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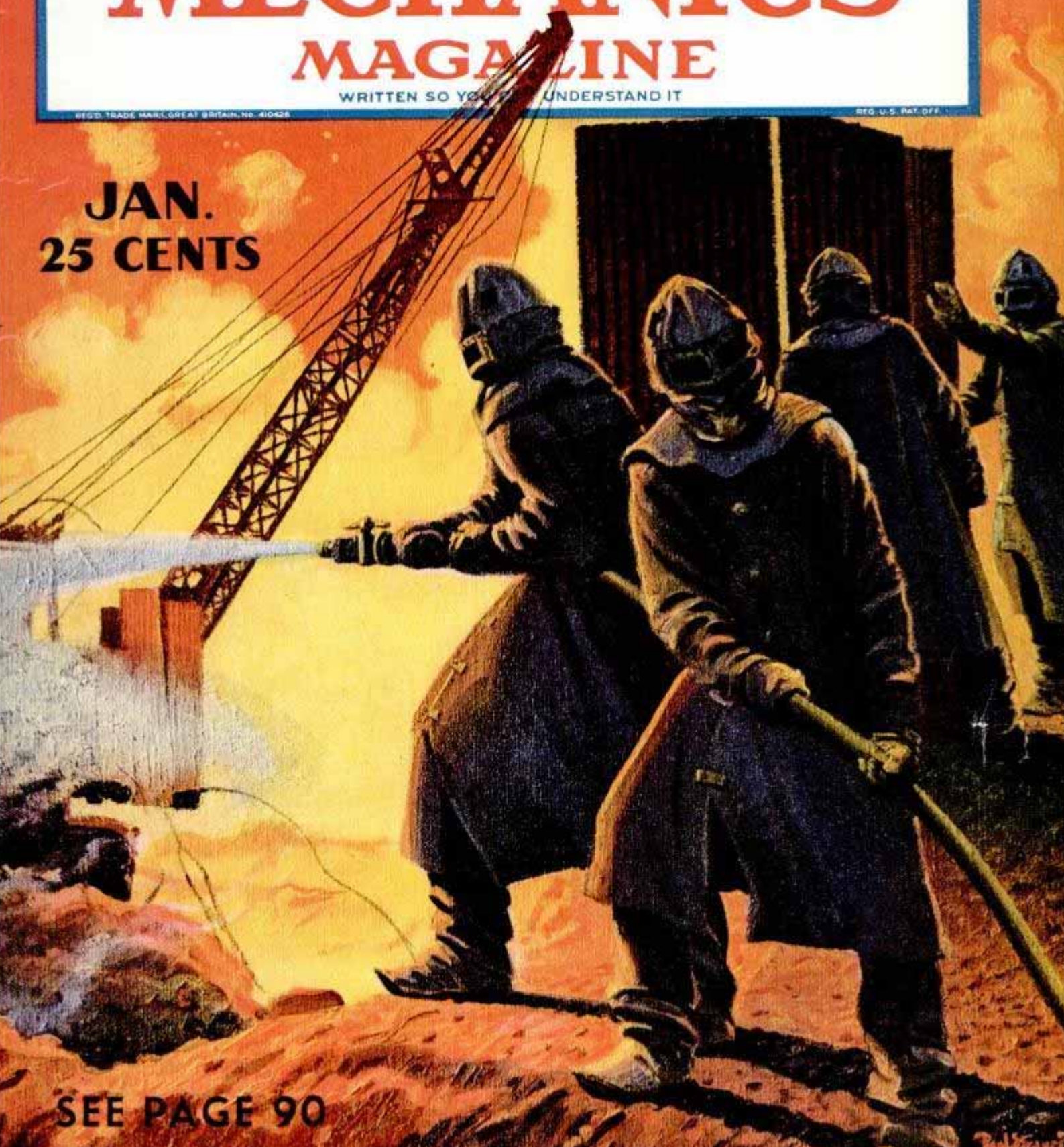
MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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SEE PAGE 90

GENE KRUPA—the World's Highest Paid Drummer



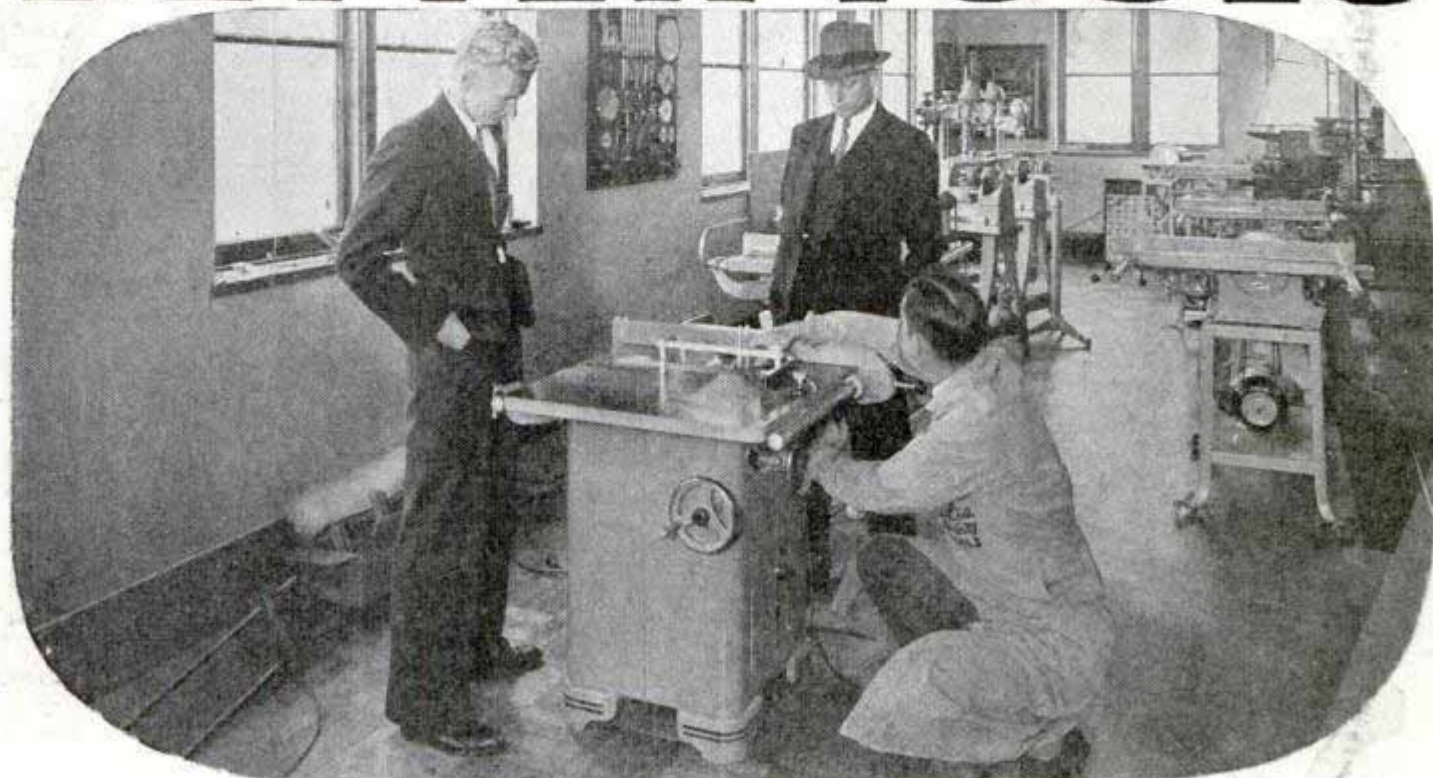
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Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

January, 1939

Vol. 71, No. 1

Special Features

Making Metal Smooth as Glass	1
Teaching Wild Animals New Stunts - Roto	
Moving the Earth	18
Flying Above the Weather	24
Trackers of the Highway	34
New Jobs on the High Seas	40
Picture Your Family	45
Mining a Glacier	51
A New Frontier	57
"Minnies" Supply Punch to Movies	66
"They're Off!" to New Thrills	72
The Latest in Aviation Radio	83
Taming Wild Wells	90

(Continued on next page)

Check and Double-Check

BENNY HOWARD, test pilot who is putting the forty-two passenger, 65,000-pound Douglas DC-4 through its paces says test-flying a new airplane is not the dashing, heroic business which most people think it is. A test pilot, it seems, does not whisk an unproved plane into the sky and try to dislodge an engine or snap a wing. The whole idea of testing is to put a plane through its paces safely. If the stalling characteristics of the DC-4 are to be determined, Mr. Howard does not take this flying laboratory and its tons of instruments aloft, point its nose straight up and await developments. He creeps up on the stall. As a result, when he stalls, he knows how he is going to get out. In "Check and Double-Check" in the February issue, Mr. Howard takes you for a test flight in the biggest land plane ever constructed on this continent.

Next Month

ONE of the most difficult tunneling jobs in construction history is nearly completed—a thirteen-mile bore through rugged Mount San Jacinto, east of Los Angeles. This tunnel is the major link in a 400-mile chain of tunnels, canals, siphons, conduits and distributing lines which will transport a million gallons of water daily. An article in the February issue tells how human moles have licked "ol' man mountain."

Taming a Wild River

FOR generations the raging Colorado was known as America's wildest stream. Today this renegade among rivers has been tamed. Its once destructive energy is harnessed to do monumental tasks and the puny hands of a few score of men, backed by the mighty strength of Boulder dam, now direct its almost limitless force. An article next month describes the operation of the dam which has tamed the Colorado.

Man's Mightiest 'Eye'

THE greatest telescope ever dreamed of, a \$6,000,000 giant that "couldn't be built," soon will be sweeping the skies. Among other things, astronomers hope to discover millions of new star systems. The 200-inch reflecting telescope on Mount Palomar in California is described next month in an article illustrated by eight pages of Colorado pictures.



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(Contents—Continued)

AUTOMOTIVE

Fan-belt vacuum pump drives windshield wiper....	22
Motors measured to find hidden troubles.....	23
"Cop" on beat motorized to save time.....	27
Suction grip for removing headlight lens.....	27
Detachable drawbar for trailer.....	30
Front-wheel-drive motorcycle.....	30
Midget car built from junk.....	38
Stainless steel cable saves drain on battery.....	49
Air circulator warms rear seat of car.....	76
Tire chain installed without lifting wheel.....	76
Racing car built of odds and ends.....	78
Non-skid traffic marker set in pavement.....	79
Colored mirrors in road show highway ahead.....	86
Portable auto brake tester.....	88

AVIATION

Meter forewarns pilot when pilot approaches stall... ..	28
Ramp submerges to lift ship from water.....	30
Automatic fuel system for planes.....	39
Giant landplane carries forty-two passengers.....	54
Single-seat fighters lead aerial offense.....	60
Latest war planes fly six miles a minute.....	61
Automatic direction finder helps pilot.....	71
Divers put wheels on flying boats.....	89
Automatic parachute opens itself.....	94

BOATS

Stainless steel lifeboat.....	22
Liner measures depths of sea with echometer.....	32
Fireboat hangs 20,000-gallon water screen.....	39
Latest liner is larger than the "Queen Mary".....	62
Giant boilers to drive the "Queen Elizabeth".....	63
Nickel-lined cargo ship built like submarine.....	65
"Bluebird" sets new world record.....	78
Ship speed raised by blisters on hull.....	96

CONSTRUCTION

Airport runway made of cotton.....	48
Two-mile conveyor belt hauls sand to dam.....	71
Earth crust's strength found by builder's tester... ..	77
Bookshelves of library form framework of building. 79	

FARMS

Low cost insect sprayer uses auto exhaust.....	32
Plant roots fed from tank attached to hose.....	76
Mechanical reaper cuts sugar cane.....	80
Pink and blue potatoes developed.....	81
Adjustable stilts for tree trimmer.....	86

HOUSEHOLD

Pushbutton faucet cap for bottle.....	28
Motorless dishwasher uses soap and water pressure. 33	
Folding clothes-closet rack eliminates crowding... ..	60
Mop with wringer attached.....	65
Electric doorknob lights keyhole.....	86
Adjustable step makes ladder safer.....	87
Portable electric oven.....	87
Venetian blinds of washable cellulose.....	96

PHOTOGRAPHY

Photo enlargement calculator.....	50
Two-tone tongs for darkroom.....	56
Windshield camera snaps speeder with proof.....	64
Film viewer magnifies picture.....	65
Film viewer notches negative for enlarging.....	95
Spoon for weighing chemicals.....	95
Camera "sees" high power in insulated test.....	96

RADIO AND ELECTRICITY

Candid X-ray camera.....	29
Glass yarn used to insulate electrical equipment... ..	38
Five-barred neon traffic light.....	48
Electric secretary takes dictation in plane or car... ..	54
Electric robot answers questions of Fair visitors... ..	56
Telegraph typewriter sends message.....	64
Shielded loop antenna built into console.....	97
How to build a 9-tube broadcast receiver.....	98
How to build a photocell relay.....	100
Practical radio suggestions.....	101
All-wave radio interference filter.....	102
Battlefield relics found with metal locator.....	102
Four-tube receiver built into floor lamp.....	102
Portable battery receiver employs low-drain tubes... ..	102

SCIENCE AND INDUSTRY

Telescope mirror finished in chromium bath.....	22
Retriever bullet samples rock in oil well.....	28
Radioactive grease finds flaw in metal.....	44
Electronic microscope.....	49
Hosiery fiber made from coal.....	50
Winch truck hauls 55,000-pound load.....	54
Cow's milk turned into wool.....	77

(Continued to page 6A)

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(Contents—Continued)

Invisible poison vapor detected by shadow..... 78
 Supersensitive radium detector 80
 Electric heart pumps blood through mechanical lung 81

SPORTS

Rubber sheath protects gun sight from damage.... 44
 Rubber expansion strips to line tennis court..... 88
 Quick action fly-tying vise for fishermen..... 94

TOOLS

Hand scraper with replaceable blades..... 32
 Clamp for splicing cable 48
 Table shaper for workshop 60
 "Iron alligator" cuts roots from sewer pipe..... 76
 Compressed air operates doors of tool chest..... 87
 Cylinder micrometer with dial indicator..... 88
 Electric paint gun has no compressor..... 94

MISCELLANEOUS

Miniature circus gives many "big top" thrills..... 17
 Balloon-inflating cart is aid to vendor..... 28
 Milk bottle "chute" for refrigerator..... 28
 Electric music-teaching board speeds pupil's work.. 29
 Risking lives working high in air..... 31
 Double bicycle carries family of nine..... 32
 Rude hut hides anti-aircraft gun..... 33
 Piano without soundboard is four instruments in one 38
 Rubber heel snapped on shoe by wearer..... 39
 Thrill ride for Fair's visitors 44
 Lantern defies hurricane in wind-tunnel tests..... 48
 Skimming milk made impossible 48
 Homes towed on barges to new site..... 49
 Field gun hurls ninety-five pound shell..... 50
 Fingertip puppet show in overnight bag..... 55
 Sea-going postman picks up floating mailbox..... 56
 Flashlight tray for change helps sell batteries..... 60
 Gauge checks rail alinement 70
 Models sculptured in concrete..... 70
 Pocket size explosion meter 70
 Radio sentry warns section gang of approaching train. 77
 "Wet wash" street sweeper 79
 "Pelican" ashtray swallows burned cigarette..... 80
 "Radiator" pipe cools smoke and traps tars..... 80
 Type casting machine with typewriter keyboard... 81
 How faces are made to order..... 82
 Portable desk phone booth 86
 Rock dust guards mine from coal dust explosions... 88
 Concrete disks for tractor gives more traction.... 94
 Poles have more sunlight than equator..... 95
 Sun punches clock on time chart..... 95
 Pushbutton index 96



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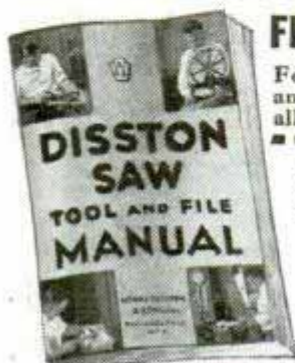
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(Craftsman and Shop Notes)

AUTOMOTIVE

Altered piston forms sturdy grinder head..... 155
 Auto shortcuts 157
 Bug screen converted to winter front..... 158
 Spark-plug sandblaster 158
 Stopping oil leak in main bearing of model-A Ford... 158
 Valves at filling station locked by metal cover..... 158
 Automatic latch to hold open garage doors..... 159
 Delivery-truck driver saves time with blackboard.. 159
 Dirt between fender at joints causes squeaks..... 159
 Vacuum cups on glove to remove headlight lens... 159
 Pipe guards on deep driveway protect fenders..... 160
 "Running" on a bad connecting rod..... 160

FARM

Holder for grain sack 141
 Percolator to cook stock feed 141
 Improving spiked calf weaner 144
 Combination wheeled mortar box and feed cart..... 151
 Fruit trees protected in winter by corn shock..... 151
 Hopper for pouring feed into hog trough..... 152
 Measuring lake shore line with wheels..... 152
 Permanent cold frame 152
 Fence post puller 156
 Large barn door opens easily with strap..... 156

FURNITURE

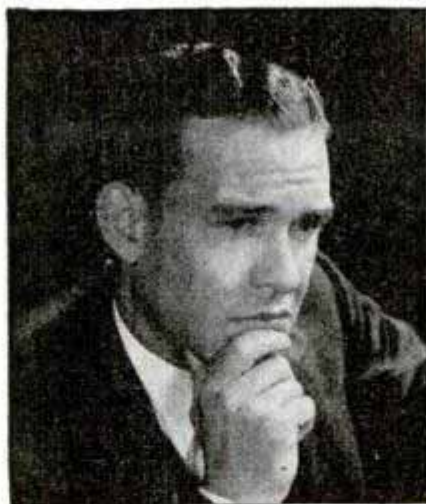
Desk and bench for the guest room..... 108
 Adjustable lounge chair 111
 A Pendleton sideboard 114

HAND TOOLS

Ball of hinge pin for hammering brass..... 110
 Wallpaper knife sharpened on emery paper..... 110
 Emergency pipe vise from two wrenches..... 112
 Plane used as a surface plate..... 112
 Combination fine and coarse file saves time..... 120

(Continued to page 8A)

HOW SAFE IS



YOUR JOB?

CAN YOU CLASS YOURSELF AMONG THE "OK-MUST KEEP!" EMPLOYEES?

NO USE dodging facts! At times—in every company's history—the pay-roll goes onto the operating table for major surgery.

And when such times come, certain employees are amputated—sometimes a few, sometimes many.

Yet a certain few are always marked "OK-Must Keep!" And the many who are let out envy them—call them "lucky."

What's Behind Job-Holding "Luck"?

It can be *proved*, however, that there's almost always something more than luck involved.

Even the fellow who seems to "have a drag" may actually have a lot more on the ball than is apparent to his fellow workers.

He may have hidden values that only his superiors see or know about.

After all, the "I-Gotta-Drag-Club" has taken a bad licking. In fact, it rather completely disbanded in 1932-1933.

Yet why is it that some employees hold their jobs at the very time when others of seemingly *equal* ability lose theirs?

If it's not luck, there *must* be some explanation.

And there *is* one!

How to Insure Your Job

The secret of holding your job in hard times is to be invaluable to your employer. And a man or woman who is invaluable is usually a well-trained one.

Training is of many kinds—stems from many sources. But the LaSalle kind has been unusually successful. Nearly a million members, in a score of subjects, over a thirty year period can testify to that—and many can prove it by their pay envelopes!

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Why It Works

Put yourself at your own president's desk for a moment.

You are faced with cutting the pay-roll. First of all, you certainly are going to do your best to hold on to those employees who really know their present jobs.

But among them—the very last to go will be those

few who are also wholly or partly trained for the job ahead—even for the job *ahead* of the job ahead!

What You Should Do About It—

But true as these facts are, you probably will tend to do nothing about them.

"My job is safe," you think. "My company won't cut down—and even if it does, *I* won't suffer."

