be sure to pick out straight studs for use around door openings, and check to see that these openings are plumb. When a partition joins a wall at a stud, the end of the partition is framed as shown in Fig. 19. Two backing strips are nailed to the back of the stud to provide a nailing place for the plaster board with which the walls are to be covered. When the partition comes between studs, a 1 by 6-in. piece is nailed to the back of the stud for backing in a similar manner.

The sheathing of the outside walls is done with ship-lap. It should be placed with the outside lap at the bottom. Start the first course on the ledge of the concrete wall and work up. Alternate the lengths so that the joints will break. Also have the joints occur over studs. Two 8-penny nails should be used at each stud.

The spacing for the ceiling joist and rafters should be laid out at the same time, though the joists are placed first. Start spacing from the back of the building. The center of the first joist is spaced 17 $\frac{3}{4}$ in. from the outside of the plate. All the

rest of the joist are spaced 16 in. on center, with the exception of the last, which is 22 $\frac{3}{8}$ in. from the outside of the front plate. Start spacing the rafters from the front of the building, placing the center of the second rafter 20 $\frac{3}{4}$ in. from the outside of the first one, 16 in. to the center of the third and fourth, and 7 $\frac{1}{4}$ in. to the outside of the first main rafter over the 20-ft. span. At the point where

the extended roof joins the main building, an extra rafter, marked X, is required, as shown in Fig. 23. The spacing now starts with the outside of the first main rafter, 8 $\frac{3}{4}$ in. to the center of the second one, then 16, 17 $\frac{1}{4}$, 18, and then 16 in. for the balance of the distance. This spacing is shown in Fig. 22. The ceiling joist do not lap at the joint as do the floor joist, but are simply butted and toe-nailed together and to the plate of the bearing partition. Fig. 25 shows the arrangement of these pieces. After the ceiling joist are all in place, lay enough roof boards across them to provide a floor on which you can work when erecting the rafters.

A general idea of the roof plan is shown in Fig. 28. Start the framing by spacing for the rafters along the ridge pole, then erect this piece by means of temporary studs, as shown in Fig. 29, at the center of each end of the building. Add two or three additional supports along the way so that the ridge will be true and plumb. When splicing the ridge pole, be sure that the 1-in. pieces, which are tacked to each side of it, come between rafters. If you are cutting your own rafters, you will find the lengths for all of these pieces on the framing elevations. Fig. 30 shows how

the notch and end cuts are laid out. Starting at one end of the building, nail the first pair of rafters into place, both on the ridge and plates, then the second, continuing to the center; then start at the other end and work in. Scraps of lumber should be used temporarily nailed between rafters, as they are raised, to hold them in line until the roof boards are placed. See Fig. 26. The rafters for the main structure are erected first. Be sure to notice the arrangement of the extra rafter X, when framing the extended roof, shown in Figs. 21 and 23. After all of the rafters are in place, and before the roof boards are laid, the top piece of sheathing on the sides should be marked for notching around the rafters, and installed. Fig. 25 shows this clearly. Gable studs are spaced 24 in. on center and have their tops beveled to the slant of the rafter, as in Fig. 31. The rafters over the covered gateway are shown in Fig. 22. They should be handsawed from pieces of 2 by 6-in. material. Lay out a full-size pattern on cardboard from the squared drawing in Fig. 27.

As wood shingles are used, the roof boards are spaced 2 in. apart, to provide ventilation, so that the upper ends of the shingles will dry after a heavy rain. The first board is started at the bottom of the rafters. The ends of the roof boards are just flush with the face of the end rafter, as shown in Fig. 31. Continue up on both sides, breaking joints over the rafters. Alternate the lengths also so that the joints do not occur on the same rafter too frequently. The opening between the roof boards forms a convenient toe-hold for working up the roof. Use two 8-penny nails at each rafter.

Now that we have our house under cover, even though a bit open in places, we will leave the description of the shingling, window, door and interior-trim installation for next month, when elevations and details of the finished building will be given.

Also here, detailed drawings and complete instructions will enable the average handy man to do all the work himself, which in building a house, represents quite a saving in cost.



FIG. 28

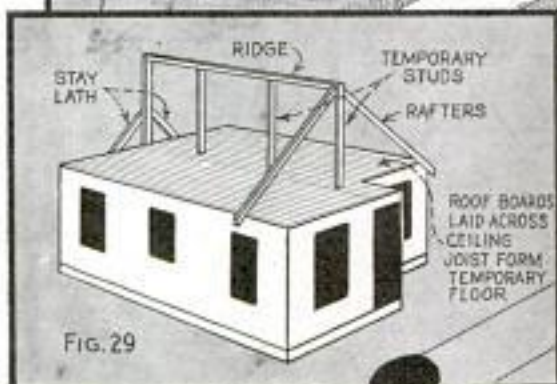


FIG. 29



FIG. 30

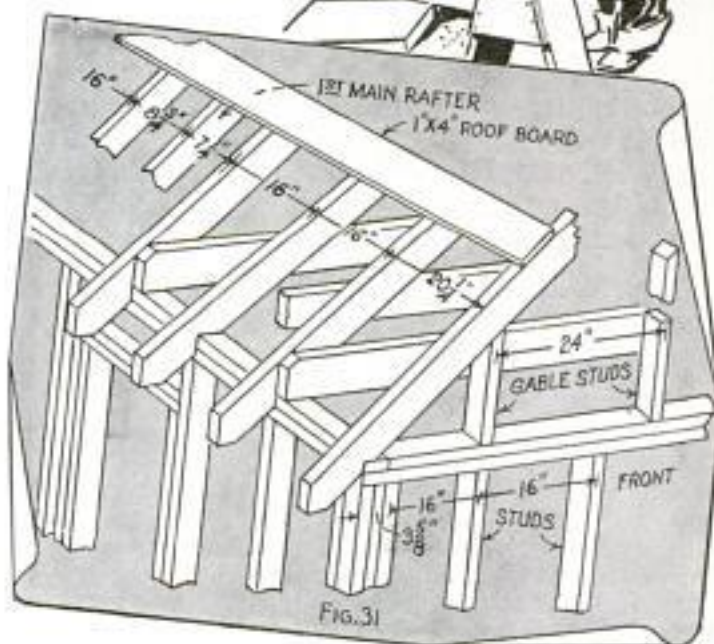
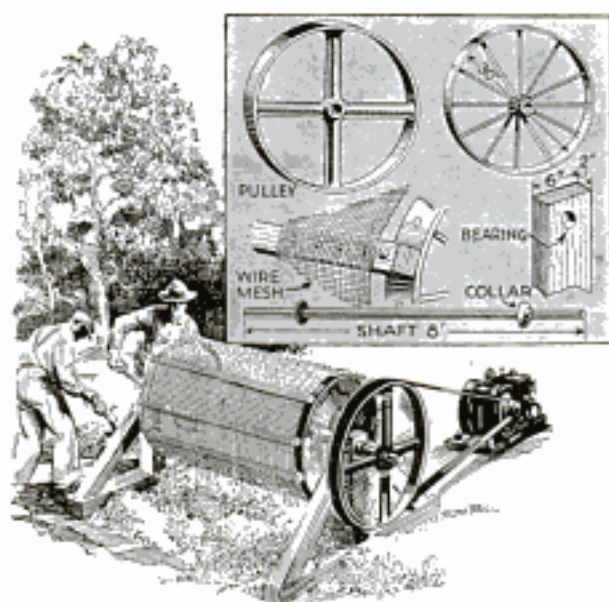