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(Contents—Continued)

Copper tubing flared with wood screw.....	120
Jig to wind small coil springs.....	134
Thickness gauge carried in key case.....	141
Background stamps made from auger bits.....	144
Slot locates gauge positions in holder.....	144
Adjustable jig holds irregular work for welding.....	154
Nut catcher for box end wrench.....	154
Torch and soldering iron for roof work.....	154
Holding two shafts in line.....	155

HOME IMPROVEMENTS

Breakfast nook housed in kitchen cabinet.....	105
Auto skid chains improve private driveway gates.....	118
Smart effects for kitchen and bath.....	131

HOUSEHOLD

"Rope ladder" shelves for door.....	110
Wax finish on wood plates.....	113
Clothesline tightened by turning a crank.....	128
Anchoring stovepipe in chimney opening.....	130
Table-top garden for apartment dwellers.....	135
Solving home problems.....	136

OFFICE

Rubber band holds pencils on drawing board.....	107
Extra sheets for notebook perforated with pen point.....	130
Removing carbon paper from typewritten copies.....	134

PHOTOGRAPHY

Dimming photofloods before exposure.....	119
Sensitive beam scale for photographic chemicals.....	121
Tilting tripod head from electrical fixture.....	135
Universal enlarger.....	146

POWER TOOLS

Work shelf for drill press.....	106
Hold-down on scroll saw becomes presser foot.....	120
Self-aligning shaft hangers.....	122
Spirals made with simple lathe jig.....	139
Starting stocks and dies.....	144

STORE AND SHOP

Pantograph drawer swings out from workbench.....	107
Rack to store golf clubs.....	120
Muffin pan serves as small parts drawer.....	138
Crochet hook fastens sack tags.....	156
Rubber-stamp rack holds pad too.....	156

TOYS AND NOVELTIES

Trick box a puzzle to open.....	105
Juggling-cat toy tosses ball.....	113
Disappearing coin trick.....	129
Simple gym unit for your back yard.....	138

WOODWORKING

Fireplace screens.....	103
Casters recessed in furniture legs.....	106
Glue dropper for cabinet and chair work.....	106
Taking thin cuts from end of board.....	122

MISCELLANEOUS

Stringing lamps in the garden.....	106
Repairing a pitcher pump.....	107
Clothespins hold tree lights.....	110
Steel wool anchors screw in plastered wall.....	110
Model windows simulated with glass and ink.....	112
Radius arm improves dividers.....	112
Magnifying glass is supported by vacuum cup.....	119
Anchoring wooden pulleys on shafts.....	122
Protecting potted fish-pool plants in winter.....	122
Silk stencils for printing greeting cards.....	123
Balancing point of ladder marked with tape.....	128
Graphite lubricating pencils for small parts.....	128
Auto casings hold bricks when repairing chimney.....	130
Wallpaper seam roller from caster.....	130
Wedge blocks hold tubing while sawing it.....	130
Cat and squirrel proof bird feeder.....	134
Portholes for model boats.....	134
"Cellophane" used as shim stock.....	140
Wheeled pot to pour tar in pavement cracks.....	140
Water hammer prevented in air-conditioning unit.....	141
Tricks that help you in soldering.....	142
Chuckling small irregular lathe work.....	145
Paperhanger's paste bucket stand.....	145
Guard on oilcan spout.....	151
What you can do with a ring stand.....	153
Wrist-strap mirror aids plumber.....	154
Sash lifts form brackets for door bolt.....	156

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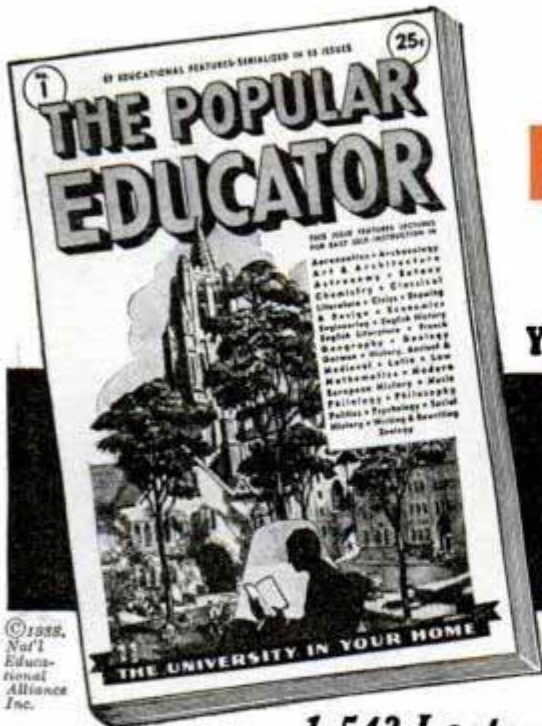
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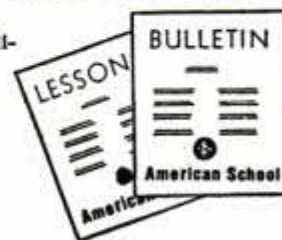
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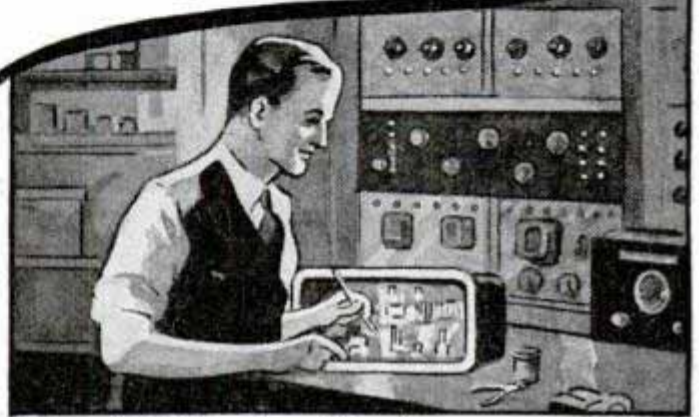
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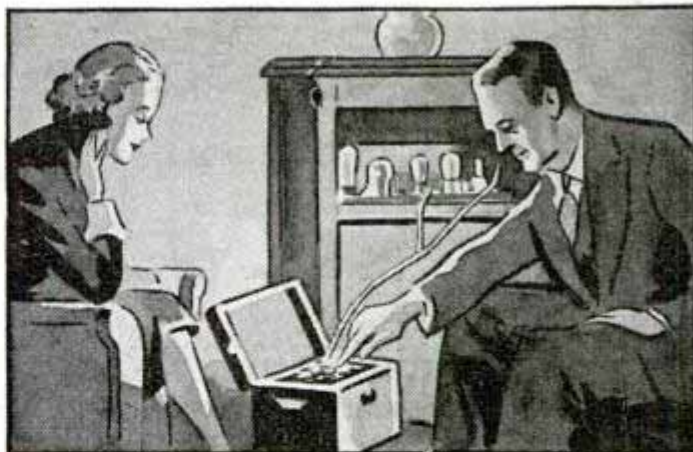
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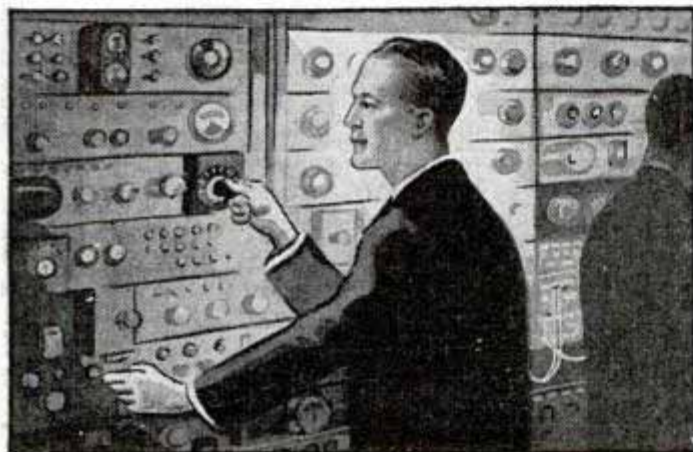
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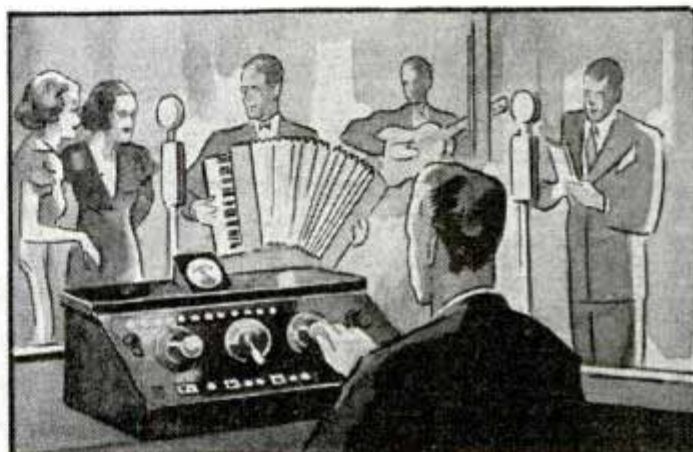
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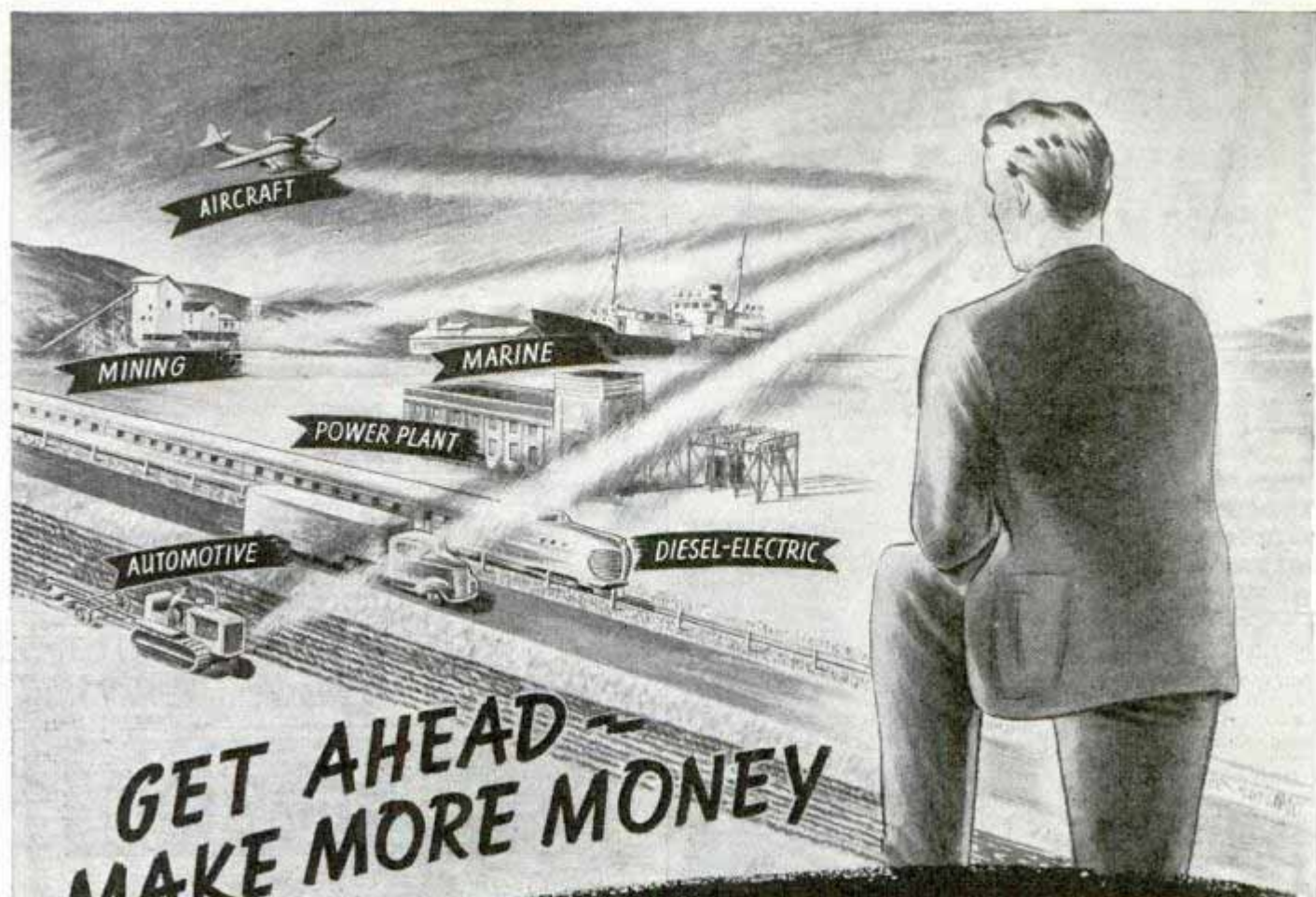
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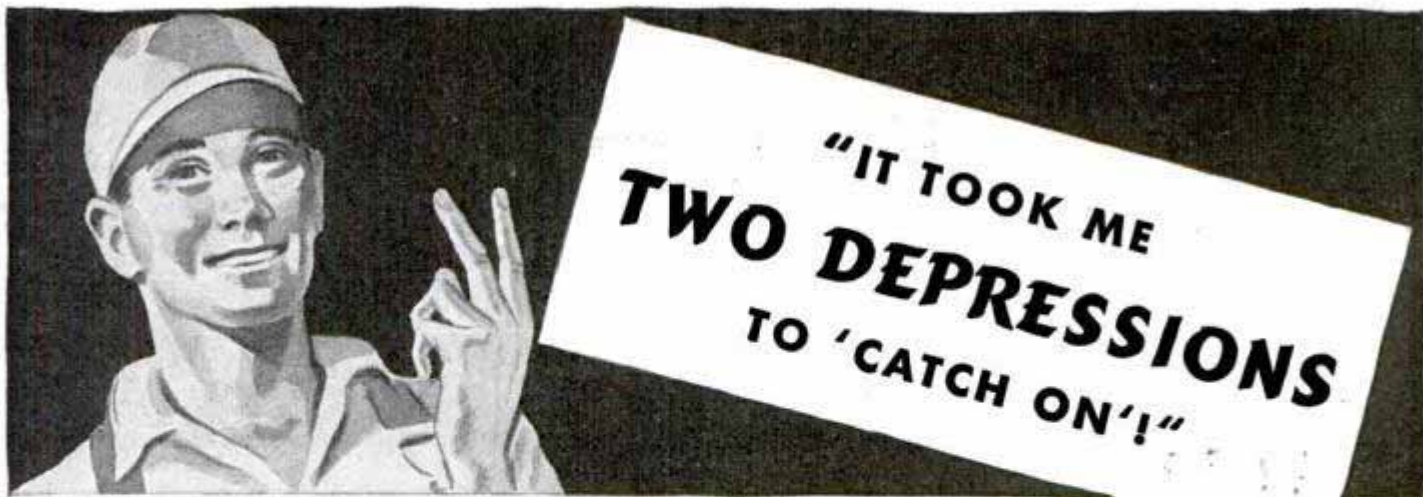
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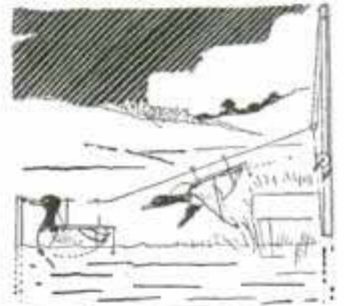


COMplete silence at the bridge table, desirable from the standpoint of many players, may be achieved through the use of a visible bidding machine patented recently. It consists of a circular box with a dial and pointer on top. Each player, in turn, operates

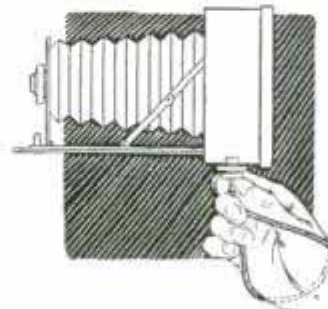


the dial to indicate his bid. Space is provided for "pass," "double," "redouble," and similar terms used in bridge bidding. In addition to bringing silence to the game, the bidder shows at a glance the suit and number of tricks bid, thus eliminating confusion.

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(Continued to page 33A)

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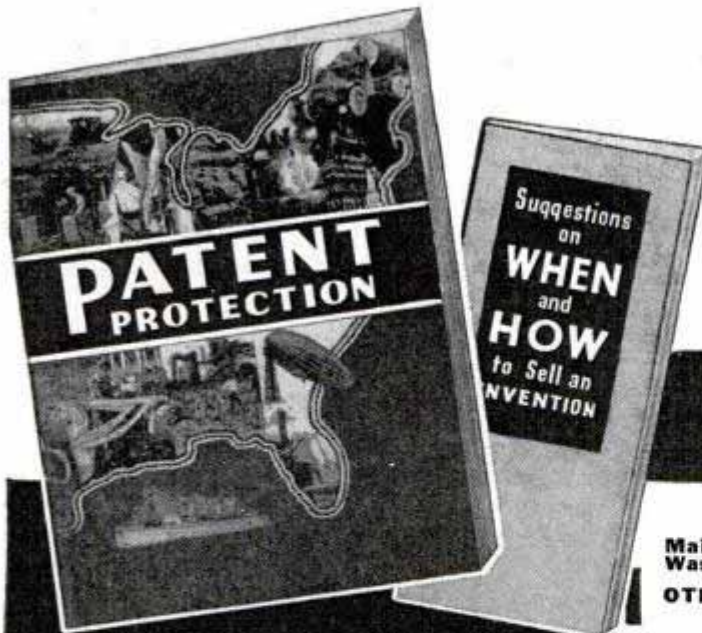
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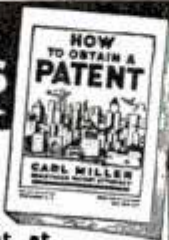
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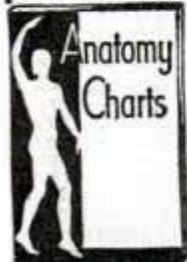
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NEW INVENTIONS

(Continued from page 20A)

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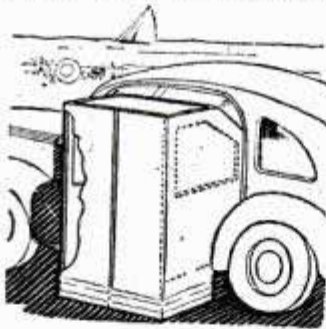


shaped so that the user is forced to grip it properly. In addition, the bristles are so arranged that the free ends of the tufts are shaped to define truncated

cones, with the tops and bases of the cones in parallel relation with the head of the brush. This arrangement, together with a trough-like formation for reception of cleansing material, such as paste or powder, is said to result in easier and more effective cleaning of the teeth.

CHANGING to bathing suit and back again at the beach where dressing

rooms are not available is made possible by a recent invention. It is a knockdown dressing room adapted to coact with one door of an automobile. When occupied the structure fits closely against the side of the auto to give complete privacy. It has a base or floor as well as a top. With both doors of the car open into the little room, there is ample space to change clothing in comfort.



FOR the home or apartment, a milk-bottle holder designed for prevention of theft has been



patented. It consists of a metal frame that locks around the necks of two bottles. Bolted to the door frame, it frustrates the sneak thief attempting

to take the bottles from the door before the householder arises.

(Continued to page 52A)

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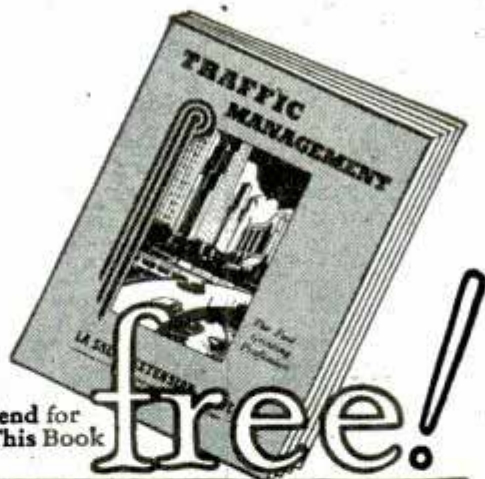
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PROSPERITY For home workers. 52 page magazine. Sample, dime. Sizemore, 4917 N. Kostner, Chicago.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CS-1142 Sunnyside, Chicago.

AMAZING Money making secrets. Particulars purple stamp. Century Service, 207 E. Ontario, Chicago.

MAKE Money mailing letters. 75c profit possible on each letter. McCants Service, Weslaco, Texas.

MILLION Articles. Buy wholesale. Valuable directory dime. Ideal Service, Park Ridge, Ill.

YOUR Name—5,000 mailing lists—25c. Get samples, opportunities galore from all over world. Pines, 583-A Monroe, Brooklyn, N. Y.

BORROW Recognized moneymaking books, folios by mail 10c each. Send for details and list. Anderson, Box 548, Muskogee, Okla.

BIG Mailorder business. Home work. Davis, 337 River, Orange, Calif.

DISTRIBUTE Commission circulars. Mail or local. Darwin McFarlin, Delavan, Wisconsin.

\$25.00 STAMPING Names, per 100 key-checks. Sample 25c. Outfits furnished. Bohn Company, P. M. Box 86, Wilkes-Barre, Penna.

300 MONEYMAKING Plans 25c. Literature 3c. Morrelle, 159-N State, Chicago.

FREE—100 Wonderful business, mail-order and home work moneymaking offers. Lewis Co., 828-C Carpenter, Oak Park, Illinois.

BALLGAMES. Movies afternoons. Work mornings, home, your own business. Write Stamford, 3762-D Broadway, New York.

SPECIAL "Sparetime Moneymaking Magazine" 10c. Tuesday, 2810 Winfield, Canton, Ohio.

EMPLOYMENT: Ten tried money making propositions \$1.00. Derry, Box 219, Hobart, Ind.

COLLEGE Education! Ambitious? Work your way through! I'm working way through University California. Twenty successful plans, 25 cents. Good investment. Box 506, Berkeley, California.

PERMANENT Profitable business of your own. Small capital. Particulars free. Ad-Craft, 149 Collingwood, Detroit, Mich.

DIME Brings ways to make money easily, quickly, honestly. O'Brune, Publisher, Paulding, Ohio.

MOULDS, Guaranteed, for casting toy soldiers, Indians, trappers, warships, sinker moulds, 244 kinds. Send 5c for illustrated catalogue. Henry C. Schiercke, 645 Spencer, Ghent, N. Y.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 26A.

WANTED Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. P65, Toronto, Can.

IMPRINTS! Sell by mail. Big profits. Fast sellers. Low priced. Samples, prices 10c (refunded.) Success, P-13032 Chicago St., Blue Island, Illinois.

TYPISTS Earn extra money. Send 25c (coin) for "Twenty-one Ways to Make Money With the Typewriter." H. Robbins, Box 6048, Kansas City, Missouri.

PENNIES In Hamilton scales produce assured income without canvassing or selling. 1910 Vermont, Toledo, Ohio.

MAILORDER Opportunities, plans, formulas, information. Circulars free. Harvey Teeple, Decatur, Indiana.

STOP Squealing—Start crowing! Work mornings home—country drives or movies—afternoons! No canvassing! Folio-A, Station "D," Los Angeles.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. N, Decatur, Ill.

RAISE Earthworms for profit. Information free, stamp appreciated. Bureau Zoological Research, 106A Broadway, Peoria, Ill.

WHOLESALE Sources, 500,000 articles. Free directory. Maywoode, 925 Broadway, New York.

FORMULAS, PLANS, ETC.

YUKON Radiator anti freeze, the pride of the north. Radiator troubles over, make your own. Formula \$1 bill. Write now, Jack Fidler, Box 65, Manchester, Conn.

224 FORMULAS Of Doctor Cummings, including personal consultation, five dollars; particulars stamp. You cannot get this collection elsewhere, but only directly from sole owner. Grinstead, 505 Fifth, New York.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49K, Park Ridge, Ill.

MOTOR Oil 2c gallon. Reclaim used oil. Formula 25c coin. George, 285 Queen, Germantown, Philadelphia, Penna.

FORMULAS—Moneymaking, fast selling products. Literature free. J. Watson Company, Stockyards Station, Kansas City, Mo.

ZEROL Anti-freeze, prevents frozen radiators to 40 degrees below zero. No alcohol. Won't rust. Complies with government standards. Manufacturing costs 15c gallon. Formula \$1.00 postpaid. Keystone Service, Topeka, Kansas.

FORMULAS—All kinds. Real moneymakers. Lowest prices. Catalog free. Clover Formulary, Niles Center, Ill.

"ANYTHING In Formulas!" Particulars free. "Research Bureau," 100 Chelsea, Charlestown, Massachusetts.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

SIXTEEN Selected moneymaking formulas \$1.00. Pryor, Box 2066, Atlanta, Georgia.

SUCCESS Is sure with Miller's Certified Formulas with simplified manufacturing service. "Not cheapest, but best." Miller, Chemist, 706-Jf, Tampa, Florida.

AMAZING Odorless formula, destroys smelly food odors in refrigerator. Keeps them sweet and clean. Big field, bigger profits, making, selling your own. Experience unnecessary. One dollar brings formula, instructions. No free literature. Air Pure, Box 362, Garwood, N. J.

BE First to manufacture this demanded auto product. Makes water pumps, radiators, thermostats and car heaters last indefinitely. 200% profit. Formula three dollars. Other formulas free with order. 3811 Orangedale, Montrose, Calif.

FORMULAS? Literature free! (50 cosmetic formulas, \$1.00; C.O.D. \$1.18)! Galluzzo, Wilkensburg, Pennsylvania.

FORMULAS. Analysis, free literature. Hertstein, 128 So Diamond Ave., Grand Rapids, Mich.

THAXLY Formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. B. Thaxly Co., Washington, D. C.

FORMULAS: 15 Proven moneymaking formulas \$1.00. (Not stock-formula catalogue stuff), real unusual offers. List free. Marvel Laboratories, 6629 No. Maplewood, Chicago.

FORMULAS. Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

10,000 MONEY-MAKING Formulas. Tells you how to make and sell almost everything under the sun; cosmetics, mucilage, anti-freeze solutions, battery solution, beverages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. \$4 postpaid. Popular Mechanics Press, Room (C38), 200 E. Ontario St., Chicago.

CHEMISTRY

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CT-1142 Sunnyside, Chicago.

FREE Cosmetic chemistry course to our December customers. Send 3c stamp for chemical catalog. Clinton Chemical Company, Swedesboro, New Jersey.

CHEMICALS In 5c quantities. Catalog 5c. Fleischer's Laboratories, Everett, Mass.

NEW Balance only \$8.00. Send for bulletin. General Scientific Equipment Co., North Philadelphia, Penna.

JOIN American Amateur Chemists Society. Journal, particulars 10c. Haslett, Mich.

FREE—40 Page catalog of chemical and laboratory supplies for amateur chemists. Wollensak microscopes and supplies, scientific books at big discount. J. D. Winn, 124 West 23 Street, New York City.

CHEMICALS. Laboratory, glassware, apparatus. Send 3c for catalog CP1. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

TELESCOPES. Microscopes, chemistry, mineralogy. Scientific catalog free. Tracey Laboratories, Evanston, Illinois.

AGENTS WANTED

SELL Sensational automobile accessory. Holds car on hill without use of foot or hand brake; frees right foot for gas; fits every make car; installed in five minutes. Our men earn \$50 to \$75 weekly. Protected territories. Small capital for stock required. Write for details. Everlast Manufacturing Company, 17 East 42nd Street, New York City.

IF You are ambitious you can make good money with a Rawleigh route. We help you get started. No capital or experience needed. Steady work for right man. Write Rawleigh's, Box A-2-PMA, Freeport, Ill.

212% PROFIT Selling amazing new liquid mender. Fixes most anything; unlimited demand. Write for free sample proof. Indiana Laboratories, Dept. T-19, Elkhart, Ind.

BEAUTIFUL English Christmas cards, excellent assortment 21 in holiday box, retail value \$2.25, agent's price 50c. Fast seller. Gold Shield Products, 350-P Greenwich St., New York.

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8 $\frac{1}{2}$ c. Razor blades 10 for 8 $\frac{1}{2}$ c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Company, PO, St. Louis, Mo.

MAKE Quick profits demonstrating unique invention of electric bulb. A bright reading and current saving night light all in one. For free details and sample offer write Hagen Import, Dept. LB, St. Paul, Minn.

CARPENTERS: Sell, install overhead garage door hardware. Pays well. Circular free. Wilkie, Independence, Missouri.

SELL Guaranteed tires wholesale. Save users up to 70%. No experience necessary. Profits easy. Unlimited field. Details free. Auto Tire Company, 4502 S. Ashland, Chicago.

STRANGE Chemical sponge cleans wallpaper like magic. Banishes housecleaning drudgery. Sensational demonstration. Samples sent on trial. Rush name. Kristee, 101, Akron, Ohio.

CALLING Cards—Big profits. Samples dime. Johnson, Box 54, Worcester, A, Mass.

TIES. Wonderful proposition. Free samples. Eureka, 307 West 38th, Manhattan.

500% PROFIT With new perfected (1938) quick-action, no flint, automatic gas lighter. Retail 25c. Sample 5c. New Method Co., Box PMG-73, Bradford, Penna.

MEXICAN Novelties! 100%-300% profit. Free particulars. Samples 10c stamps. Marquez-PD, Apartado 1176, Mexico, City.

GUARANTEED Electric shavers. Tremendous Xmas seller. Sample \$1.98 postpaid. Plans free. 1917 South 70th Street, Milwaukee, Wisconsin.

WANTED—Purchasing agents, no experience or money required, write and mail 3c stamps for application to Purchasing Mgr., 176 N. Halsted St., Chicago.

SELL Artistic oil painted personal portraits! Portraiture, 826 Noble, Chicago.

FAST Selling one call foot specialty. New product. Large profits. Automatic repeat plan. Phelps, 1900 Euclid Ave., N. E., Cleveland, Ohio.

I'LL Give you groceries at wholesale besides splendid opportunity to make up to \$45.00 in a week. Brand new Ford sedan given as bonus. Details free. Albert Mills, 3206 Monmouth, Cincinnati, Ohio.

BUSINESS Proposition: Resilvering mirrors, autoparts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 128 Marion, Indiana.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

500% PROFIT. Modernistic guaranteed Stick-on letters for windows, offices, trucks. Large sizes 1c. Easily applied. Free samples. Modernistic, B-3000 Lincoln, Chicago.

BIG Successful money-maker—Radiator Alcohol Seal—only 25c postpaid. Write quick. Midwest Sales, 1337 Monadnock Block, Chicago.

205 MONEYMAKING Opportunities, today's conditions. Your own business, home, office, etc. Introductory booklet free. Stamford, 3762-E Broadway, New York.

METROPOLITAN Window Letter Co. Two piece letters, penny each, free samples. 1699 Lexington Ave., New York.

MILLIONS Of prospects! Buyers everywhere! Sensational social security plates! Tremendous value! Fast seller! Big profits! Complete selling outfit free! Union Specialty, 1775-A Broadway, New York.

WHY Sell goods with stingy profits? Easily make today's newest profitable popular products yourself! Stamp brings valuable details telling how. Miller, Chemist, 706-Ja, Tampa, Florida.

ATHLETES Foot. Dime brings dollar package guaranteed Oldarme Australian. Mycolac, Importers, Atchison, Kansas.

NATIONALLY Advertised Elgin electric shavers (ac) for \$2.98. Year guarantee. Make \$1.00 profit each sale. Agents sample \$2.50. Specialty Products, Bourne, Mass.

WANTED—Reliable, ambitious men over 21 years of age with good car to travel in the country. Steady work. Write for particulars. G. C. Heberling Co., Dept. P.M., Bloomington, Illinois.

WE Are the originators of metal social security plates and cases. Ours outsell them all because we manufacture the best, 70% commission. Everlasting Records Co., 665 West Lexington St., Baltimore, Md.

MAKE More money! Selling a line no one else has! New and different radios, quick selling electrical appliances, attractive gift items. Write for catalog. Hart Products, 168 West Jackson Boulevard, Chicago.

AMAZING Product. Amazing earnings. Year-round repeat business. Details free. Sample 35c. Lyle Products, Sarasota, Fla.

SALESMEN Wanted. Sell business cards, commission. Willmar Press, 674 Main St., Pawtucket, R. I.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 26A.

BABY Shoes plated bronze, silver. Lifetime process. Agents sample \$1.50. Also general plating. Braun Electroplating, 118 E. 28th, New York.

COSTS 2c—Sells 25c. Fast selling necessity for agents, crews, demonstrators. Sample 10c. Linnell, Box 1963-E, Cleveland, Ohio.

PARING Knife. New. Peels, slices, cores. 200% profit. Sample 10c. Three other household necessities. Apex Co., 400 Dakota Bldg., St. Paul, Minn.

PROFIT 100% Selling calling cards. Bonus, prizes to workers. Outfit free. Universal, Orange, Massachusetts.

FREE Sample world's best seller. G. Mfg. Co., Washingtonville, Ohio.

AGENTS—Opportunity make money; book containing 107 successful business plans; home-office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

AGENTS Make big profits on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2810-R Dodier, St. Louis, Mo.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

STARTLING Invention—Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Baby Calculator Co., Box 1118, Chicago.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents," is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

BIG Money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 40, Dunellen, New Jersey.

BIG Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco," 1305 Washington, Boston, Mass.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Auto monograms. Easily applied by agent or customer. Neonite, Akron, Ohio.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 149 Fifth Ave., New York.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-P Broadway, New York.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

REVOLUTIONARY Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$350.00 monthly. Carter Products Corp., 900 Front Ave., Cleveland, Ohio.

GUARANTEED Gold leaf letters for store and office windows. 300% profit. Free samples. Metallic Co., 438-B N. Clark, Chicago.

ATLAS Window sign letters. Large sizes, penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

HIGH-GRADE SALESMEN

SALESMEN—New money-making sensation for garages, service stations, no competition, fine repeater. Automotive Laboratories, 1555 Hanchett Court, San Jose, Calif.

SELL Xmas cards, calendars, business cards \$1.50 thousand. Business stationery, book matches, advertising tape, paper towels, pencils, salesbooks, rubber stamps, free sales portfolio. 35% commission daily. Money making specials. David Lionel Press, 312 So. Hamilton, Dept. CL, Chicago.

SELL Mirror silhouettes! Best sellers in 35 years manufacturing advertising specialties. Also sensational calendar values. Harvest selling season starting now. Ad-Nov-Co, Newton, Iowa.

DID You make \$50 last week? Does your job offer you real future? If not, why not start a wholesale business of your own? Start with little as \$2.50. Handle line 200 nationally advertised 5c-10c products. Show merchants new plan for increasing sales and profits. Handle everything from your home at start. Chance to operate one of our Silver Fleet service trucks. Facts free. World's Products Co., Dept. 1910, Spencer, Ind.

SELL Popular Xmas and winter items. Fast sellers. Good commission. Glider Skate Co., Dept. 19, 3126 West 49th Place, Chicago.

\$6 To \$15.00 Daily, new; quick sales. Resale item. Car dealers, garages, service station. Write Factory, 2812 Gilham, Kansas City, Mo.

IF You are ambitious you can make good money with a Rawleigh route. We help you get started. No capital or experience needed. Steady work for right man. Write Rawleigh's, Box A-2-PMS, Freeport, Ill.

MAKE Big daily cash profits selling Top Quality Advertising Book Matches. Low prices. Experience unnecessary. Full time profits unlimited. Free sales kit. Zipper case offer. Match Corporation of America, Dept. E-1, 3433 West 48th Place, Chicago.

BIG Commission selling celluloid pricing tickets, metal shelf moulding, menu covers, changeable signs, celluloid advertising buttons. P. Pricing Press, 124 White St., New York.

SELL Brohard-Rainer "Good Shirts." Made-to-measure. 125 big samples. Three prices. Established 1924. Big opportunity for hustlers. Brohard-Rainer "Good Shirts," Dept. 700, Fourth Street, Cincinnati, Ohio.

AT Home, your own manufacturing business, making popular \$1 novelties. Cost you 3c to 15c. Everything supplied. Write So-Lo Works, Dept. N-842, Cincinnati, Ohio.

CHRISTMAS And calendar bargains! More profits! Easier sales! Catalog free! Elfko, 436 North Wells, Chicago.

SELL Crofoot stapling devices to shade shops, screen makers, and every industrial plant with a shipping department. Repeat sales of staples will establish profitable business of your own. Sells well with related industrial lines or alone. Part or full time. Write J. B. Crofoot Co., 223 Evergreen Ave., Mount Prospect, Illinois.

ATTENTION Salesmen! New deal! Merchants waiting. Particulars free. Scruggs Company, 1105 Willow, Chattanooga, Tennessee.

MYSTERY Invention, carried in pocket, keeps hands, feet, ears, body warm on coldest days. Everybody buys. Low price—big profits. Kumfy Warmer, 4208 Davis Lane, Dept. S-2301, Cincinnati, Ohio.

"KEENEREDGER" Produced 800 shaves from one blade. \$1.00 postpaid. Keener-edger, Oblong, Ill.

MIRROR Salesmen—Sell to furniture, hardware and gift shops. All prices. Jobbers write Midwest Novelty Mirror Company, 2905 Madison, Chicago.

NEWLY Invented door knob lights key hole. Install in one minute. Earn big profits. Sample \$1.00. Jaxon, 329 N. Front, Grand Rapids, Michigan.

DISTRIBUTORS Wanted. Make more money selling Twenty Grand aspirin, carded goods, big line 10c cosmetics, etc. Lowest prices. International Distributors & Rubber Goods Co., Memphis, Tennessee.

SALESMEN. Distributors—200 items—brushes, mops. Marvelous magnetic brush excels vacuum cleaner. Big profits. Neway Brush Company, Hartford, Conn.

SALESMEN—Distributors, sell complete line automobile bulbs. Davis Lamp Co., 17 East 42nd Street, New York City.

EXCELLENT Opportunity selling our complete line of brushes, largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

GUARANTEED Gold leaf letters for store windows. Free samples. Liberal offer to car owners. Metallic Co., 438-A N. Clark, Chicago.

MAKE More money with Red Comet Automatic Fire Extinguishers. Low price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 704 Red Comet Bldg., Littleton, Colo.

50 YEAR Established manufacturer of the widely known Mendenhall's Cough Syrup and other household remedies wants salesmen-distributors selling to drug, grocery, and general store trade. Deliver and collect. Liberal commissions. J. C. Mendenhall Medicine Co., Inc., Dept. 81, Evansville, Ind.

EARN Money in your spare time taking subscriptions to Popular Mechanics. Unlimited possibilities, every family a prospect. Easy to sell. Bonus paid in addition to liberal commission. Send postcard for further details today. Circulation Dept., Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

HELP WANTED

IF You are ambitious you can make good money with a Rawleigh route. We help you get started. No capital or experience needed. Steady work for right man. Write Rawleigh's, Box A-2-PMH, Freeport, Ill.

WEAR Fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilkmit, Desk A-37, Greenfield, Ohio.

LOCAL Agents wanted to wear and demonstrate suits to friends. No canvassers. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. H. J. Graves, 1300 Harrison, Dept. N-817, Chicago.

CIVIL Service exams coming. 1000 different jobs. Free list. Notification Service, 4244 W. 59th St., Chicago.

M. M. Earned \$267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 69, Chicago.

OBTAIN Employment! Try unusual methods, including homework ideas. 50 cents. Money-back guaranteed. Particulars free. New Idea Service, 126-A Lexington Ave., New York.

EDUCATIONAL AND INSTRUCTION

IF You like to draw, sketch or paint—Write for talent test (no fee.) Give age and occupation. Federal Schools, Inc., Dept. PM19, Minneapolis, Minn.

LEARN Photo-Engraving! Always in demand! Thorough training all branches. Illinois School of Photo-Engraving, Box 510-M, Effingham, Illinois.

"UNCLE Sam" 1939 jobs. Start \$105-\$175 month. Prepare for next examinations. Full particulars, list positions, free. Franklin Institute, Dept. F3, Rochester, N. Y.

BECOME Practical scientific investigator. Modern, illustrated course. Thorough training by former agent U. S. secret service. Particulars free. International Secret Service Institute, TDM-19, Hoboken, N. J.

FOR An extremely profitable lifetime business, operate a collection-credit agency. Free folder. Cole Associates, Syracuse, N. Y.

WATCH Repairing is steady profitable work. Experts always in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script engraving course included. Write for free details today! Nelson Co., 2013 Manhattan Building, Chicago.

CHESS. Instructive. Interesting. Particulars free. Chess Thoughts, Pearl River, N. Y.

MATHEMATICS, Sciences, drafting, blueprint reading, surveying, preparation civil service, engineering examinations. Mondell, 112 West 42d, New York.

COMPLETE Course auto body and fender repairing. 285 illustrations. Special \$3.00. Money back guarantee. Hope Trade School, Burlington, Vt.

TYPING Course 35 cents complete. Palmo Systems, Box 413, West Palm Beach, Florida.

LEARN In a few weeks high class decorating, paperhanging, graining, marbling, sign painting. Catalogue No. 4 free. Chicago Painting School, 437 North Clark St., Chicago. Established 1902.

CIVIL Service arithmetic, spelling, geography, clerical tests. Principles, questions, answers. Complete \$1. Clerk-carrier \$1. Stenographer-typist, 65c. File clerk 50c. Mental tests 50c. Free descriptive folio. Merit Publications, Munsey Building, Washington, D. C.

PENMANSHIP. Learn to earn. 70-lesson course, superb pen-written copies, \$2.00. Portfolio. Beautiful specimens 10c. L. H. Hausam, 558M, Emporia, Kansas.

HOW Inventive minded become independent. Explanation free! Donald Higbee, Cantil, Calif.

BETTER. Cheaper. Two complete exams, \$1.10. List government jobs free. Write today. Pergande Publishers, Milwaukee, Wisconsin.

BLUEPRINT Reading taught by mail. Write Blueprint Reading Institute, Dept. A, Box 5662 Metropolitan Sta., Los Angeles.

SONGWRITERS Wanted. Instruction book free. Song Bureau, Dept. 44, Salem, Indiana.

SECRET Investigation. Experience unnecessary. Detective particulars free. George Wagner, M-2640 Broadway, N. Y.

LEARN Auto mechanics, body, repairing, welding, electricity, refrigeration. Diesel. Stevinson's, 2008A Main, Kansas City, Mo.

MASSAGE. Hydrotherapy, dietetics, druggists therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

GOVT Jobs start \$1260-\$2100 year. Men-women age 18-50. Former examiner's tested method helps qualify you. Particulars, list jobs free. Write today. Patterson School, 8C Mercantile Bldg., Rochester, N. Y.

LEARN Machinist trade, tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Co., 601 Lake St., Chicago.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

PAINT Signs for profit. Fine lettering fast with Speedway Patterns. Modern styles, many sizes. Free samples, literature. For 3-in. alphabet enclose nickel. Display Letters Co., 8309 Third Ave., Brooklyn, N. Y. Dept. M.

CARTOONISTS: Complete course on "Drawing Heads." Over 200 illustrations 20c. Box 71, Mattapan, Mass.

MORGUE—Artists ready reference. Compact collection helpful drawing aids, monogramming tips. Extremely valuable to students, beginners, professionals. First series over 200 drawings, hands, arms. Send 50c coin. Metro Studios, Box 473-P, South Bend, Ind.

CARTOONING. Modern streamlined method. 50c each lesson ordered, or \$2.00 complete 5-lesson course. Individual attention. VonRuden, Poplar Bluff, Mo.

26th ANNUAL Art supply catalog on request. Ask for yours. Bart Supplies, Dept. N, 915 Marquette, Minneapolis, Minn.