FIG. 31

Improved Power Screen Handles Sand and Dirt



This Homemade Power Screen Is Inexpensive to Make and Will Handle a Large Quantity of Sand

Powered with a small gasoline engine, this screen was used for screening sand and black dirt for making greens on a golf course. To make the screen, 5-ft. crosspieces were bolted to the rims of two cultivator wheels, forming a large cylinder which was covered with $\frac{1}{8}$ -in. wire mesh. The wheels were keyed to a suitable shaft supported between two triangular frames made of 2 by 6-in. stock. Bearings for the shaft were made by drilling holes through the upper ends of the frames and fitting them with oil cups. The engine was belted to the screen by means of a large pulley keyed to the end of the shaft. In use, the end of the screen opposite the pulley is raised so that when the sand is thrown inside, the screenings work out at the opposite end.

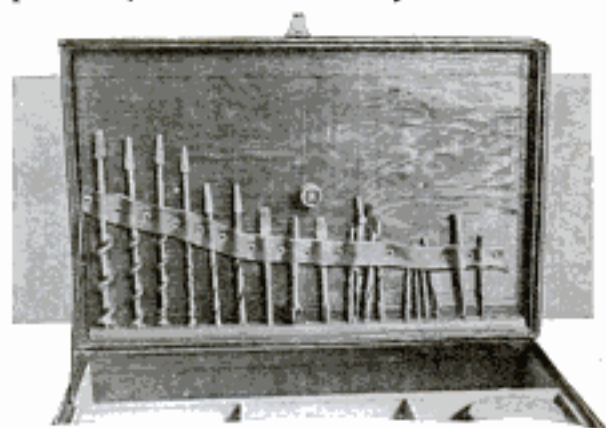
How to Make Thermocouples

Thermocouple pyrometers for measuring the temperature in ovens, furnaces and molten metals may be made at small cost. A thermocouple consists of two pieces of different kinds of wire, No. 18 gauge or larger, twisted together at one end for a distance of about $\frac{1}{2}$ in. and brazed or welded together. This is the end which is inserted into the place where the temperature is to be measured. The other two ends of the wires are fastened to the terminals of a millivoltmeter. If Nichrome IV and

Advance wire are used, the approximate temperature in degrees Fahrenheit is found by multiplying the millivolts, indicated by the meter, by 24 and adding 32 to the result. A thermocouple made from these wires is suitable for measuring temperatures up to approximately 1600° F., while one for measuring temperatures up to slightly over 2000° F. can be made by using Nichrome IV and pure nickel wire. With a thermocouple of this type the approximate temperature is found by multiplying the millivolts by 42.3 and then adding 32. The wires from which the thermocouple is made should be long enough to reach to the meter without splicing, and they should be insulated with asbestos sleeves between the twist and the meter. Thermocouples may be mounted in holes drilled in the walls of furnaces, and in other places too hot or inconvenient for a thermometer. For measuring low temperatures close to the boiling point of water, thermocouples may be made from almost any two pieces of wire of different material. In these simple types, a galvanometer is connected to the couple, which is then calibrated by inserting it in a pan of water together with a thermometer and recording the meter readings corresponding to the temperature indicated by the former. If the meter reads backward when first connected, reverse the connection of the leads.

Holding Augers and Bits Tight in Toolbox Lid

Tacked to the lid of a toolbox as shown, a strip of inner tube makes a good holder for augers, bits, small screwdrivers, punches, etc. The elasticity of the rubber



Rubber Strip Tacked to Inside of Toolbox Lid Makes Non-Rattling Holder for Small Tools

permits easy insertion of the tools, yet holds them tightly and prevents them from rattling when the box is moved.

Replacing Springs in Valve-in-Head Car Motor

Here is a simple time-saving trick for installing new valve springs in motors of the valve-in-head type. First remove or slip to one side the rocker arm over the faulty spring. Then solder one end of a length of soft-iron wire to the top of the valve stem and wrap the other end of the wire to the radiator tie rod so that the valve will be held against its seat. The retaining pin can then be removed and a new valve spring installed.

New Minnow Pail Keeps Bait Alive

A bait dealer in Wisconsin uses a conical-shaped pail that keeps minnows alive on delivery to his customers. The pail is fitted with a hinged cover that has a screened cut-out to admit air so that the water is aerated as it splashes. Very little water is lost due to the sloping sides, which tend to deflect the water down as it splashes inside the pail.



Rope Treatment to Prevent Kinking

New hay ropes often kink and twist after being strung in pulleys. To prevent this trouble, take one end of the rope and give it one turn around a smooth, round anchor post, or similar object, at least 8 in. in diameter. Then hitch a team, truck or tractor to this end. Unwind all the rope and string it out. Start pulling while a helper, holding the long end, offers enough resistance to produce some smoke as the rope sears a ring around the post. This does not injure the rope and it will not kink after this treatment while idling.

A Rack for Storing Welding Torches

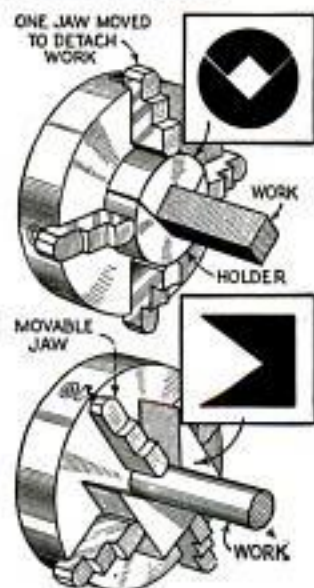


Welding Torches Are Always at Hand When Needed if They Are Kept in This Holder

Screwed to a wall, this rack keeps various sizes of welding torches at hand, and in neat order. It is made of 1-in. stock to which are screwed cleats of the same thickness, their upper edges being cut out to fit the contour of the torches.