PEN And ink illustrations for catalogue and general printing purposes at right prices. High grade work. Heraldic Studios, 1914 Oakdale Avenue, Chicago.

BE A lettering artist! Learn how to letter headings for magazine and newspaper advertisements. Highly paid profession. Free booklet. Guild School of Lettering and Advertising Design, 324 Summit Avenue, Hackensack, N. J.

EARN cash income, copying and duplicating simple cartoons for advertisers. 3-M Service, Argyle, Wis.

PLAYS, STORIES, MANUSCRIPTS

ORIGINAL Poems, songs wanted immediately for publication. Westmore Music Corporation, Dept. 33H, Portland, Ore.

MAKE Extra money writing in easy field. Stamp for particulars. Progress Co., Box 17, South Pasadena, California.

WRITERS! Tremendous earnings through "Master Plot Builder," absolutely revolutionary. Amazing details free. Department 71, Morgan Publishers, 3923 West Sixth, Los Angeles.

SONGWRITERS Wanted, write for free book. Song Bureau, Dept. 42, Salem, Ind.

SHORT Stories and novels rewritten and typed for marketing. Welton Tinney, Wynnboro, Texas.

WANTED, Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 209, Toronto, Can.

ADVERTISING AGENCIES—LETTER WRITERS—FOR ADVERTISERS

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3431, Chicago.

30 WORDS 135 Canadian newspapers \$5.00. Canadian Enterprises, 1183 Bloor, Toronto, Canada.

FORCEFUL Sales letters. Hutzletter Co., 41-44 Davies Bldg., Dayton, Ohio.

YOUR Ad in 180 big newspapers \$7.68. Mailing lists compiled. Sales literature written. Faultless Advertisers, 3405 Prairie, Chicago.

INCH Display, 28 magazines, \$1.50. Paramount Press, D2, Atlanta, Missouri.

ADVERTISE—Sell by mail. Write Goodall Agency, 628 Montgomery, San Francisco.

ADVERTISING Placed all magazines, newspapers, radio. Lowest rates. Free service. 54 page rate book free. Baker Advertising Agency, A-189 West Madison, Chicago. Successors to Ankrum. Established 28 years.

MAIL-ORDER Ad reaching 1,500,000 families throughout United States \$15.40 inch. Newspaper, magazine, ratebook free. Chicago Union Agency, 20-P West Jackson, Chicago.

INCH Display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

ADVERTISE: 24 Words in 250 newspapers \$10. Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

DIRECT-MAIL Advertising services. Sales letters that sell. Mailing lists. Omaha List & Letter Co., Box 2172, South Omaha, Nebr.

BUSINESS SERVICE

LOS ANGELES Mail address \$2.00 monthly. Dickey, 628 W. 9th.

AUTHENTIC Information, any subject, 50c. Paramount Press, Atlanta, Missouri.

PHILIPPINES Law cases, collection, deposition, handled. Free commercial reports. Franco Law Offices, Box 3409, Manila, Philippines.

CANADIAN Mailing address \$1.00 monthly. Canadian Enterprises, 1183 Bloor, Toronto Canada.

WASHINGTON, D. C., mail address, business, personal. Your mail reforwarded daily. Hawkins Mail Service, 817 Fourteenth.

EFFICIENT Nationwide circular mailing. 1000 6x9 \$1.50. Results guaranteed. Fuller Times, 6920 Fullerton, Chicago.

CHICAGO Mail address \$1 monthly. Your personal, business mail forwarded daily. Established 1919. General, 56 West Washington.

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2 LINES 25c, 3 Lines 35c. Stamprite, FP43, Springfield, Mass.

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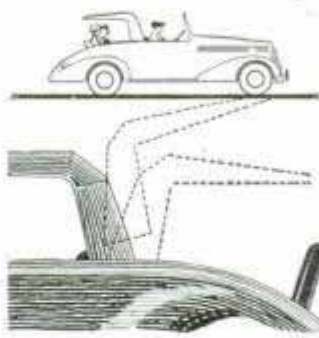
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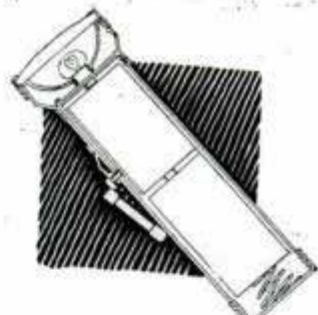
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(Continued from page 33A)

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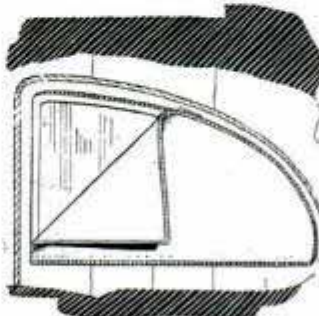


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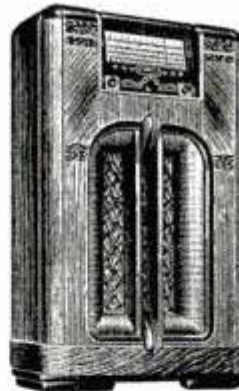
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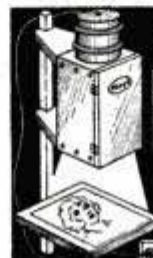


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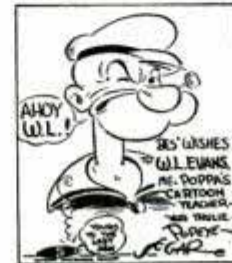
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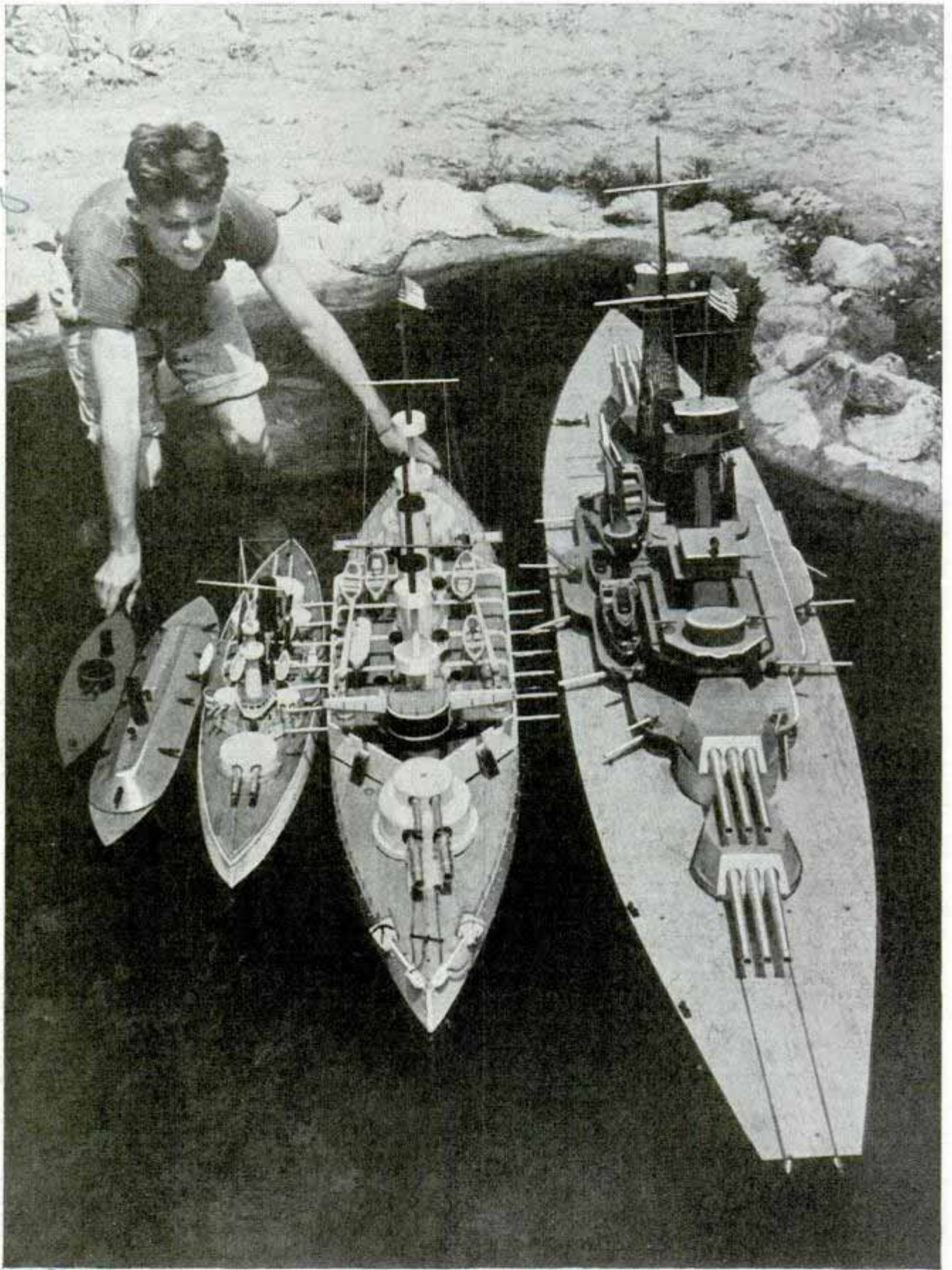
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Howard E. Bixby of Berkeley, 1105 Hillcroft Road,
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Acme

These five scale models represent development of American battleships, from the "Monitor" and the "Merrimac" through the "Oregon" and the "Kentucky" to the "California," present flagship of the fleet. The "California" is driven fifteen miles per hour by a five-horsepower gasoline engine. Howard E. Bixby, builder of the midget navy, causes the "California" and the "Kentucky" to start, stop, maneuver and fire both main and broadside batteries as he stands on shore or rides near by in a boat. He uses a telephone dial or whistles, since the boats are controlled by radio and sound

Popular Mechanics Magazine

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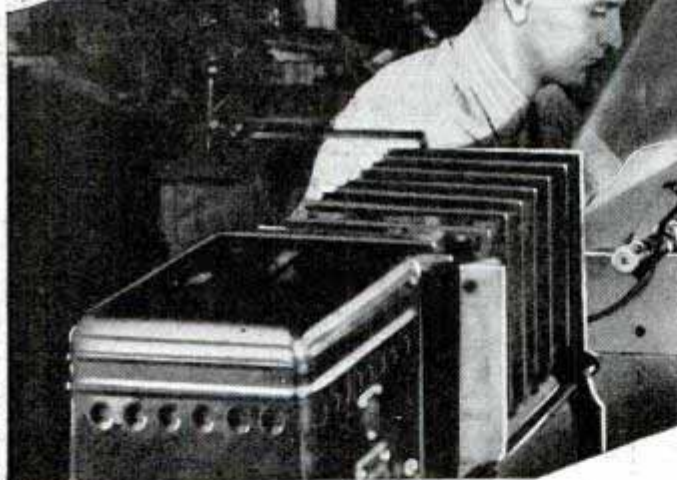
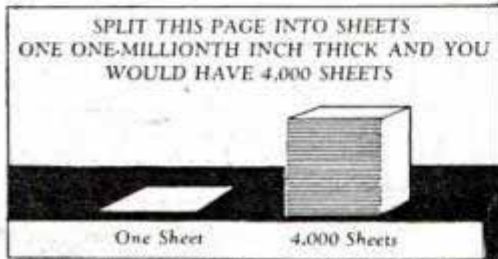
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JANUARY, 1939

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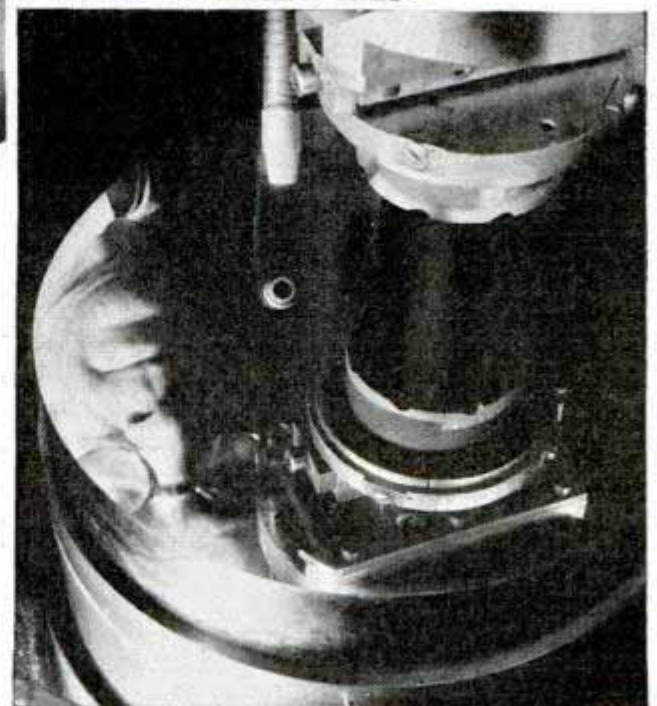
Making METAL SMOOTH as GLASS



By Julian Leggett

LONG the goal of scientists and the industrial world, a revolutionary process for commercially making the surface of any piece of metal as smooth as the finest optical glass has been discovered.

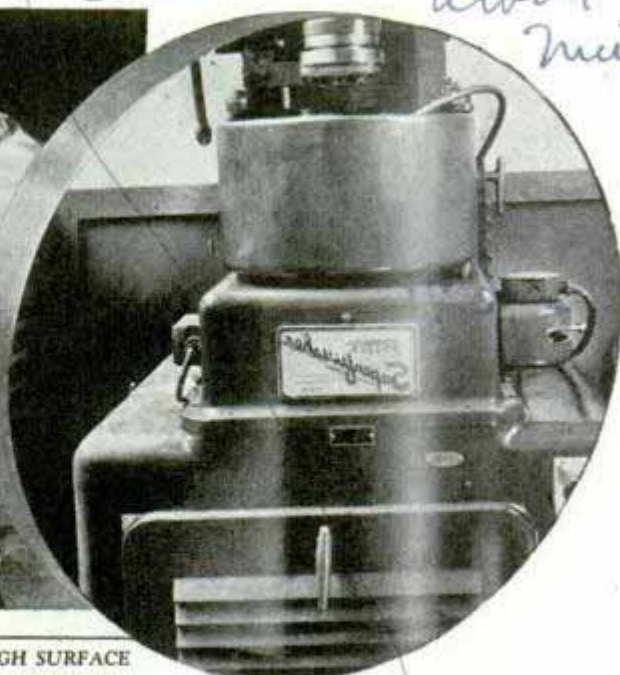
In addition to being more attractive to the eye, metal finished in this manner fits together more closely when used as moving parts in a machine. Three results of such precision manufacture will be: greatly increased life for moving parts, reduction in noise, and elimination of long "run-in" periods commonly employed to bring about quiet operation in new motors.



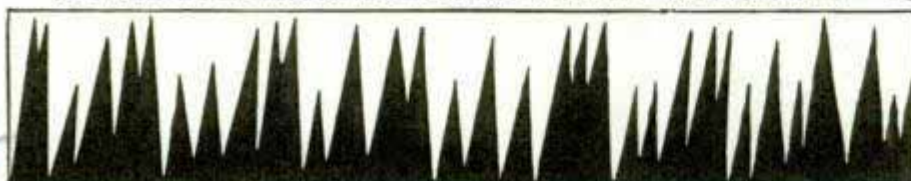
Top, measurement of surface smoothness projected on screen in millionths of an inch. Bottom, operator's reflection on Superfinished metal

Chrysler Corp
3-11
massachusetts

*Dr. J. G. ...
Physicists Research Co., Ann
Arbor Mich*



DEVELOPMENT OF SMOOTH SURFACE FROM RELATIVELY ROUGH SURFACE



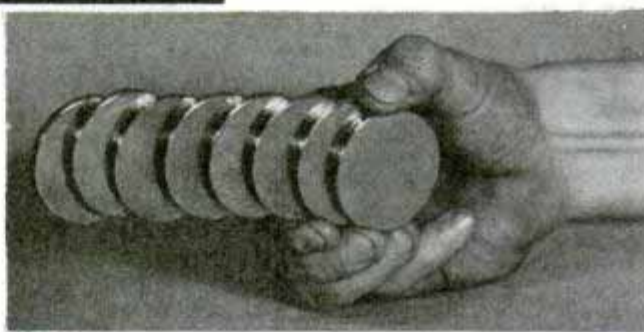
Base Metal 50 Micro-Inches



Base Metal 2 Micro-Inches

Top, left, measuring surface of piston pin with Profilometer. Right, reflection of Superfinishing machine appears in photo of smoothly finished disk. Note mirrorlike appearance of disk

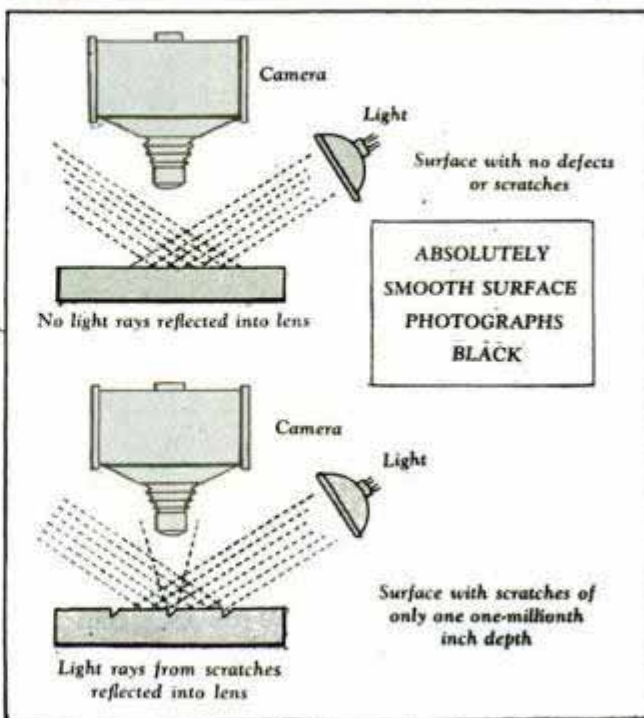
Above, comparison of surface having defects fifty-millionths of an inch high with surface Superfinished to two-millionths of an inch. Right, Superfinished disks held together only by adhesion of their own surfaces. Bottom, why smoothly finished surface photographs black



Although the satiny-looking surface of any metal object may appear to be as smooth as glass, you can prove that it isn't by scratching the finish gently with your fingernail. This simple test reveals tiny, invisible ridges and depressions which turn into mountains and valleys under the magnification of a high-power microscope.

When the surface of metal moving parts rub against each other in a machine, these microscopic jagged edges wear off gradually, no matter how well lubricated the parts are kept. Soon the little ridges are gone, tending to destroy the precision with which the parts were fitted together, and then the machine may begin to pound and vibrate, hastening the day when the parts will be worn out.

"Superfinish" is the name of the new process, which was developed under direction of David A. Wallace, President of Chrysler Division of Chrysler Corporation. Although it was devised for automotive



application, it has almost unlimited possibilities in other fields, lending its magical touch to tiny parts for a watch, plungers for Diesel engines, moldboards for farm plows, stainless-steel sheets for the steel mills, paper rolls for the production of paper and the hub-bearing surfaces of a variable-pitch airplane propeller.

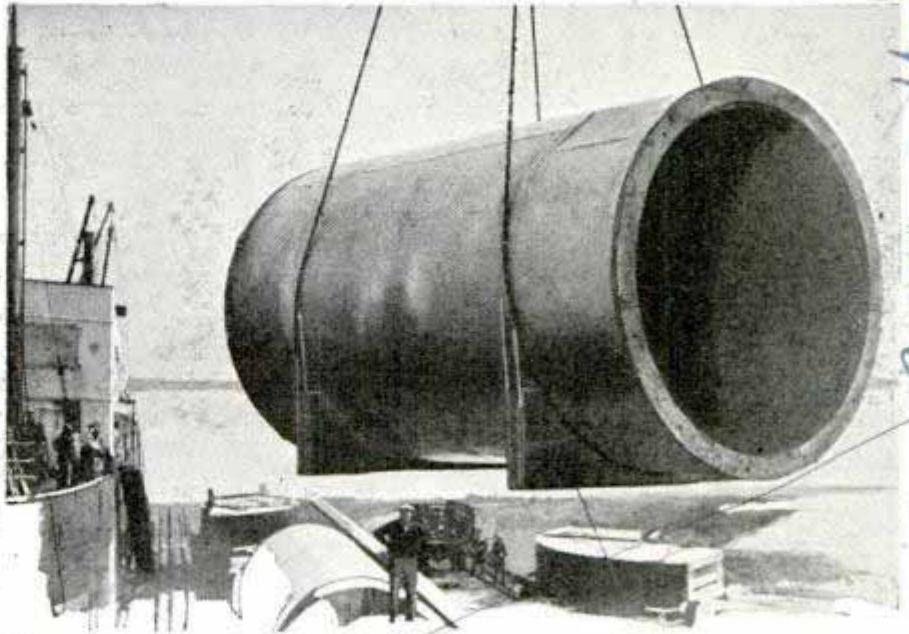
By this process, it is possible to achieve, in ordinary production, parts whose surface defects are as little as two-millionths of an inch deep, which for commercial purposes is regarded as perfect. In experimental work, finishes with ridges no more than two-tenths of one millionth of an inch have been produced. As a means of comparison, if the sheet on which this story is printed could be split into about 4,000 sheets, one of the super-thin sheets would be approximately one millionth of an inch thick.