Attachment for Chuck Speeds Up Production Work in Lathe

Here are two simple attachments for a four-jaw chuck that will greatly speed up production when handling small square or round stock in a lathe. Once the attachment is centered in the chuck, it is only necessary to loosen one jaw to remove or insert the work. The attachment for round stock is shown in the lower detail, and that for square stock in the upper one.



Ⓜ A pair of battery-terminal pullers will be found useful for pulling rusted bendix brake levers for resetting them on their serrations after adjusting the car brakes.



Small Insulated Ice House Mounted on Old Truck Provides Portable Ice Station

Ice-Distributing Station Mounted on Old Truck Chassis

An ice company in Kankakee, Ill., utilized several old motor trucks to make portable distributing stations. If the locations selected proved to be unsatisfactory for business, the stations were moved. When not in use during winter months, the stations were moved into storage and protected from the weather.—George Harrison, Valparaiso, Ind.

Gas Pump Driven by Truck Wheel



To facilitate transferring gasoline to and from his tank truck, one owner mounted a small water pump on the body and belted it to one of the rear wheels, which, of course, was jacked up when using the pump. The belt is tightened by raising the body of the truck with a second jack until the proper tension is obtained.

Destroying Cutworms in Gardens

Cutworms can be poisoned with the following mixture: wheat bran, 1 pk., paris green, (poison) $\frac{1}{4}$ lb. In a separate con-

tainer, reduce the consistency of blackstrap molasses, 1 pt., with a little water, and stir it into the bran mixture, adding water to make a moist, crumbly mash. For larger quantities, mix wheat bran, 100 lb., with white arsenic, (poison) 5 lb., and blackstrap molasses, 2 qt., in the same way as the smaller quantity was made. This mixture will treat 15 acres if the mash is broadcast, or 20 to 25 acres, if it is scattered only along corn rows. As cutworms crawl out of the ground at night, the mash should not be scattered earlier than four o'clock in the afternoon.

Left-Hand Thread Cut by Reversing Running Direction of Lathe

A left-hand thread can be cut with a lathe in the same manner as a right-hand one is cut, starting the tool at the tail-stock end. The cross slide is run out until the toolpost is at the back of the work



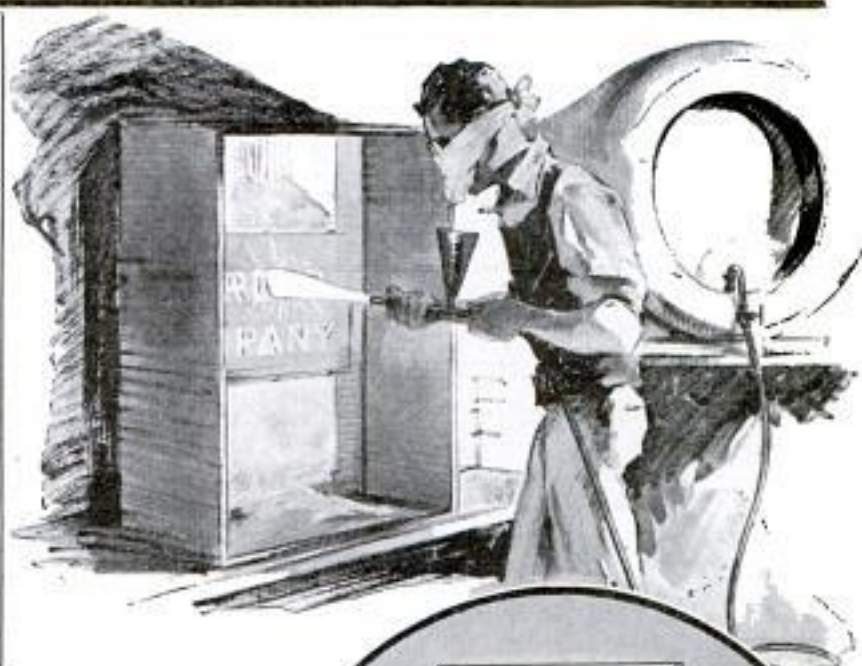
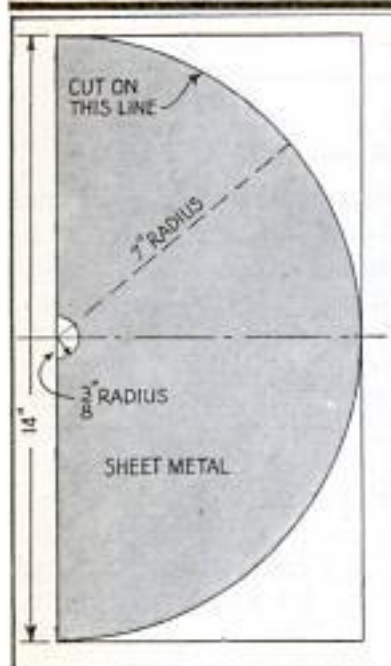
as shown, running the lathe in reverse. The advantage over the usual method, is that the tool can be brought into the cut away from the work, thus taking up all backlash before the actual cutting starts.—H. Moore, Hamilton, Ont., Can.

Bead Keeps Compass from Making Large Hole in Paper

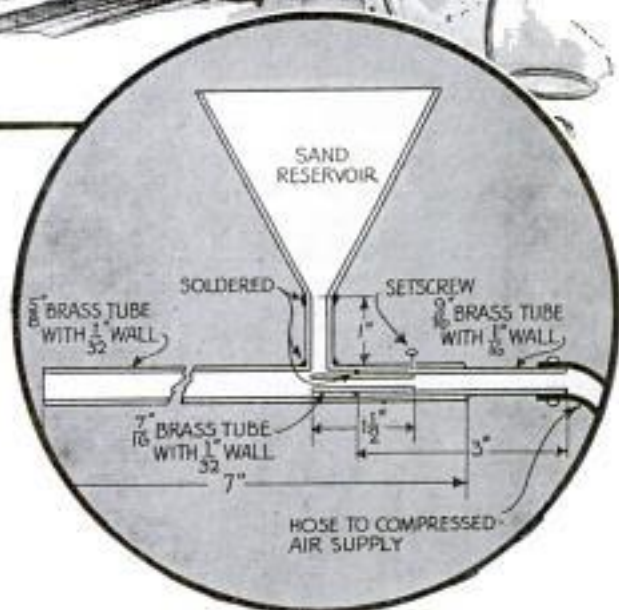
To avoid marring your drawing paper with large holes from a compass point, slip a bead over the point so that it projects a little, as shown in the circular detail, and glue it in position. In this way, the bead keeps the compass from being pressed too far into the paper, yet allows the point to engage the surface sufficiently to prevent slipping.



A Simple Gun for Sandblasting Light Work

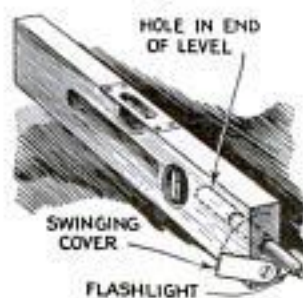


This simple sandblaster is made from pieces of brass tubing and sheet metal. A vacuum cleaner may be used to furnish the air supply, although better results will be had from a compressed-air supply, such as an inflated auto tire. The exact air pressure required depends on the work, a pressure of 30 lb. being about right for most purposes. When using the blaster for the first time, adjust the tube carrying the air hose until the best results are obtained, and then tighten the setscrew holding the assembly in place to hold the adjustment. The blaster may be used for a number of purposes, such as matting the surface of metal, cleaning, and for producing ornamental finishes on glass. Well-cleaned and polished metal surfaces usually take electroplate better if they are sandblasted, and then cleaned before plating. Lettering may be etched in glass by rubber-cementing a tough paper mask over the parts not to be blasted. If a number of pieces are to be blasted with the same pattern, a sheet-metal mask may be used repeatedly. In blasting glass it is a good idea to support the work and approach it slowly with the blaster until the desired results are produced, using fine, sharp sand that has been screened to remove large pieces and foreign matter. For fine work, various grades of emery powder or



coarse pumice powder may be used instead of sand. When doing this work, the operator should wear a mask and goggles.

Flashlight Carried in End of Level



You can carry a pocket flashlight in a hole drilled in the end of a level for reading the level in the dark. A swinging cover is screwed to the level to keep the flashlight in place.

If desired, a second hole can be made for carrying extra lamps for the flashlight.



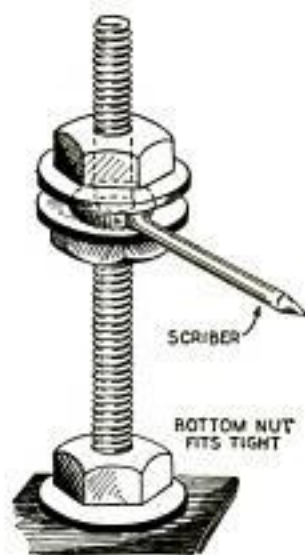
Simple Device Aids in Holding Tools at Proper Angle to Grind Bevel on Cutting Edges

Device Helps in Beveling Cutting Edges of Tools

To eliminate difficulty experienced in grinding the correct bevel on cutting edges of tools, such as chisels, planer bits, etc., I made the device shown. It consists of a piece of sheet metal, to which is screwed a piece of wood having notches cut on the top side. In this way, I could clamp the end of the device under the grinder and place the butt end of the tool in one of the notches, which held it at the proper angle while grinding.—Roscoe A. Johnson, Portland, Ore.

A Surface Gauge for Rough Work

One mechanic who had several rough castings to scribe, made the illustrated surface gauge to save his regular gauge. A threaded rod was fitted with three nuts, one being screwed tightly against a suitable base into which the rod was turned, while the other two were used to hold the scriber, which was a piece of drill rod bent at one end to fit around the rod, while the other



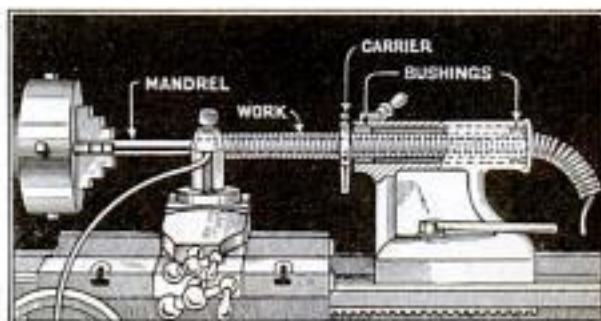
end was pointed. A metal washer was placed on each side of the scriber, adjustment of which is obtained by running the two nuts up or down on the rod.

Clutch-Plate Alining Tool Made from Transmission Gear

Garage mechanics who specialize on one or two makes of cars, and do not have a clutch-plate alining tool, can use the main transmission gear and shaft of a junked car of the same make for this purpose. By inserting the end of the shaft into the bearing in the end of the crankshaft, or flywheel, as the case may be, while assembling the clutch and pressure plates, the other parts of the clutch can be lined properly. In this way, the capscrews can be tightened without repeatedly swinging the whole transmission up to the clutch to see if the assembly lines up properly.—Carl Meiter, Russell, Kans.

Coiling Long Spring in a Small Lathe

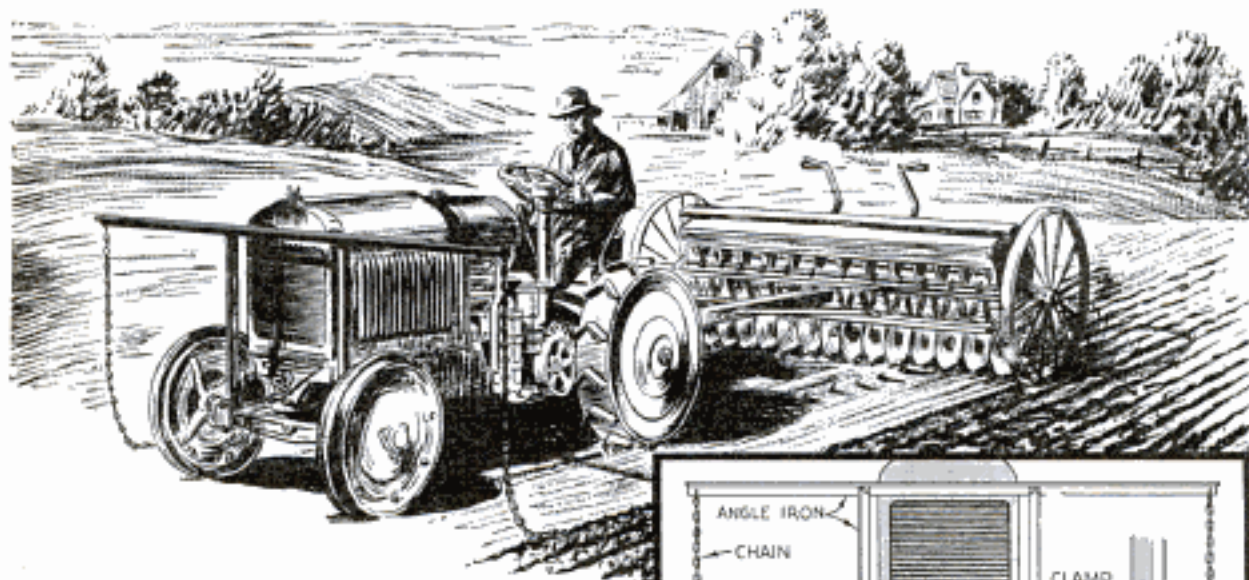
I recently had a job of coiling a 25-ft. closed, left-hand spring in a 6-ft. lathe. To do this, the tailstock spindle and screw