An optical glass finish can be produced upon flat, round, concave, convex and other types of surfaces, either external or internal, in three to thirty seconds. The operation is somewhat similar to wiping a glass surface lightly with a silk handkerchief to remove dust. After a metal surface has been finished by other means, the invisible ridges are reduced almost to the vanishing point by cutting stones running at amazingly slow speeds under extremely light pressure, ranging from a few ounces to a few pounds. A lubricant of the proper viscosity is used to wash away the cuttings and to hold the stones a sufficient distance from the surface to prevent new scratches. When the surface defects have been removed to the point where virtually all that is left is crystalline metal, the cutting action stops automatically.

Surfaces with the new finish are so nearly perfect, developers of the process say, that if they are kept properly lubricated, there is practically no measurable wear on

(Continued to page 147A)

Yoke of Eleven-Foot Tubes Built for 200-Inch Telescope



Nineteen-foot section of yoke built for world's largest telescope is hoisted aboard ship at Philadelphia for the Panama Canal and California

freighter. Pennsylvania
Some notion of the gigantic size of the 200-inch telescope being built at Mount Palomar, Calif., is obtained from a view of the huge tubes which form its yoke. Each sectional tube is eleven feet in diameter and nineteen feet long. The tubes and the horseshoe bearing for the telescope were built by the Westinghouse Electric and Manufacturing company and shipped from Philadelphia by way of the Panama Canal to California.

Automatic Rinser for Negatives Rocks under Water Stream

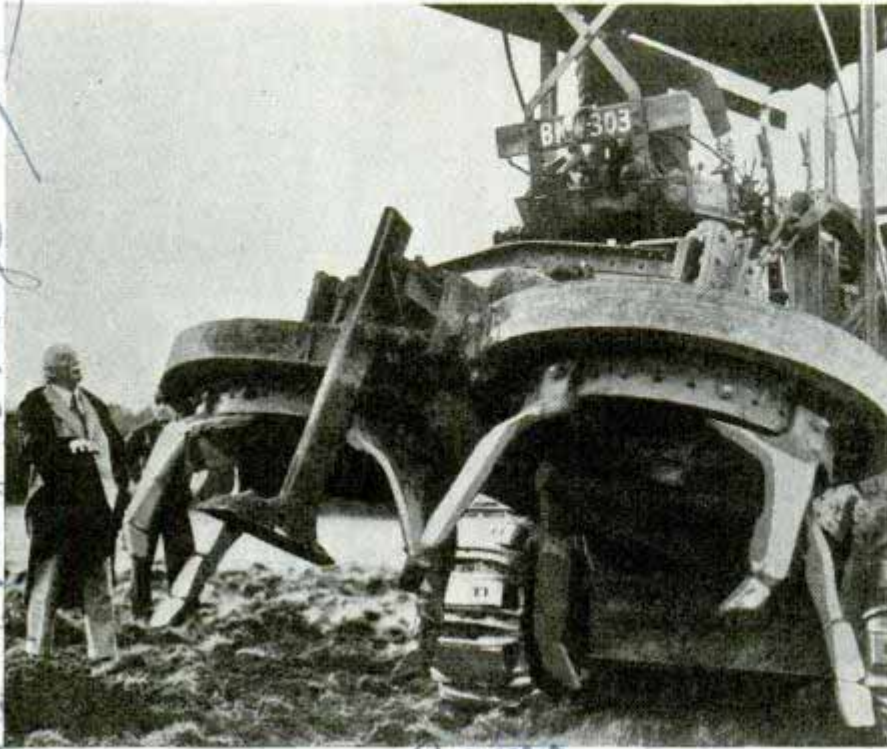


Rocking under the stream from the faucet, a rinsing pan for photographic films and prints keeps changing the water automatically. The pan is double, with a pivot under the center wall. As a small stream from a faucet flows into one side the pan tips on the pivot and the stream is diverted to the empty side, and the process is repeated. Slots in the ends keep draining the water.

L. S. Wright, Inc.
5209 Euclid Ave

Giant Claws of Gyro-Tiller Churn as They Plow Earth

obtain the proper key. For instance, if the house door key is in the first position, the user simply presses the button with a single notch beside it. The case holds the keys firmly, insuring against loss.



David Lloyd George, wartime prime minister of Britain, supervises operation of huge gyro-tiller as it plows deep into soil of his farm

From the primitive plowshare and hoe to the mechanical gyro-tiller is a span of but a few years, yet a whole age intervenes. In sharp contrast with the laborious methods of hand-tilling, this crawling monster bites into the earth with giant rotating claws as it churns across the field. Preparing the ground for cultivation, it breaks a trail nearly five yards across.

Right Key Pops Out of Case When Button Is Pressed

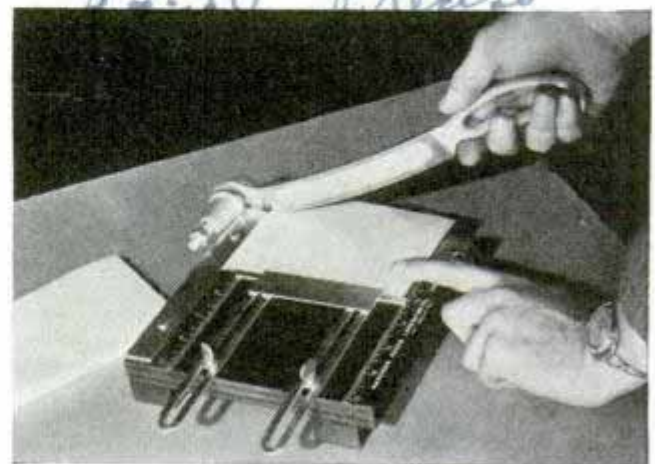


Enabling the user to select the proper key for home, automobile or office without looking at the case, a new device expels the right key when a button is pressed. If three keys are carried in the case, three buttons are provided, one for each key. Identifying notches on the case indicate to the user which button should be pushed to

Sparking points are located in the casing; the cylinders take in gasoline and air, the mixture is fired, and the exhaust fumes pass out as the cylinders rotate.

Trimming Board for Photos Has Adjustable Guides

Precise trimming of photographs can be done readily with a cutting board that has adjustable guides for the paper. There are rulers at both top and bottom, and the guides can be squared accurately.



Adjustable paper guides assure an accurate trim

used on survey farm of Lloyd George

Webwood Corp. Broadway 141

way machine shop and mfg. Co. Miami Florida

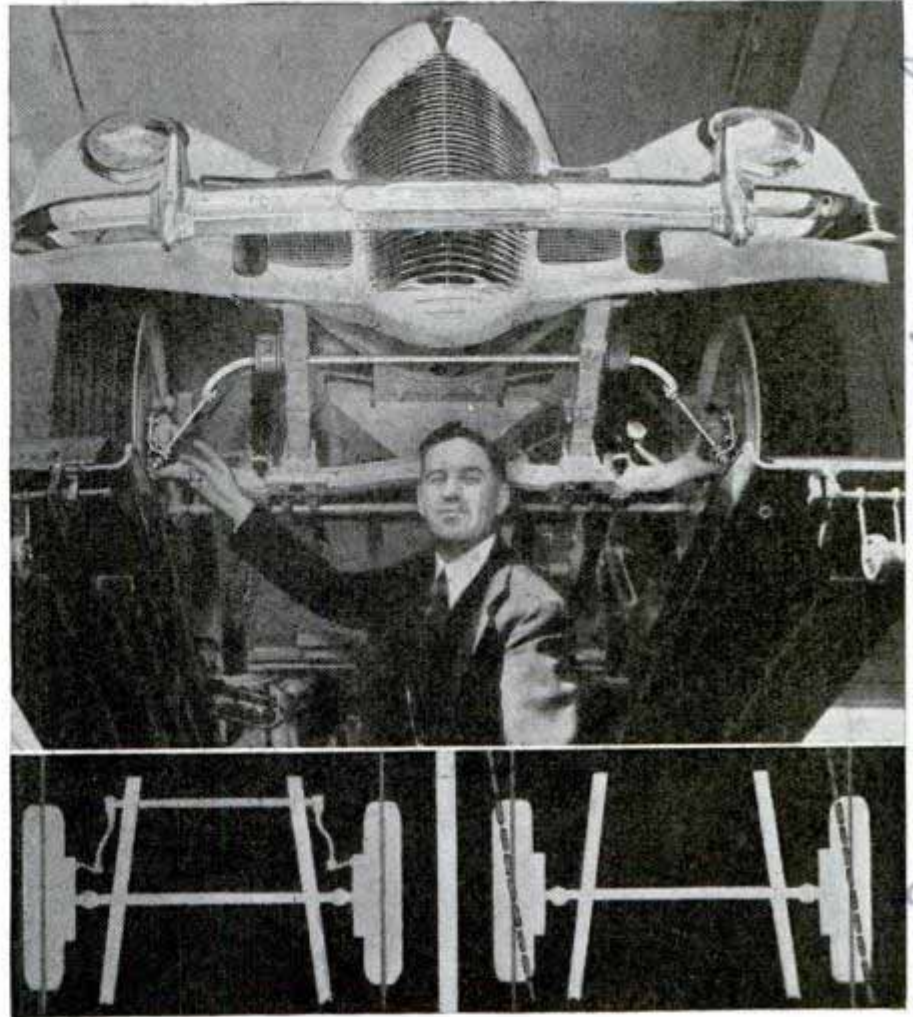
H1826 Engine's Whirling Cylinders Cool Spark Plugs
In the early days of aviation the "whirling nightmare" was a rotary engine that whirled, cylinders, propeller and all, around a stationary crankshaft. A similar engine has just been developed for trial by the French air ministry, its cylinders revolving inside an outer casing, but in the new engine the crankshaft turns nine times as fast as the cylinders. Sparking points are located in the casing; the cylinders take in gasoline and air, the mixture is fired, and the exhaust fumes pass out as the cylinders rotate.
H1245
Trimming Board for Photos Has Adjustable Guides
Precise trimming of photographs can be done readily with a cutting board that has adjustable guides for the paper. There are rulers at both top and bottom, and the guides can be squared accurately.
H1249
Right Key Pops Out of Case When Button Is Pressed
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American Photo Laboratories Co.

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pu
bu
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Safety Bar Aids in Steering Straight Course

Designed to give greater control over the front wheels, a safety bar on one of the latest automobiles helps the driver steer in a straight line. The bar is attached to the frame across the front of the chassis with the ends angled backward to form lever arms exactly like the sway-bar. The ends of the levers, however, are connected by suitable links, not to the axle as in former practice, but to the wheel spindles. This attachment point is so located that as soon as anything turns the wheel from the straight-ahead position, whether it is the driver or wind or road shock, the bar is actually twisted like a spring and immediately it tends to pull the wheel back to center. This action, occurring directly at the wheel and not back at the steering gear where it would have to operate through several joints as well as connecting links and bars, gives a remarkable result. No matter what tendency there is for the front wheels to depart from the straight-ahead position, it



Top, Hudson's front end, with steering stabilizer bar in white. Bottom, diagrams showing how bar helps steer straight course

is immediately corrected. The device constantly helps the driver with just the proper amount of self-steer and is particularly useful in cross-winds and on curves. It was designed by Hudson engineers.

Motor Car Co.

Ten-Wheel-Drive Marsh Buggy Wades Bottomless Bog

Mud that would stop almost anything but ducks and frogs is a negotiable high-



Ten huge tires on its ten driving wheels help this "marsh buggy" navigate almost impassable bog

way for the all-wheel-drive truck developed for swampland transportation. Built to accommodate from four to ten tires measuring thirteen and one-half by twenty-four inches, this marsh buggy can wade into apparently "bottomless" mud. Special axles and gears enable it to apply driving power to ten wheels, gaining traction through a marsh even with a load of men and machinery.

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1001

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STORMS



Left, Henry Ford pushes switch to start 500-ton refrigerating system in huge new weather tunnel recently placed in operation at the Ford Motor company. The tunnel will produce virtually every conceivable weather condition, enabling engineers to test automobiles without waiting for nature to create the particular conditions desired. The refrigerating system is powerful enough to maintain a temperature of twenty degrees below zero. In addition, a "cold" chamber provides temperatures as low as forty degrees below zero for cold-weather tests of engine, oil, battery and starter

HEATING SYSTEM CAN RAISE TEMPERATURE TO 150 DEGREES

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PROPELLER CREATES WIND VELOCITY OF 85 MILES PER HOUR

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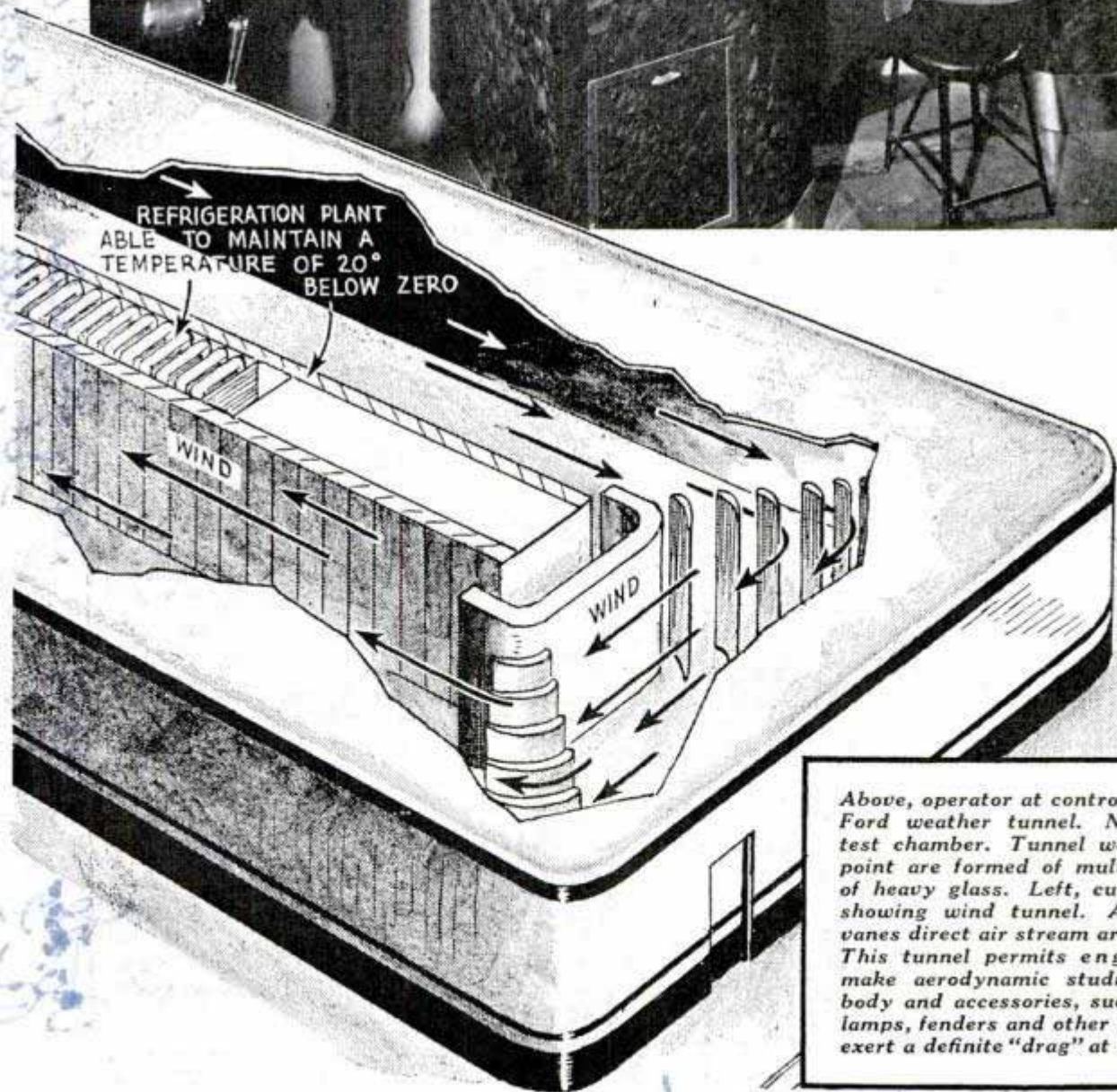
SAND AND DUST JET

WIND

Center, control end of weather tunnel, with automobile in test chamber. Note rain jets for subjecting car to rainstorm conditions, spout in floor for producing a duststorm, propeller for creating windstorm of eighty-five miles per hour, heating system which can raise temperatures to 150 degrees and refrigerating system for creating sleet or snowstorm conditions. Thus the tunnel may be used for making storms to order. Instruments on control board permit the taking of 100 readings of various conditions concerned with operation of the car. The vehicle under test is mounted on a treadmill connected with a dynamometer. Its spinning wheels turn the treadmill to record engine power output. The engine is controlled from board outside. At right, member of crew chipping away ice after test in below-zero "weather"



MADE *to* ORDER

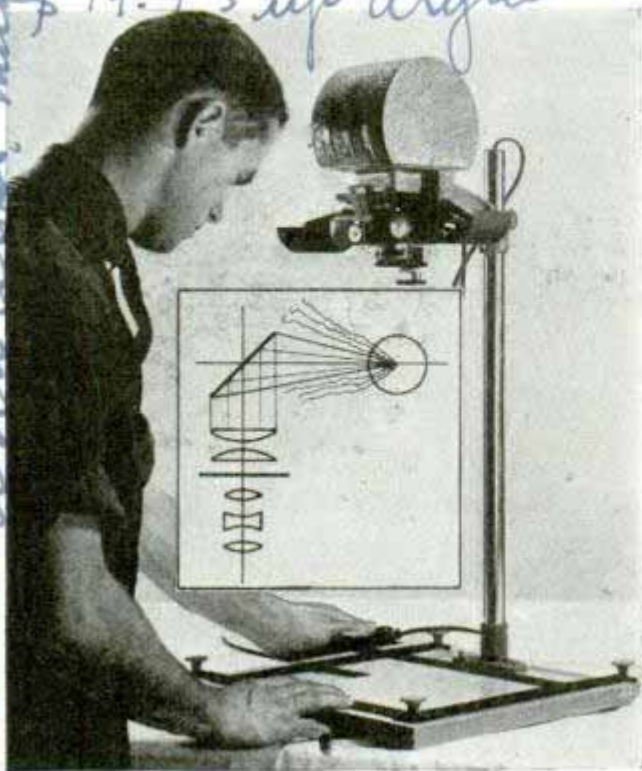


Above, operator at control console of Ford weather tunnel. Note car in test chamber. Tunnel walls at this point are formed of multiple layers of heavy glass. Left, cutaway view showing wind tunnel. Airfoil steel vanes direct air stream around turns. This tunnel permits engineers to make aerodynamic studies of auto body and accessories, such as headlamps, fenders and other parts which exert a definite "drag" at high speeds

1242

Enlarger Using Angle Light Makes Big Photo-Mural

International Research Corp
14.75 up Argus

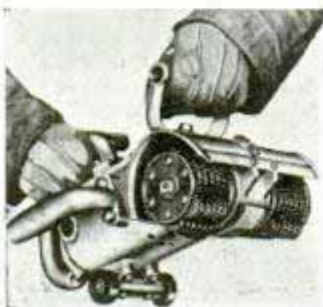


Enlarging from miniature film. The inset is a diagram of light system showing reflector and lenses

Miniatures can be made into photo-murals with an inexpensive enlarger which employs reflected light instead of the conventional direct, diffused illumination, obtaining both coolness and flat brilliance. It is a thirty-five-millimeter enlarger, and by inverting its film holder, eleven-by-fourteen pictures or even photo-murals forty inches wide can be printed. The film holder is of Bakelite, a book-type device made without glass and therefore non-scratching and dust-free. It handles strip film or single negatives. A 100-watt prefocused projection lamp is used, at right angles to the optical system.

1252

"Free-Wheeling" Paint Scraper Cleans with Whirling Teeth



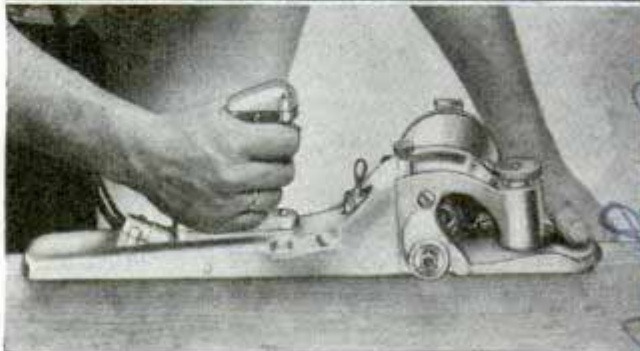
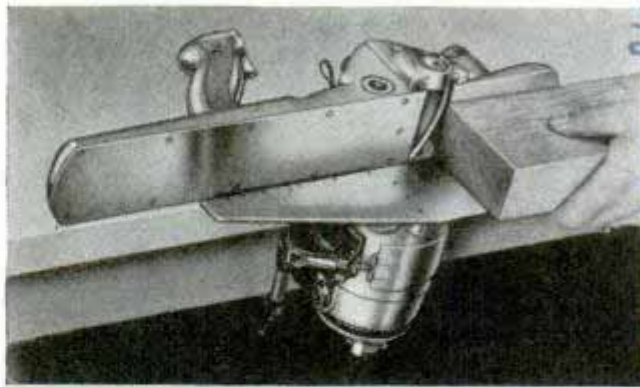
Paint, scale and rust can be removed economically with a mechanical "sand blaster" which employs whirling sawteeth instead of sand. Numerous

small cutting wheels are mounted loosely on a rotating head, and as the entire "cutting bundle" revolves at high speed the teeth are thrown outwards by centrifugal force, contacting the surface some 115,000 times per minute. Because of this loose mounting there is no gouging of the painted surface, and excessive wear on the cutters and overload of the motor are avoided. One man using the tool cleaned a 75,000-gallon tank with 3,250 square feet of surface in four days, a job that formerly took four men twelve days.