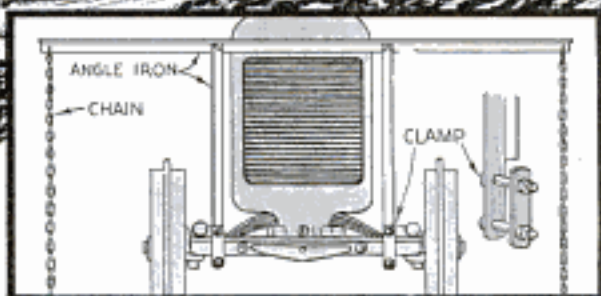
Long Springs Are Easily Coiled on Small Lathe when Screw Assembly Is Removed from Tailstock

were removed, and a bushing was inserted in each end, the bore being the same as the outside diameter of the spring. One end of the mandrel was gripped in the chuck and the other extended through the tailstock. In making the spring, one section was coiled from the tailstock to the chuck, and the carriage was then run back to the tailstock, pushing the coiled part of the spring over the mandrel and through the tailstock. The wire was clamped to the mandrel with the carrier and another section coiled, this cycle being repeated until the spring was completed.—Charles Kugler, Philadelphia.

Guide on Tractor Helps in Drilling Grain

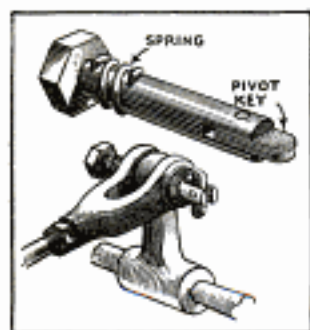


Clamped to the front axle of his tractor, one farmer made a guide or marker to overcome the difficulty experienced in steering the tractor so that the grain drill would not overlap the land previously covered. The guide was made by riveting two vertical pieces of heavy angle iron to a horizontal piece of the same material, the length of which is the same as that of the drill. Chains, long enough to drag on



the ground, were then attached to the ends of the horizontal piece. The tractor is steered so that the lower end of one chain drags along in the previous drill mark.

Pin with Pivoted Key Is Quickly Removed from Machinery



To facilitate the removal of a pin holding parts of machinery together, slot one end and pivot a key slightly off center in it as shown. A short piece of coil spring between the head of the pin and the machine part, holds the key against the latter so that it cannot loosen enough to release the pin.

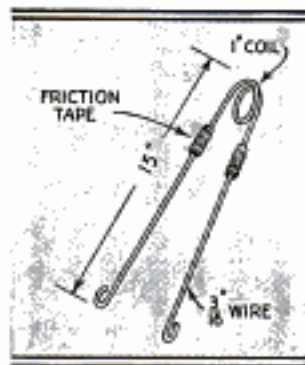
Bolt Used as Bushing Puller

A bolt will be found handy for installing new spindle bushings on a car. Get one about the thickness of the spindle bolt and a little longer. You will need a heavy nut and a few washers. Place the new

bushing in place, after removing the old one, and insert the bolt, using washers under the head to prevent damaging the bushing. Then by screwing up the nut, the bushing can be pulled into place in the spindle.

Device Smooths Wrinkled Pockets

This device will save time for the clothes presser in smoothing wrinkled pockets. It is a piece of spring wire bent as shown, friction tape being wound around each side to provide grips for the hand. In use, the sides are pressed together, then inserted into a pocket, after which the sides are released, and the device pulled out. As the ends spread in coming out of the pocket, the wrinkles are removed.





Built at Side of Oil Pit, Repair Kit Keeps Tools Handy and Serves as Sign

Repair Kit Built at Side of Oil Pit Keeps Tools at Hand

A gas-station owner in Detroit, Mich., built a repair kit for his tools at the side of the oil-draining pit. It is about 5 ft. high, and 3 ft. wide. In it are kept wrenches, tire-repair outfits, nuts, bolts, etc. These are always accessible, and are locked up at night by closing the swinging door. Lettering on the inside and outside of the door serves as a sign to let motorists know that auto repairing is also done at the station.

Section of Disk Harrow Makes Neat Small-Parts Cabinet



One section of a disk harrow supported vertically on legs provides a handy cabinet for tools and small parts in a blacksmith shop or garage. The lower end of the disk shaft is drilled to take the legs.

Removing Welding-Torch Tips

The tips in welding-torch heads sometimes stick, and are broken off in trying to remove them. I have found the best method of removing either a tip or the broken end is to back up the head with solder and then tap it with a small ball-

pein hammer to loosen the part, taking care not to hammer the head out of shape. A wrench may then be used to remove the tip, or if it is broken off, a square file or similar tool may be inserted into the hole and the broken part unscrewed. As a welding-torch head is expensive, it is practical to repair a broken one. This procedure necessitates cutting off the broken part, heating the head and building it up from the seat with a good welding bronze. The work is then quenched and dressed down to proper size, after which it is drilled out, reamed, and tapped to take the tip. After tapping, prepare a copper seat, which is inserted into the base of the tip receptacle. The copper should be annealed, and when in place, it may be expanded to a tight fit by screwing the tip in securely.—Hallie P. Davidson, Great Lakes, Ill.

Improvised Clamp for Mitered Joints

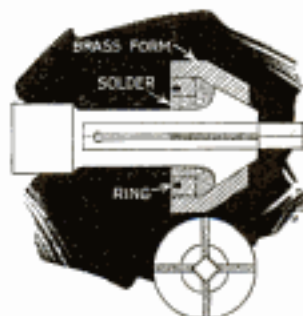


Two triangular blocks, screwed to a benchtop near the movable jaw of a vise, and a third block, screwed to the jaw, can be used for

clamping mitered work such as picture frames, for nailing or gluing. The size of the work will determine the spacing of the blocks.

Truing Screw-Machine Collets

Here is a method that has been found successful for truing screw-machine collets: A piece of square stock is put in the collet and is held in place by a brass form threaded on the inside to take a threaded ring as shown. The space between the form and collet is then filled with solder, which keeps the collet from expanding so that the surface can be trued up. After the job is finished, the solder can be melted and saved.





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Winter Toboggan Slide	Homemade Baseball Game
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THE ARMY ON WHEELS

(Continued from page 55)

ing widespread suffering. Scores of steamers were unable to sail for lack of coal. The outlook for ocean shipping was even worse. What tonnage we had was on a most unsatisfactory basis. There were ships of the army, the navy, the shipping board, the Belgian relief and of various commercial organizations. They all operated according to their own necessities.

We had man-power in abundance, but we had no plan for employing the factories, the farms, the mines or the transportation system of the nation in a general scheme that would enable us to apply our might in war. If ever there was a government in trouble it was that of the United States at Christmas, 1917. For all supplies, commodities, storage and tonnage buyers for our own army, navy, shipping board, the Belgian relief and numerous commissions of our allies were competing recklessly with each other. One situation which developed illustrates the condition that existed in every market. In Chicago, representatives of numerous nations, all committed to the same purpose, bought contracts for the delivery of more wheat than could be produced. They had cornered the market against themselves. Jim Patten, the greatest of wheat speculators, hazarded the opinion in the wheat pit that unless there had been government interference the price of wheat would have gone, perhaps, to fifteen dollars a bushel.

The most important war-department order I ever saw was one known as General Order No. 167, dated December 18, 1917. It established in the office of the chief of staff what became known as the storage and traffic section. To this section was given plenary powers in the procurement of supplies, of their storage and the transportation of troops and supplies. What had been the business of innumerable competitive bureaus was then consolidated under a single agency with gigantic power. The man who was placed in charge was Maj. Gen. George W. Goethals who came from retirement to exercise his fabulous ability in this post.

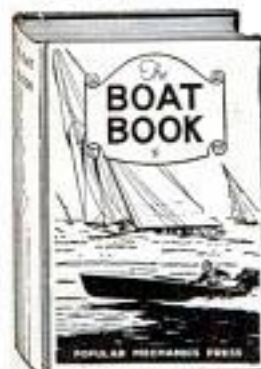
This digression into the condition of affairs during the World War has been made to show the steps the army has taken and is taking to prevent a repetition.

(Continued to page 125A)

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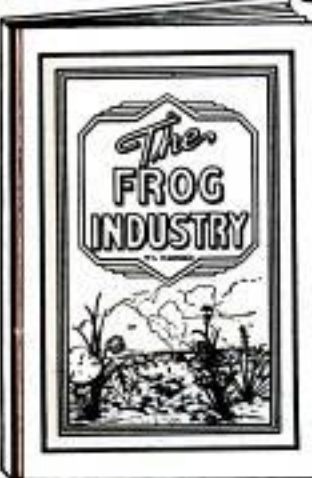
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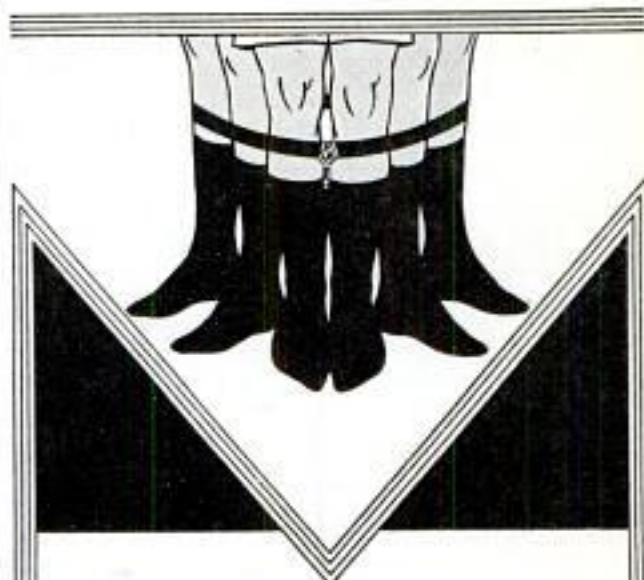
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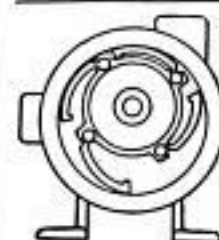
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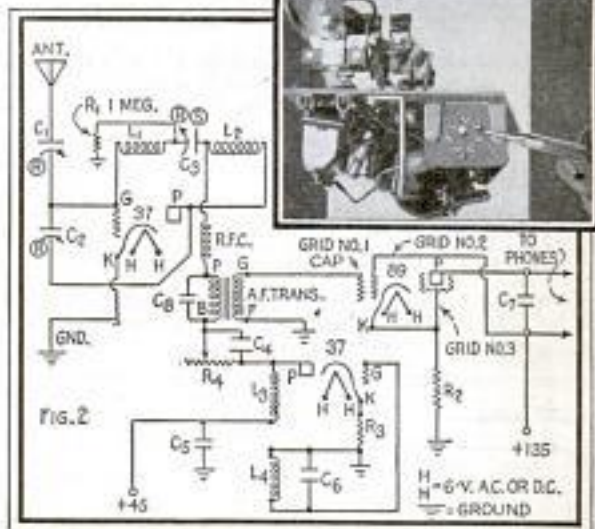
When writing please mention Popular Mechanics

BUILDING FIVE-METER RECEIVER

(Continued from page 131)

also be given. Almost any kind of anten-
na can be used for the receiver, and the
circuit is the popular super-regenerative
variety using auto-set tubes that may be
operated either on batteries or a.c. The
B-supply can be obtained with either bat-
teries or any B-eliminator that will fur-
nish the necessary 135 volts.

The simplified wiring diagram is shown
in Fig. 1. This is an X-ray view of the lay-
out showing all parts and con-



nections above and below the subpanel.
The photos show the arrangement of the
tubes and midget variable condensers on
the subpanel. It will be noted that the 2-
plate midget condenser is mounted above
the 5-plate band-setting condenser by
means of a 1/8-in. strip of bakelite, 1/2 in.
wide and 2 1/2 in. long. This assembly is
also clearly shown in the insert photo
above the schematic diagram, Fig. 2. This
condenser assembly and the 11-plate main
tuning condenser, C3, are mounted on the
base by means of 1 1/2-in. 6-32 machine
screws at a height of about 1 in. These
midget condensers are the Hammarlund
ultra short-wave types and the rotors are
common with the frames. The coils L1
and L2 are supported by condensers C2
and C3. These coils each consist of 7 turns
of No. 16 enameled wire and have an in-
side diameter of 3/8 in. The turns are
spaced the diameter of the wire. The main
tuning condenser, C3, is located 2 1/2 in.