1288

Electric Plane Is Convertible into High-Speed Jointer

Capable of making a three-sixteenths-inch cut in soft wood, an electric plane just introduced will plane a surface two and one-half inches wide. Large but portable, it can be converted instantly into a high-speed jointer by using the bench bracket furnished with it. A one-horsepower universal motor drives its spiral cutter at 18,000 revolutions per minute, producing a smooth surface with or across the grain. An adjustable fence makes it possible to plane accurate bevel cuts up to forty-five degrees, and a micro-adjustment screw sets the front shoe for heavy or paper-thin cut. With a grinding attachment the plane sharpens its own cutter.



Electric tool used as high-speed jointer or plane. It can plane precise bevels to forty-five degrees

Tool works
Britain Conn
Stanley
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Am and Info & Equipment
Co-2143

THIS lion, balancing on two tightropes and roaring ferociously, had his first lesson in this trick when he was coaxed to walk across a wide plank to get a piece of meat.

Teaching
WILD ANIMALS
NEW STUNTS

9



*Carl Thomas E. Stinson, Jr. 10555 Holman Ave
Los Angeles*

THIS trainer is working a group of "cats." The lions are called from the pyramid stand, one at a time, for individual performances.

LIONS that walk tightropes and seals that ride horseback are two of the latest attractions produced by crack animal trainers. In the circus world, new bags of tricks are necessary every year or so, and now that motion pictures are demanding wild animals to do tasks that seem almost miraculous, trainers are "educating" their animals to perform stunts of which no one dreamed before.

Teaching a lion to walk two swaying tightropes high in the air seems like a nearly impossible task until an experienced trainer tells how he does it. Charles Gay, who has a tightrope-walking lion at his lion farm at El Monte, Calif., starts to teach his cubs tricks when they are nine months old, after their trainers have gained their trust through frequent petting and feeding.

"Teaching a lion to walk the tightrope

takes about six months of steady training," says Gay. "We start with a wide plank ten feet long on supports a few feet off the ground. We tempt the animal to walk this plank by leading it with a piece of meat. After it has learned it will be rewarded for walking, we remove a central support, allowing the plank to bounce and sway under the animal's weight.

"Next we substitute two narrow planks for the wide one, gradually training the lion to walk the narrower planks until he finds himself walking a couple of pieces of two by four planks. The next step is to substitute one and one-quarter-inch iron pipes, then thick steel cables which the lion can grasp with his non-skid pads, and finally the smaller cables on which he performs his act.

"During all this time we gradually lengthen and heighten the supports so the

*Lions - C. Gray, Gray's
Lion Farm, El Monte, Calif.*

901

animal finally learns to walk ropes twenty or thirty feet long that may be twenty feet in the air. During the first part of the training, the lion may take an occasional spill, so we use a pile of wood shavings under the planks as a safety mat."

Teaching a lion to walk along a row of stilts something like the top of a picket fence is done somewhat similarly. First, the animal is coaxed to walk across three low pedestals placed in a row. Then the pedestals are replaced with three higher and smaller ones. Additional groups of three are added to the row. As the animal progresses, in pursuit of a chunk of meat, the pedestals are gradually replaced with thinner supports until the lion learns to walk along a row of tall two by four planks.

Young lions are like a bunch of children. Some are quiet and gentle while others never grow tame enough to be approached safely. Once an animal has been trained it may stay gentle all its life, or without any apparent reason it may suddenly revert to its wild disposition. From then on the trainer can never trust it.

Trainers remain constantly on their guard for the first danger signal during an act, no matter how peaceful the animals may appear.



GIANT black bear, above, engaged in a make-believe wrestling match. The seal at the left, below, is riding a pony cart and balancing on its front flippers while clapping the back flippers in a demand for applause. The seal at the right is enjoying a dainty breakfast.

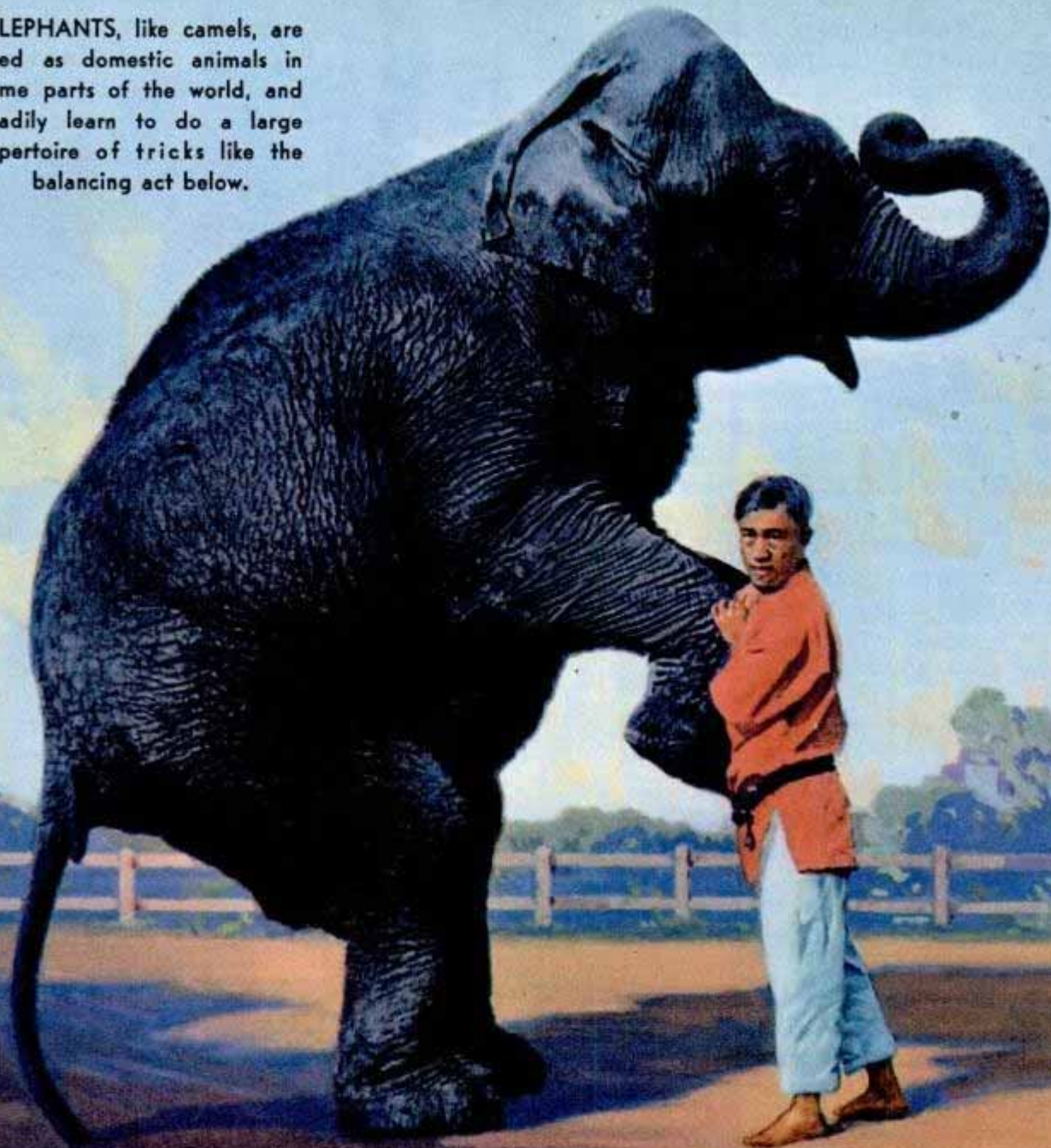
Seals -



Monterey Calif



790
ELEPHANTS, like camels, are used as domestic animals in some parts of the world, and readily learn to do a large repertoire of tricks like the balancing act below.

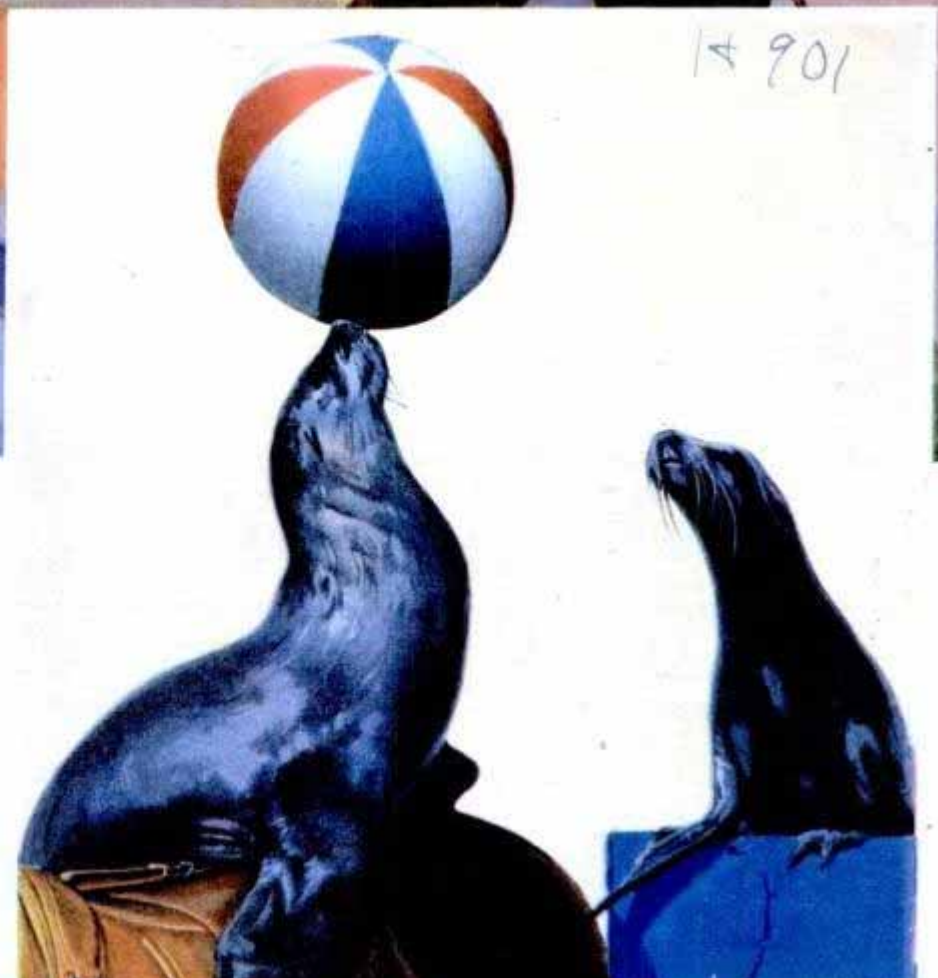


The pupils of the eyes frequently give the trainer his first inkling of approaching trouble. When a lion is calm and peaceful his pupils are small, but as he begins to grow alarmed or angry the pupils distend. When that happens an alert trainer sends the animals back to their cages. Otherwise the animal may spring on him or start a free-for-all fight.

There is always an element of danger in a lion act, even in the circus pyramid routine in which lions jump to their pedestals and roar and strike at the trainer's whip upon command. Lions that have grown up together work in groups the best, while animals that are total stran-

gers to each other are difficult to work as a group. Sometimes a lion, like a person, becomes short tempered for a day or so. Then the trainer leaves him in his cage.

It would take months and in some cases it would be impossible to train lions to do some of the things you watch them do in motion pictures. The trainers achieve the same ends by various subterfuges. If a movie studio telephones in the morning, demanding a lion for that afternoon that will jump into a trunk or pursue someone upstairs, Gay has a lion on the set at the proper time although he has no lion trained to do either stunt. Yet on the stage the lion performs as if he had been



17

WRESTLING with a trained lion, as the man, above, is doing, always has an element of danger in it because no one knows what the animal may do. Right, two seals playing ball.



trained in the stunt for years. How Gay does it seems simple, once he explains it.

"If the script calls for a lion to pursue a woman up a flight of stairs," he says, "we take advantage of the fact that a lion, in strange surroundings, wants to stay inside his familiar cage. We start by placing the lion in a small cage at the top of the stairs, not far from the cage with which he is familiar. When we release him he dashes into the cage that represents home to him. Then we put him back in the small cage and carry him downstairs.

When we release him he runs back up the stairs to his home. Finally, we take the small cage, with the lion inside, and hide it downstairs out of camera range. When the cameras are ready and the heroine is running wildly up the stairs we again release the lion. To the camera it appears the vicious beast is about to overtake the girl. As a matter of fact, the lion often beats the heroine up the stairs on his way to the cage. Then we have to shoot the scene all over.

"To make a lion appear to jump into a trunk and hide we do something similar. The 'trunk' is really nothing but a low partition painted to resemble a trunk, with the lion's cage hidden behind it. When we release the lion from a smaller cage he runs toward his home cage, bounding over the partition that

STILT walking, top, left, is a difficult stunt to teach any animal, but the lion does it. The rope-walking lion is rehearsing for a movie scene in which a doll will be substituted for the stick in its mouth. Below, applying make-up to seal before a movie shot.



happens to be in the way. The way the camera sees it, the lion jumps into the trunk. It may take only half an hour to rehearse such a scene."

Seals seem to be among the most intelligent animals and some of them can be taught simple stunts in a few days. They readily learn to answer when their names are called and seem to have an intuitive knowledge of what they are being asked to do. They are sensitive to praise and scolding. Trainers have learned that the easiest way to teach them tricks is to reward each one with a small chunk of fish as soon as he does what is wanted. The catch is that from then on the seal expects to be rewarded frequently during a performance.

Simple balancing acts form the conventional repertoire of circus seals but they are capable of performing much more intricate stunts. In the motion picture,



TAKING its dinner from a bottle was not much of a trick for the lion cub, above, to master. The camel, left, has been taught a few simple tricks for circus exhibitions.

"Spawn of the North," the director wanted a seal to act as the hero's pet. His chief demand was that the seal must appear natural instead of appearing to perform stunts. H. W. Winston, who supplied "Slicker" for the picture, trained the seal so well that it was given a major part in the production.

In the picture you see "Slicker" wrestle with the hero in the water, follow him on shore like a dog, and even turn on the water in a bathtub when he wants a swim. The seal cries, shakes his head to

signify "yes" or "no," claps his flippers with joy, and in many other ways acts "human" on the screen.

At present Winston, famous for his trained seal acts, is perfecting an equestrian act in which two seals ride ponies, a third rides a pony cart, and a fourth acts as ringmaster and supplies the mounted seals with balls and double batons that they juggle while riding. Picking up a large rubber ball, the ringmaster seal balances it on his nose, then tosses it to one of the mounted seals, who

A 931



EQUESTRIAN seal act, top, with two seals riding ponies, a third the pony cart and a fourth acting as ringmaster. Bottom, trainer thrusting his arm inside the mouth of a lion which has been taught to remain gentle during performances instead of roaring and putting on a scene for the spectators as most "cats" are trained to do.

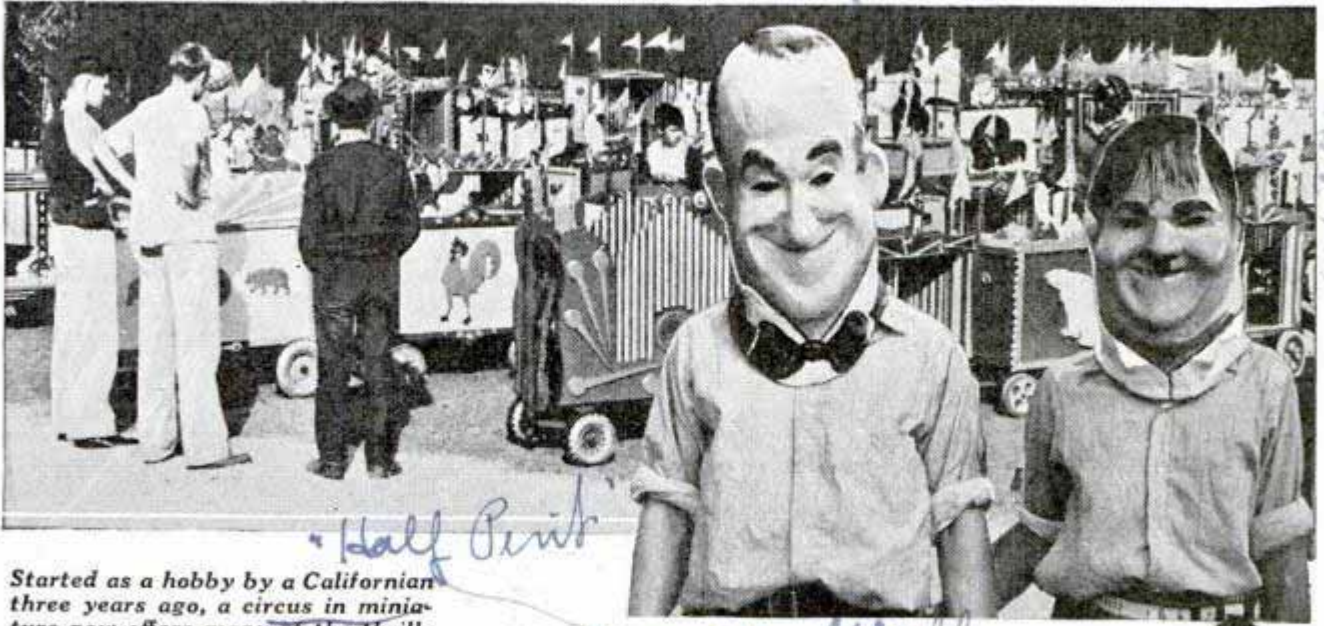
16

catches it on his nose on the fly, balances it, then passes it to the next seal. Finally, when each seal has caught the ball and juggled it, the ball is returned to the ringmaster.

The finale of the act is a routine with a fire baton, a stick with a flaming gasoline torch at each end that is tossed to the ringmaster seal. The seal flips the baton into the air, spinning it and catching it in his mouth, then he tosses it to one of the mounted seals who carries on the performance from there. Some of the seals have learned to roll over on the ground while balancing balls on upturned noses. All clap their flippers when they want applause. Winston has also taught them to balance on their front flippers and to raise their bodies into the air while clapping their back flippers.