(Continued to page 118A)

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MAGIC-RAY FARMERS

(Continued from page 61)

had such abnormalities as rounded wings, noticeable variations in the size of color spots, or unusually large feelers.

What does all this mean to the average farmer, nurseryman, gardener, florist or stock raiser? If one cares to speculate, he might well vision the day when man will be independent of nature in the development of new forms of plant and animal life adapted to meet his particular needs. Under such conditions, tropical fruit might be developed to grow in a temperate climate, for instance.

As yet, however, these scientific farmers are very cautious about making predictions. They are shooting their invisible light blindly, trusting to luck that it will penetrate the roots of life, then painstakingly weeding out the countless deformed, abnormal specimens and saving for future study the few which appear to offer possibilities. But even their inborn caution does not keep these laboratory farmers from sounding a note of hopefulness about what the future may hold in store.

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(Continued to page 124A)

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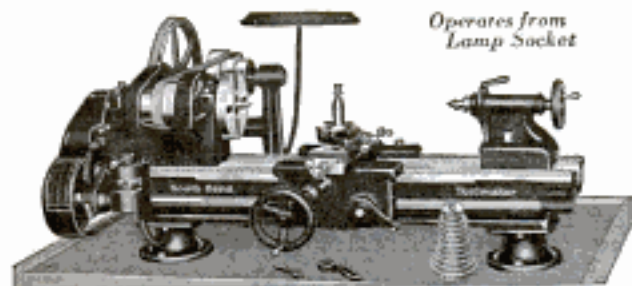
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WHY COTTON IS STILL KING

(Continued from page 69)

hydride for making fluorescein and eosin dyes, manufacturing it from naphthalene. The color laboratory at Washington developed a way of making it cheaply and this paved the way for the manufacture of glyptal resins at a cost so low that they can be incorporated into paint that dries quicker and lasts longer than ordinary kinds. Formerly, synthetic resins were too costly to be used in place of natural ones. A short time ago house paints employing glyptals were placed on the market after successful use in industry.

The huge factories making cellulose products, dyes and synthetic chemicals constitute one of the nation's most important lines of defense or offense in case of war, Doctor Calcott points out. The close relation of cotton and big guns is well known. Steps taken in making automobile lacquer and smokeless powder do not differ greatly, so that production could be switched from one to the other without much difficulty.

There is a dye commonly known as sulphur black made from dinitrophenol, a harmless yellow substance consisting of one molecule of carbolic and two of nitric acid. By adding another nitric-acid molecule the chemist can produce picric acid, a high explosive. In a similar way nitrotoluene is made in manufacturing dyes. It has only one nitric-acid molecule or nitro group. By adding two more, trinitrotoluene, the well-known T.N.T., can be made.

A comparatively new radiator anti-freeze is ethylene glycol, made by overheating natural gas or oil and treating the resulting ethylene with water and bleaching powder. If, instead, the ethylene is acted upon by sulphur and chlorine, mustard gas is produced.

Much of the cellulose now used for making everything, from paper to Mickey Mouse cartoons, comes from wood—from some 7,000,000 cords of it a year. Wood, a less-pure form of cellulose than cotton, has been kept on top by its cheapness. The reverse may be true some day. Not long ago a method was developed for producing "chemical cotton." This is not an artificial cotton, but the fuzz that is removed chemically from cotton seeds. In the ginning of the raw cotton to separate

(Continued on page 124A)

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MAGIC-RAY FARMERS

(Continued from page 120A)

other aspect of the matter—the increase of the sum-total of human knowledge, acquired only at the expense of skill and time and labor—the electrical industry may be able to make a substantial contribution to the solution of the problem of the present-day X-ray geneticist."

That is the ultimate goal of these scientific farmers aided by electrical greenhouses, experimental fields, modern facilities for microscopic work and the best in X-ray apparatus. If it is attained, these men, shooting their invisible light at the very foundations of life itself, will offer the electrical industry's own particular gift to the farmer, the nurseryman, the florist and possibly the animal breeder—the power to create plant and animal varieties at will!

WHY COTTON IS STILL KING

(Continued from page 122A)

seeds from usable fibers, a considerable amount of short fibers remains on each seed. This fuzz cannot be removed successfully by combs or any other mechanical device, so that cotton seed has become to some extent a by-product of low-commercial value.

When treated chemically by the new process, each seed gives up its fuzz and itself becomes cotton-seed bran which contains over thirty-seven and one-half per cent of sugar. The fuzz, a nearly pure form of cellulose, lends itself immediately to the making of hundreds of important articles and compounds. The bran can be fed to cattle.

The boll is not the only part of a cotton plant that contains cellulose. Twigs, stalks and leaves are made up largely of this material. That is what led to the recent growing of test crops in North Carolina to determine the feasibility of raising cotton for its cellulose rather than its fiber. The test plot was sowed, cultivated and harvested by machine methods similar to those used for hay or wheat. The cost was reduced to one-twentieth that of raising cotton for the fibers alone.

So, before long, the cabin in the cotton may become a garage for a mowing machine, and the gin in the neighboring village may be made into a chemical plant.

THE ARMY ON WHEELS

(Continued from page 114A)

In the passage of the national-defense act, congress has wisely provided in advance for meeting the conditions set forth above. No longer will the control of procurement and industrial mobilization be entrusted to the general staff. One section of that act provides that the assistant secretary of war "shall be charged with the supervision of the procurement of all military supplies and other business of the war department pertaining thereto, and the assurance of adequate provision for the mobilization of material and industrial organizations essential to war-time needs."

Our shopping list as a people at war in 1918, contained 700,000 different items. Today, a list of vitally essential things has been reduced to about 4,000 articles complete for issue, and the men of the war department know from what factories these things might come. Let no one think that today America is unprepared—industrially.

This new shopping list of the army contains many items which are a vast improvement over implements used in the last war. The infantry, for example, now have racing tanks. During the World War we had two types, the lumbering forty-ton fellows which had to be transported by rail to the scene of action. Thereafter a soldier, walking, could keep abreast of them when they were going full speed. Even the lighter six-ton tanks were no faster and they, too, because of the short life of their caterpillar tracks, had to be moved to the front on trucks.

The latest and most admirable of the tanks is the "Christie." It has a 340-horsepower plant. It can be driven at a speed of forty miles an hour to the front, and then on its caterpillar tracks, at only slightly reduced speed, can be sent rushing across the roughest battle terrain. It can charge "in high" up steep slopes and if at a twenty-five-mile speed it encounters a twelve-inch log it glides over it easily. This is due to the fact that four wheels on each side are individually sprung by a clever arrangement of powerful springs and strong levers. Therefore, its protected crew may ride swiftly into action over uneven ground without excessive vibration, while some of them operate a gun mounted on a stable platform.