"All seals used in stunts are captured while young," Winston says. "They have remarkably different personalities and some learn to do tricks easily while others can hardly learn to do more than simple balancing (Continued to page 128-A)

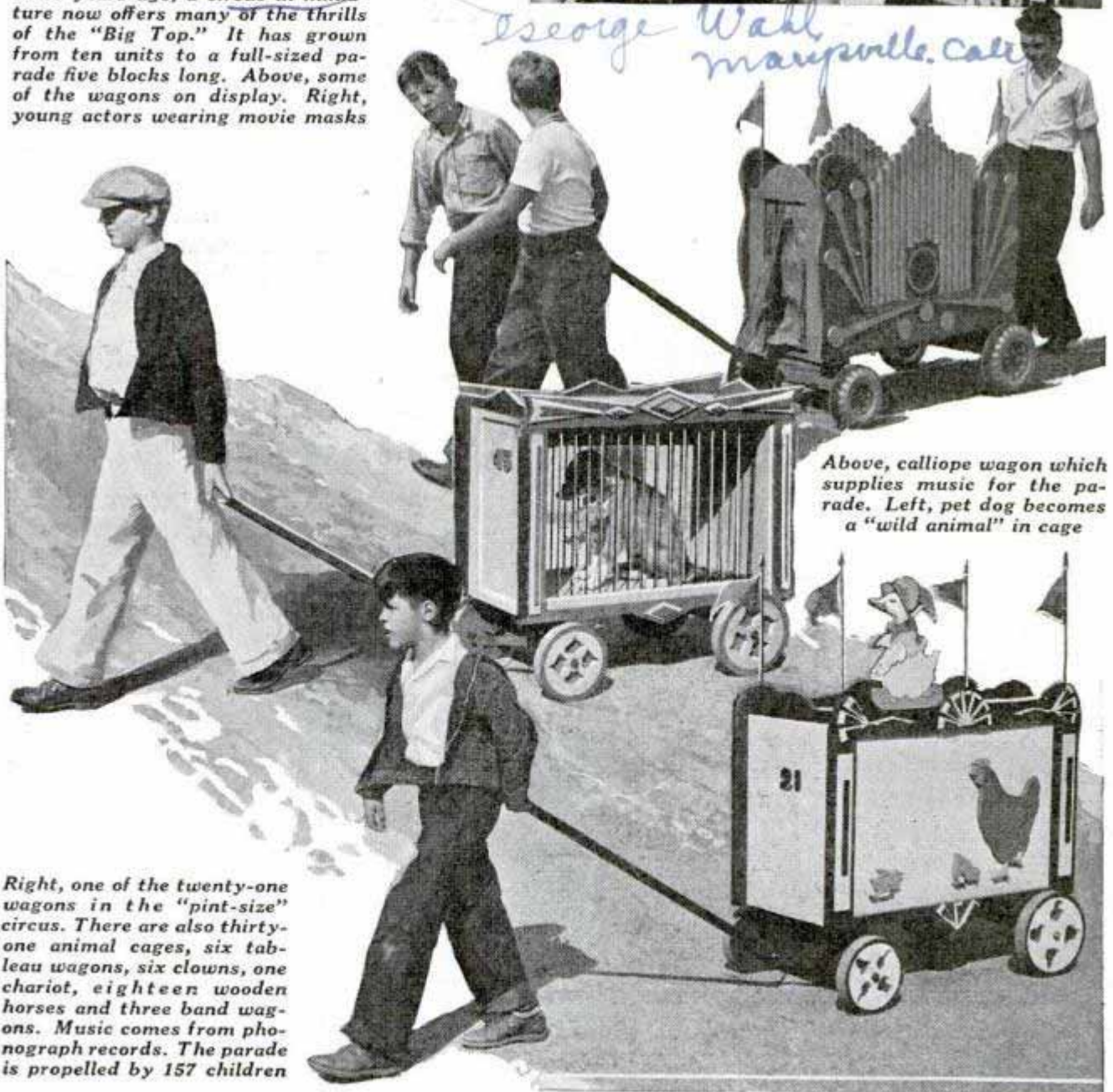
Miniature Circus Gives Many 'Big Top' Thrills



Started as a hobby by a Californian three years ago, a circus in miniature now offers many of the thrills of the "Big Top." It has grown from ten units to a full-sized parade five blocks long. Above, some of the wagons on display. Right, young actors wearing movie masks

Half Pint

*George Wahl
Mariposa, Calif.*



Above, calliope wagon which supplies music for the parade. Left, pet dog becomes a "wild animal" in cage

Right, one of the twenty-one wagons in the "pint-size" circus. There are also thirty-one animal cages, six tableu wagons, six clowns, one chariot, eighteen wooden horses and three band wagons. Music comes from phonograph records. The parade is propelled by 157 children

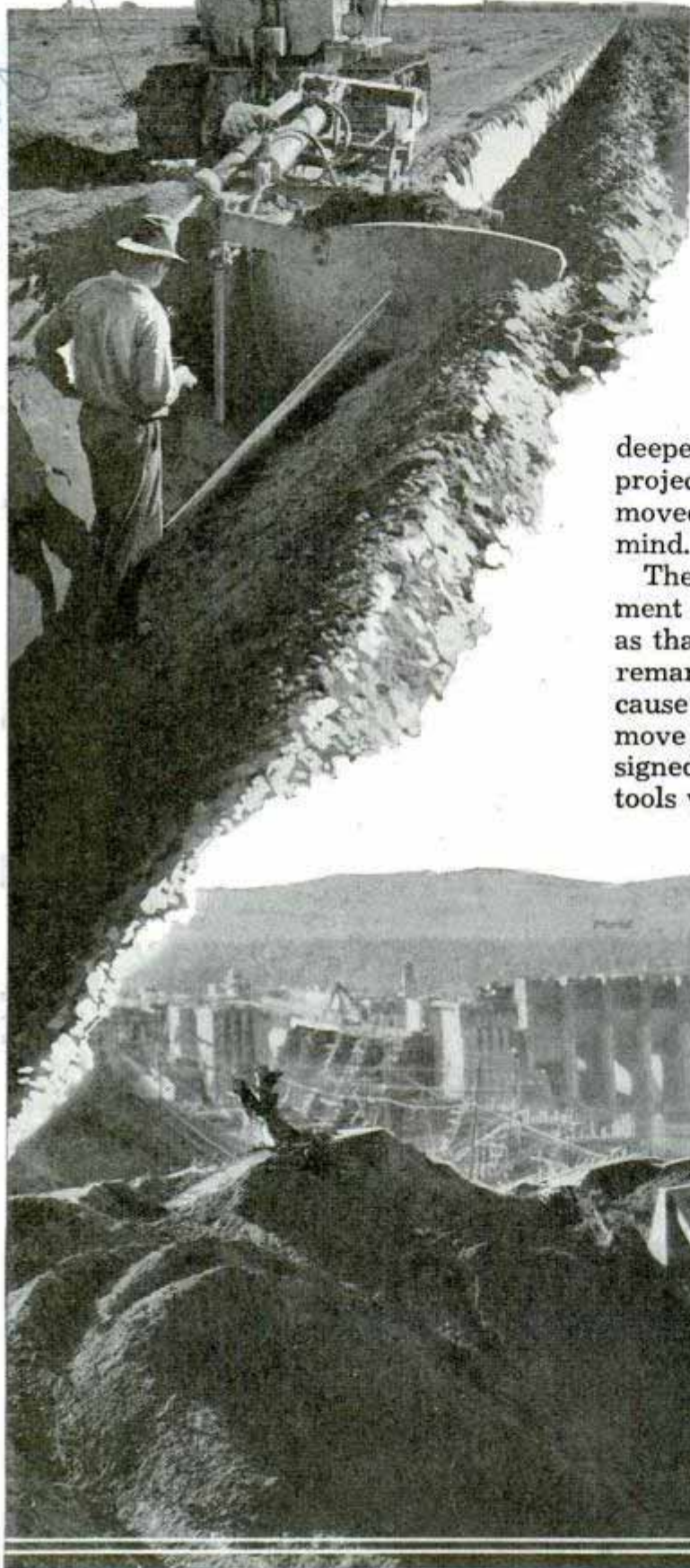
7-113 2
Plow - made for special
job by Port & Bros
Santa Ana Calif.
see letter.

MOVING

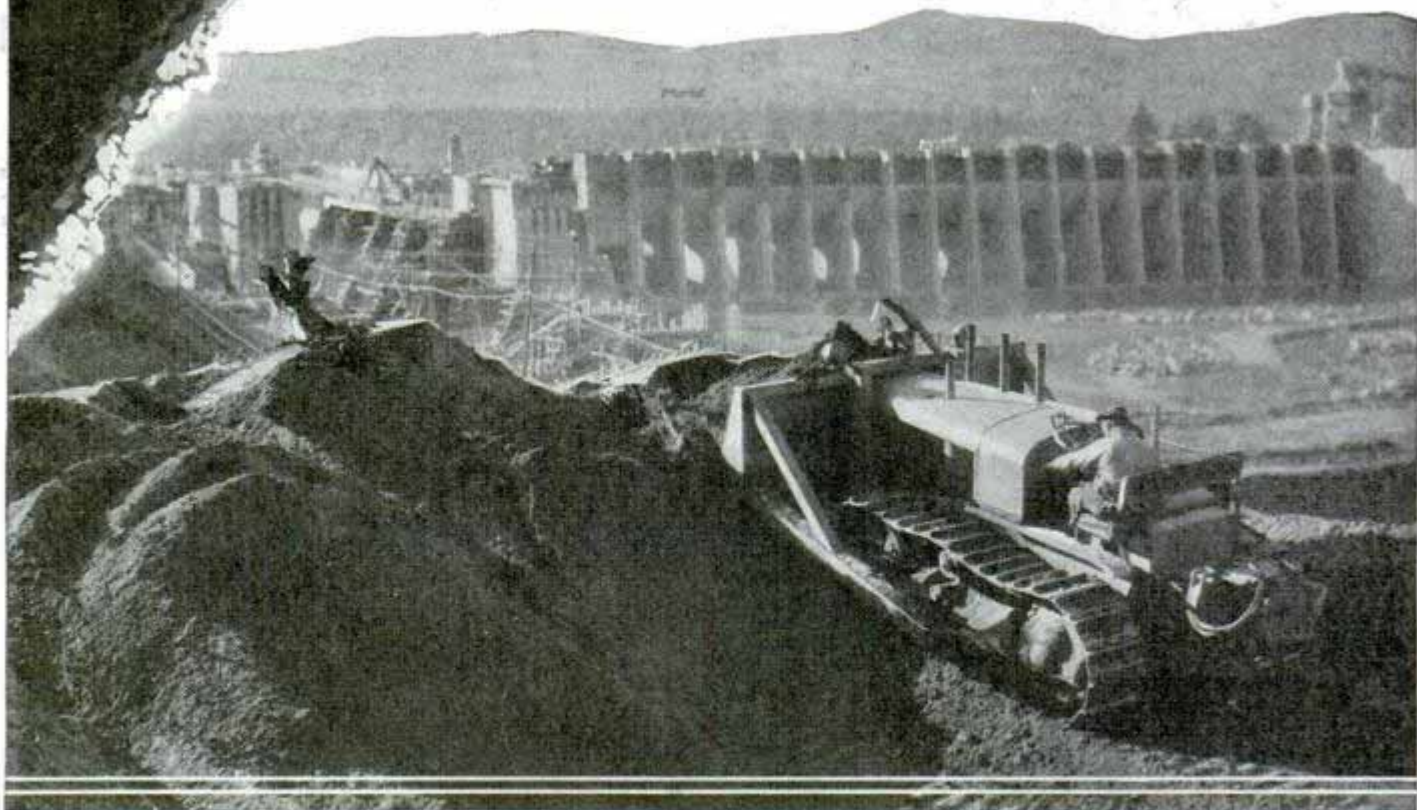
THE small boy with his pail and shovel and the tractor-bulldozer combination have something in common—they both move earth. But where the boy works by handfuls, the 'dozer works in big yardages. And does this at a speed that often rivals a landslide.

Road making, road-alinement work, canal construction, dam construction, paving and road surfacing, mining, terracing, channel deepening and tunneling are some of the projects on which the total amount of earth moved is beyond conception of the human mind.

The development of labor-saving equipment for gigantic earth movements, such as that at Grand Coulee dam, has been as remarkable as the tasks themselves. Because methods of a decade ago did not move earth fast enough, a contractor designed and built a scraper and other allied tools while working on big highways, rail-

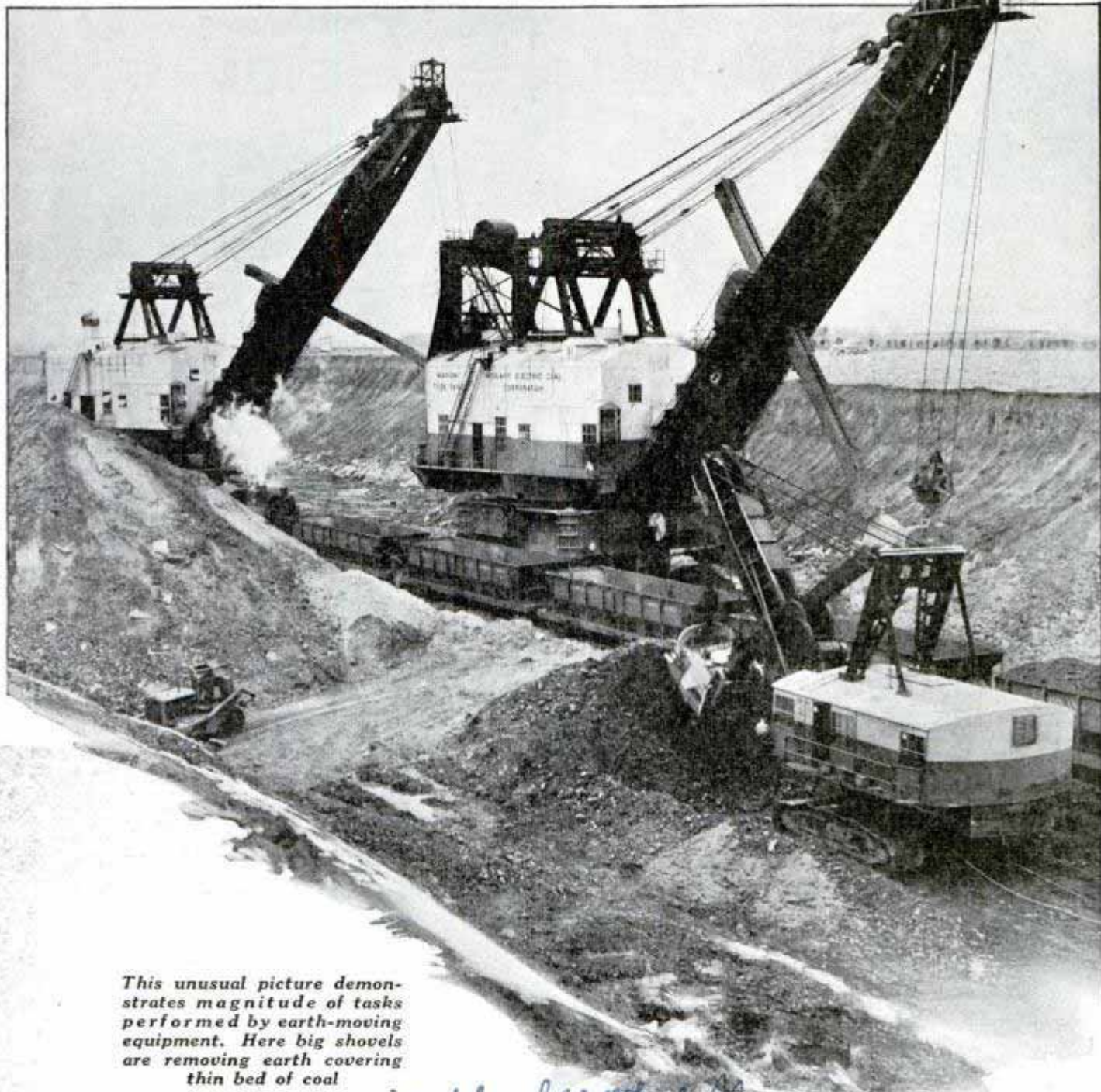


Cont. Co. M. Clark 5941 Jackson C. Blvd.
Chicago



Top, tractor pulling special plow is used in reclaiming flooded land by plowing four feet deep to turn under sand and silt and bring up fertile soil. Bottom, modern construction always calls for vast movements of earth

THE EARTH



This unusual picture demonstrates magnitude of tasks performed by earth-moving equipment. Here big shovels are removing earth covering thin bed of coal

Middlebrook, Ill.

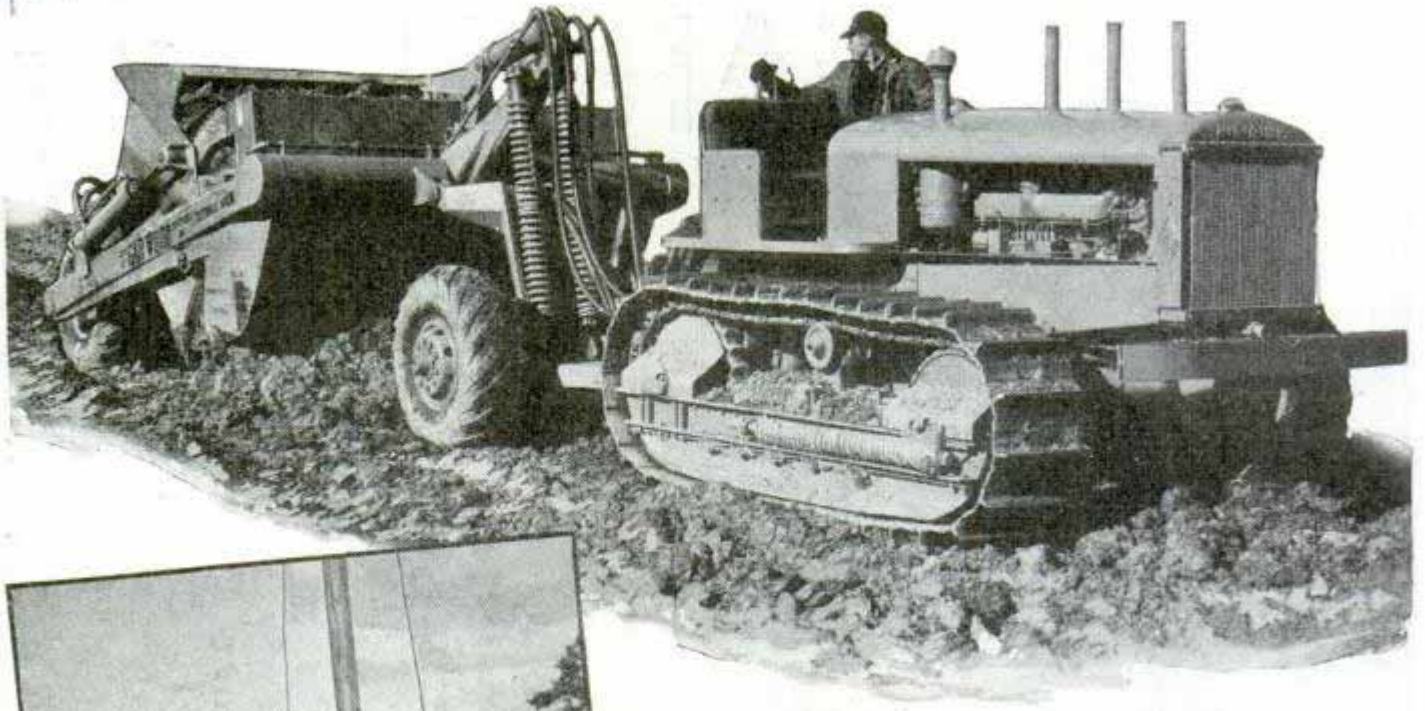
road, dam and levee contracts. Then came the present fast-operating, big-capacity "carryall" type of scrapers, bulldozers, angle dozers, sheep-foot tampers, rippers and similar apparatus.

But these tools must be pulled, pushed or otherwise operated. The track-laying type of tractor usually does the pulling or pushing on tough jobs.

The precipitous Jack-Rabbit Trail in Riverside County, Calif., was done entirely

with Diesel tractors, scrapers, bulldozers, rippers and tampers. In five months this equipment moved 650,000 cubic yards of earth. The total was something like 1,200,000 cubic yards. Only a few years ago cuts like this would have necessitated power shovels and much hauling equipment. The same fleet used on Jack-Rabbit Trail then moved on to work on a huge dam.

Precision is the chief characteristic of tractor and earth-moving machinery pro-



Top, one man does work of many with this tractor-scraper combination. Center, earth-borer digs hole and sets in pole. Bottom, elevating grader building mile in fifteen hours moves 6,000 yards of earth per mile

duction. Unlike automobiles this equipment has no break-in period. Tractors must be built to endure the relentless torture that goes with vast earth-removal projects. From the moment contractors put them on the job, tractors must pull or push and rip through gumbo, trees, hardpan and rock.