(Continued to page 126A)

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THE ARMY ON WHEELS

(Continued from page 125A)

The infantry which will be provided with such swift, mobile fortresses will also carry trench mortars many times as effective as those issued to them in the last war. That one had a minimum range of 150 yards and a maximum of 750 yards, and the explosion of its shell produced a crater about two feet deep and four feet in diameter. Our newest mortar, procured from France, can fire either a seven or a fourteen-pound projectile, and the lightest of these is about equal in destructive effect to that from a seventy-five millimeter gun. It has a minimum range of thirty yards and a maximum of 3,300. In other words infantrymen in the next war will be using weapons as destructive as artillery.

The rifleman will not have to manipulate a bolt each time he fires his weapon. Instead, his gun will be semiautomatic. He will load it by inserting a clip of ten cartridges, and he can fire each one in turn simply by squeezing the trigger. If he is operating as a sniper and his first shot at an enemy misses, he can instantly correct his aim and take another shot by squeezing the trigger. The advantage of this will be apparent to any doughboy who in the last war discovered the disadvantage of having to work the bolt mechanism after taking one shot. This was an interruption to his aim.

The doughboy of the future will not have to await instructions that cannot be delivered until telephone wires have been laid. The various fighting units will keep in touch with each other as readily as nowadays we keep in touch with Amos and Andy.

I might list many other devices which have developed out of our peace-time needs which are going to be readily applicable to the effective defense of our country in the future. Even though the very sky above our heads has become a part of our frontier, our unparalleled ability to create machines gives us a great advantage which we have hardly begun to appreciate. Rome when she was mightiest was constantly endangered by barbarian hordes. Civilization today is not concerned with such a threat. It need not be, either; not when every grocer's boy driving a light truck is already half trained for service in a battery of artillery.

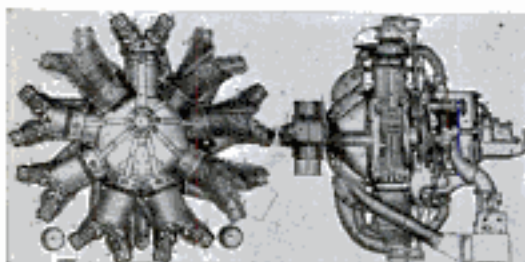
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32x5.25-20	2.75	32x5 1/2	3.25
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Anything you write me or send me is strictly confidential between us. All letters and drawings are kept in strong, steel, fire-proof files, which are open only to myself or authorized members of my staff. I have secured patents for inventors located in every state in the Union. My organization is a large and efficient one. My practice is confined entirely to Patents, Trademarks and Copyrights. I have had years of experience in Patent Matters. When you place your idea in my hands, I am in position to proceed at once to secure protection for you. My fees are reasonable, and if you desire, I can arrange convenient terms of payment.

My Location in Washington

My offices in Washington are convenient to the Patent Office, and I and my assistants can, therefore, appear promptly before the officials and Examiners.

Now everybody's tryin' to climb on our Bandwagon

by "Singin' Sam"



WHO'D have thought, folks, when we introduced Barbasol fifteen years ago, that the time would ever come when we'd have to warn you against substitutes?

But just look who's here—a whole passel of people who've changed their tune and admitted "Bristles" was the wrong hoss!

They all grinned when we said Barbasol would make the messy old shavin' brush as obsolete as the high-wheel bicycle.

They said man had plastered on lather with a brush since the dark ages and, by

cracky, they always would!

But they were wrong, folks, yessir, they were wrong!

A few open-minded men tried Barbasol and found it worked like a charm. They bragged about it to their pals, and first thing we knew, sales began to pile up.

We kept right on improving Barbasol and the sales kept right on climbing.

And today, it's actually the fastest-selling shaving cream on the market, bar none.

That's why everybody's trying to climb up in the driver's seat.

We don't say these new preparations are "no good." Not at all. Almost anything's better than the sippy old brush and lather method of removing whiskers.

But we do claim Barbasol gives you the coolest, smoothest, slickest shave man ever treated his face to.

And you've got only one face in this vale of tears, so why not take a tip from Singin' Sam and treat it to the best?

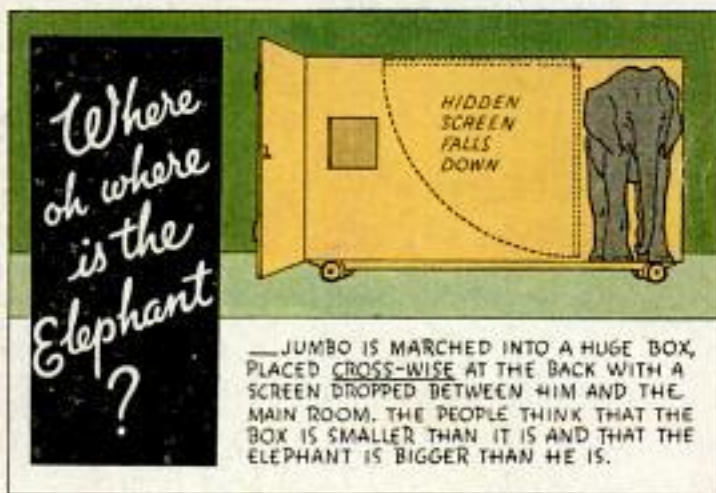
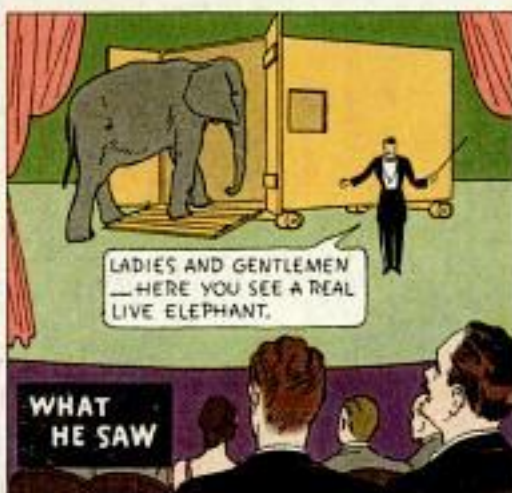
THE BARBASOL COMPANY, Indianapolis, Indiana



Tune in Singin' Sam, Every
Monday, WABC and
Columbia Network, 8 P. M.
E. D. S. T.

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