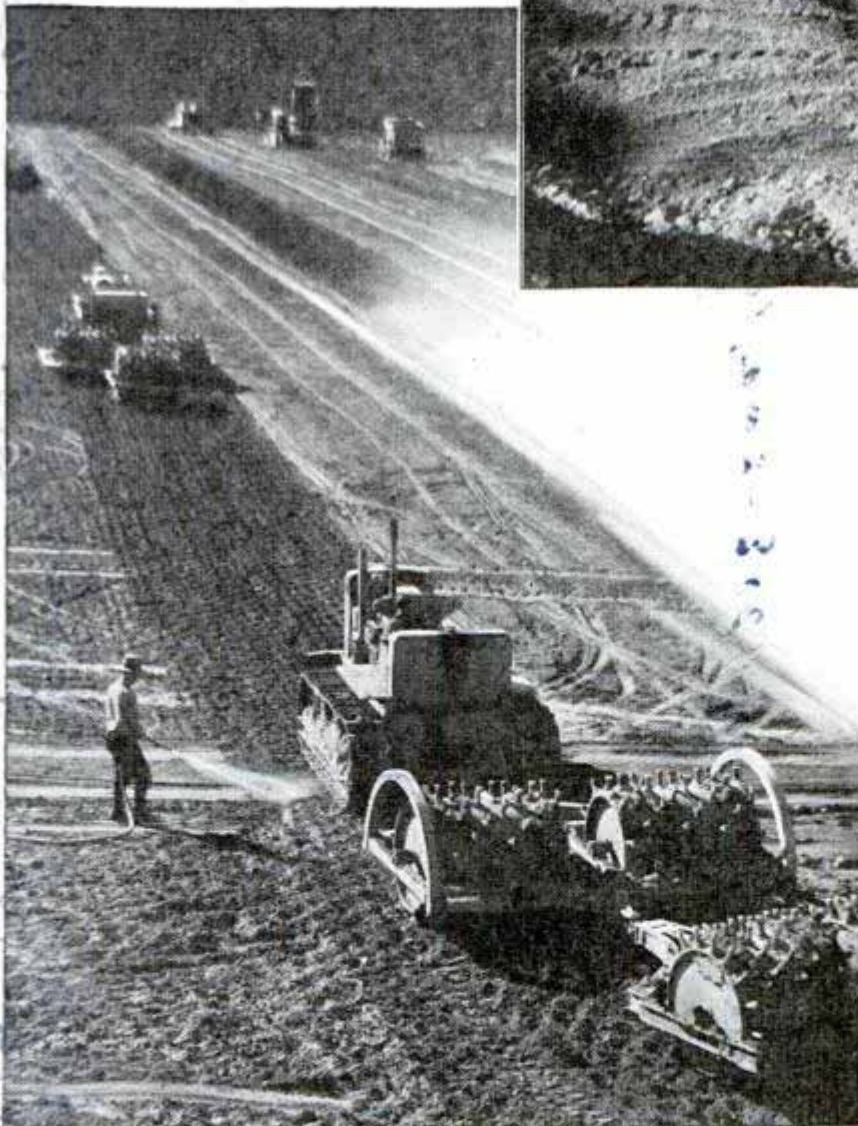
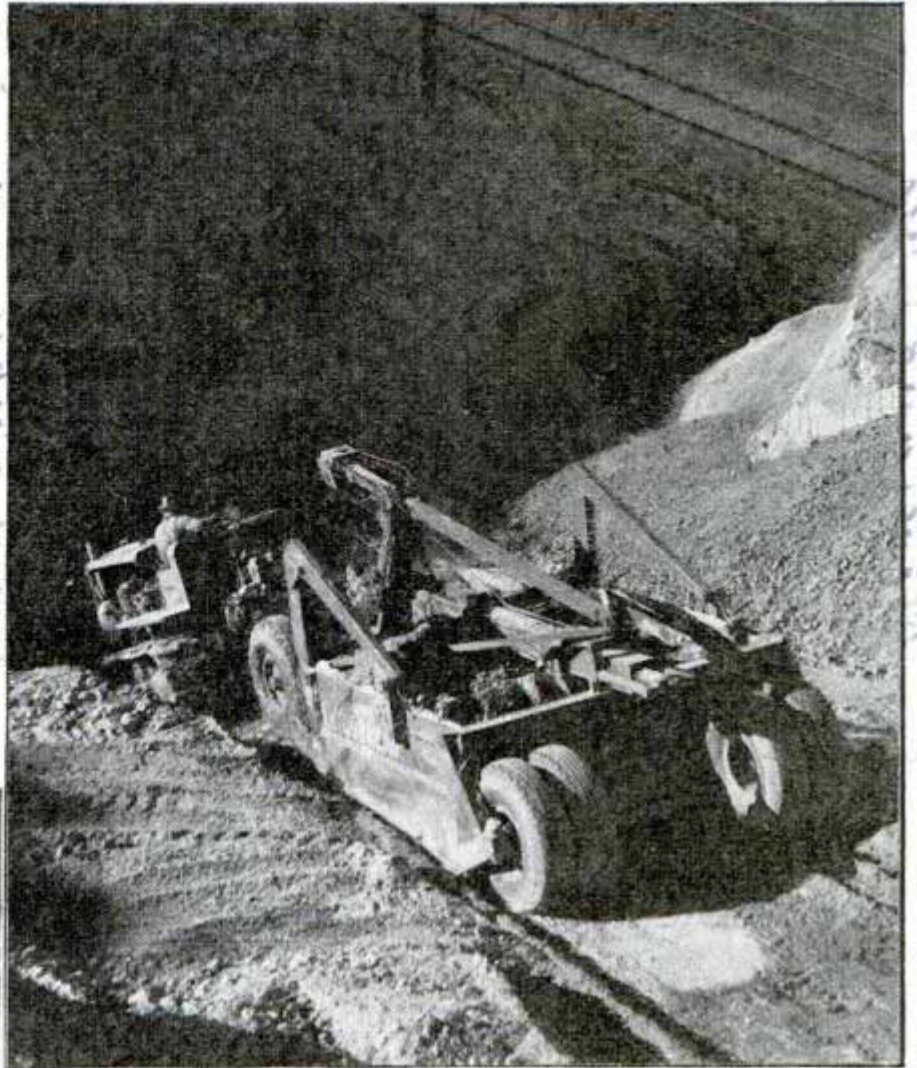
The onlooker does not see the accurately balanced crankshaft of the huge Diesel; the oil seals for critical bearing protection to retain oil and keep out grit, dust and moisture; the phosphor-bronze bushings that guard against wear, nor the fuel injector parts held to an accuracy of two and one-half millionths of an inch.

Operators get a big pay load because the design of the bowl, set of the cutting edge and the front carrying apron speed the filling of the bowl through a minimum movement of dead dirt. The entire weight of the scraper can be thrown onto the cutting edge. Both the front apron and tail gate can be manipulated to facilitate the loading process.

The speed of the power control unit enables the operator to instantaneously raise the cutting blade when stumps or

rocks are hit; thus the tractor need never be allowed to lug down to the point of inefficiency.

The front carrying apron forms a part of the scraper bottom; in other words the bowl fills from the middle both ways, to the back and onto the apron. The carryalls are mounted on big pneumatic tires and heavy-duty over-size roller bearings, consequently of great strength and resiliency, arc welded, reduce weight to a minimum, yet make for stout construction. As a result, the tractor pulling a carryall



Top, more than 500,000 cubic yards of dirt were removed on cutoff near Los Angeles. Bottom, closeup of sheep-foot tamper, which is used in compacting loose earth

scraper wastes no power hauling the dead weight of heavy castings and bulky steels and so can handle bigger pay loads.

A long wheel base, coupled with instantaneous cable control, makes for fractional-inch accuracy in spreading with these carryalls—so accurate that blade graders usually can be dispensed with on finishing work.

The forepart of the load dumps automatically as the front apron is raised, the remainder of the load is forced forward and out by the sliding tailgate—there is no chance for sticky material to remain in the bowl.

And loading, hauling or spreading, the carryall is one-man operated—all operations in sight and controlled from the tractor seat.

When a road is to be made on a side hill that is too steep for a

(Continued to page 144A)

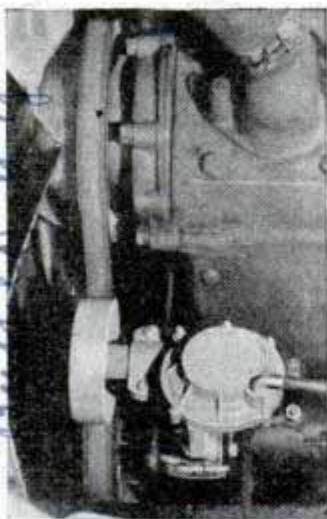
Seven-Foot Telescope Mirror Is Finished in Chromium Bath



Here is the big mirror for the telescope after its bath in chromium and aluminum. The glass is twelve inches thick

Almost exactly four years elapsed in the grinding and polishing of the eighty-two inch telescope mirror recently completed for the new McDonald Observatory in Texas. The last stage was the application of a chromium and aluminum bath in a vacuum chamber. The three-ton reflector is made of Pyrex glass twelve inches thick.

Fan-Belt Vacuum Pump Drives Car's Windshield Wiper

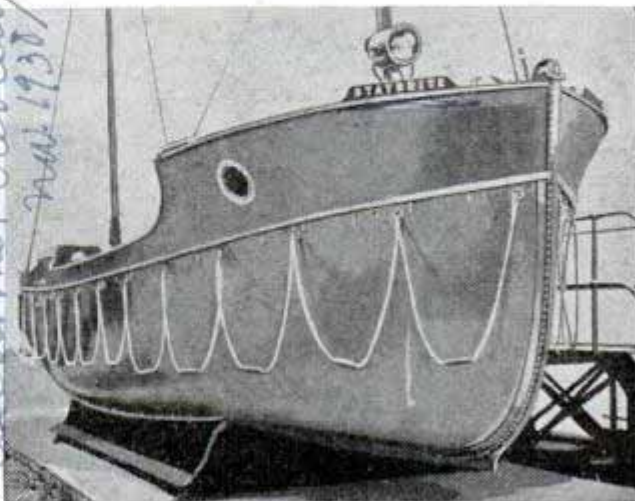


Strong, constant vacuum for operating the windshield wiper is supplied by a small pump running in contact with the outside of the fan belt. The vacuum line from the pump, which is in constant operation, runs to the wiper through a combination tee connection and check valve. Also running to the tee connection and check valve is a vacuum line from the auto's intake mani-

fold. The check valve automatically opens a line directly to the source of vacuum that is the greatest. When the motor is idling, this would be the intake manifold and when the motor is under load, it would be the vacuum pump. The combination of the two sources of vacuum assures a dependable and constant supply of vacuum, which means that the windshield wiper will operate at an even speed regardless of the load. The pump is easily installed without drilling by means of brackets. The inside of the pump requires no oiling, and the bearing is lubricated with a standard grease gun.

Lifeboat Built of Stainless Steel Resists Corrosion at Sea

Stainless steel from hull to rudder, a lifeboat which has just passed official tests is not only leakproof but virtually indestructible. Ordinary lifeboats may deteriorate even while resting on the deck, but this twenty-eight-foot craft cannot corrode. The hull plates are welded to the stiffening ribs for strength. The hull plating, only eight-hundredths inch thick, and the rudder, propeller shaft and propeller all are of stainless steel.



This lifeboat, made of stainless steel, is said to be virtually indestructible

Warner and Swasey Co. 5701 Carnegie Ave. Cleveland Ohio
Trico Products Corp 807 Washington St. Washington D.C.
E. A. Robert Under
Director Optical Dept
see Dept 1936-372
Dr. John Plasmeth, consultant in design H 1246
Mr. Locke
Electromek Cleveley 308 42nd Ave
Mar 1937

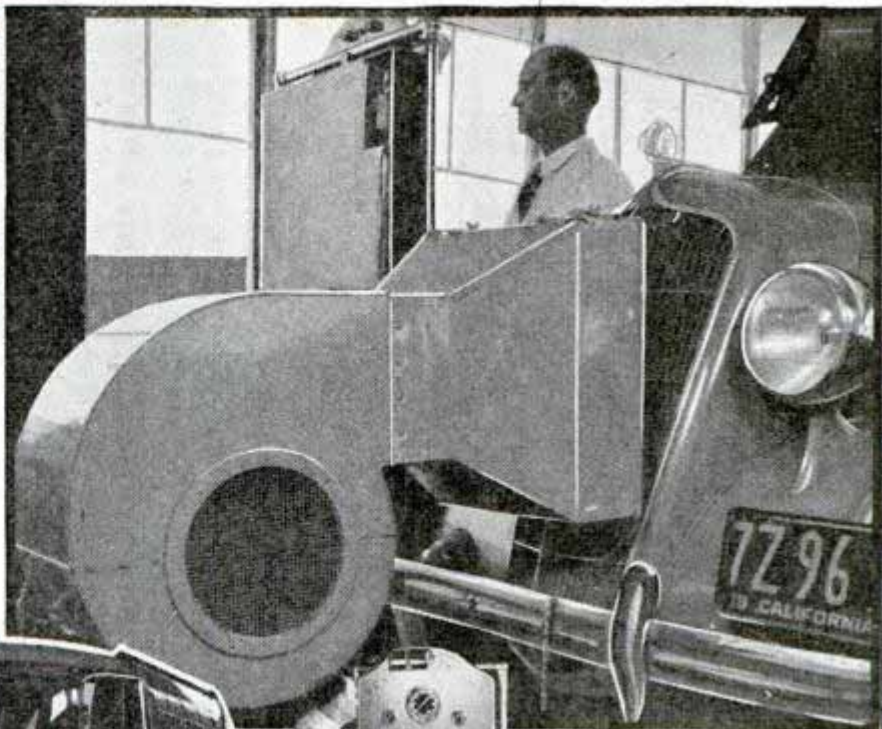
being a... work
Ghebers, Ltd. Stagbrite
Sheffield, England
Div. 1
England
Lister Grey & Co. Newark

U.S. - Welby Davin

Motors "Measured" to Find Hidden Troubles



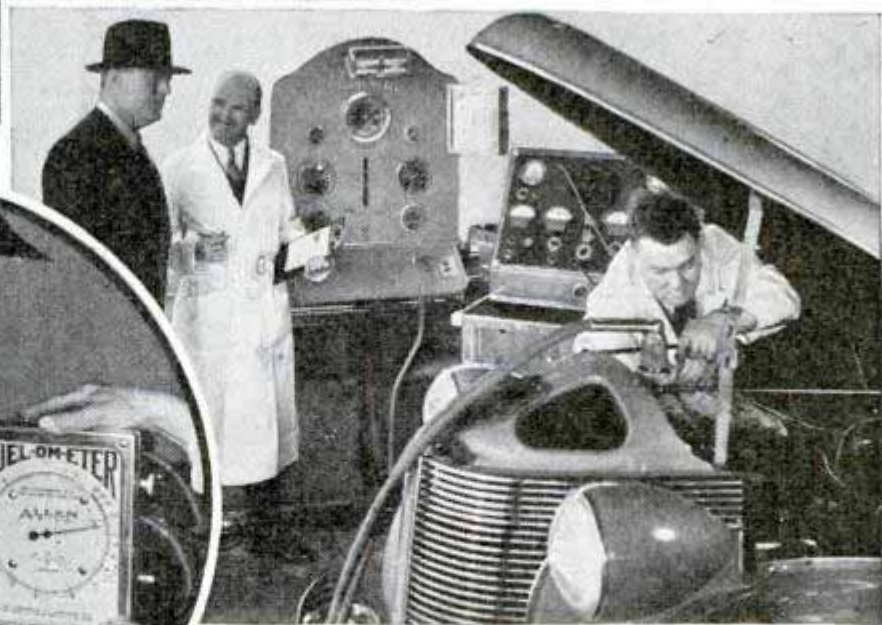
These instruments that reveal hidden troubles in the auto are part of a motor-measuring unit introduced recently



Photos courtesy Union Oil Co.



Above, big fan creating sixty-mile wind to test car radiator. Left, auto undergoing test on chassis dynamometer, which automatically checks car for gasoline mileage, horsepower and other things vital to efficient operation



Above, testing radiator with hose line. Left, fuelometer attached to motor. These are some of the precision instruments used in checking carburetors, distributors, spark plugs. In a 1,000-car test, engineers found nine out of ten cars incorrectly adjusted. The motor-measuring unit, installed in Los Angeles, tells the owner the exact condition of the motor

Carl Thomas &
Stinson, Jr.
12555 Hollywood Ave

at Walshe Blvd.
and W. 11th place

Carl Thomas &
Stinson, Jr.
racing driver

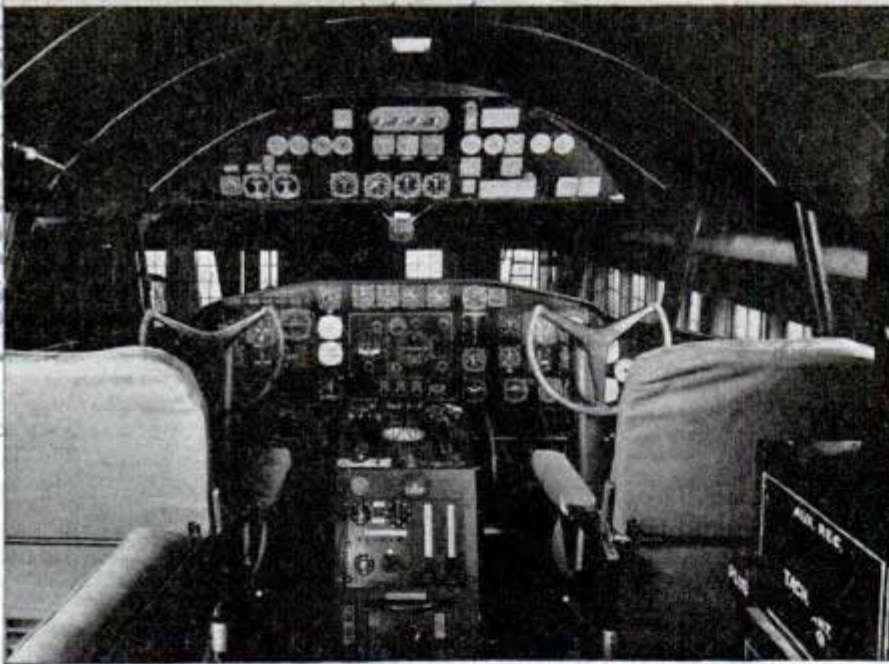
So. California

1055 5 Holman Ave.
Los Angeles Calif

FLYING



Above, the author equipped with oxygen line for flying in substratosphere. Below, cockpit of "upper level" passenger plane



By Captain D. W. Tomlinson

Transcontinental and Western Air

Municipal Airport, Kansas

NEXT summer you will be able to board a pressurized-cabin air liner and fly across the United States higher than ever before.

You will fly faster than you do today although the plane will seem to stand still, so high will it be above the ground. If the weather is clear you will be able to see 100 miles in every direction, with more than 40,000 square miles of scenery laid out beneath the windows of the plane. If storms are raging near the surface you will still be in brilliant sunshine.

The inside of the cabin will be warm and

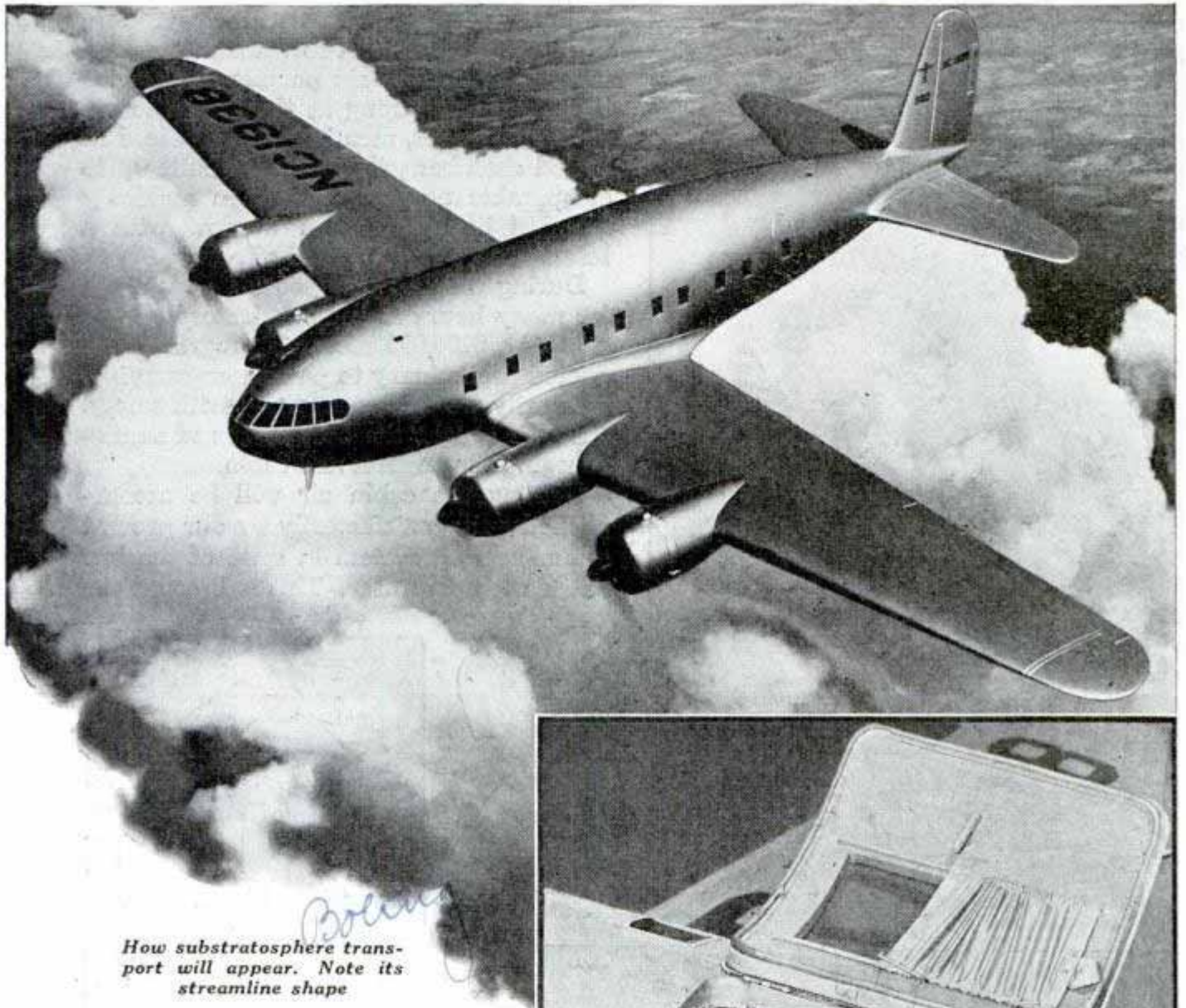
City, Mo
cabin normally will be only 8,000 feet and never more than 12,000 feet.

You will be flying in one of the new Boeing pressurized-cabin transports being built for TWA. These huge four-engined planes, which will carry thirty-three passengers, are being built especially for "over-weather" operation. Fresh air, drawn in through the leading edge of the wing, is compressed and heated to provide a comfortable atmosphere even though the plane may be flying four miles high.

Faster speeds and better weather are the reasons for flying high. The air is so thin that the plane moves through it with less drag, picking up speed at the rate of a one-per-cent increase for every 1,000 feet of

4800
Four 1100 hp
Wright Cyclone engines

ABOVE *the* WEATHER



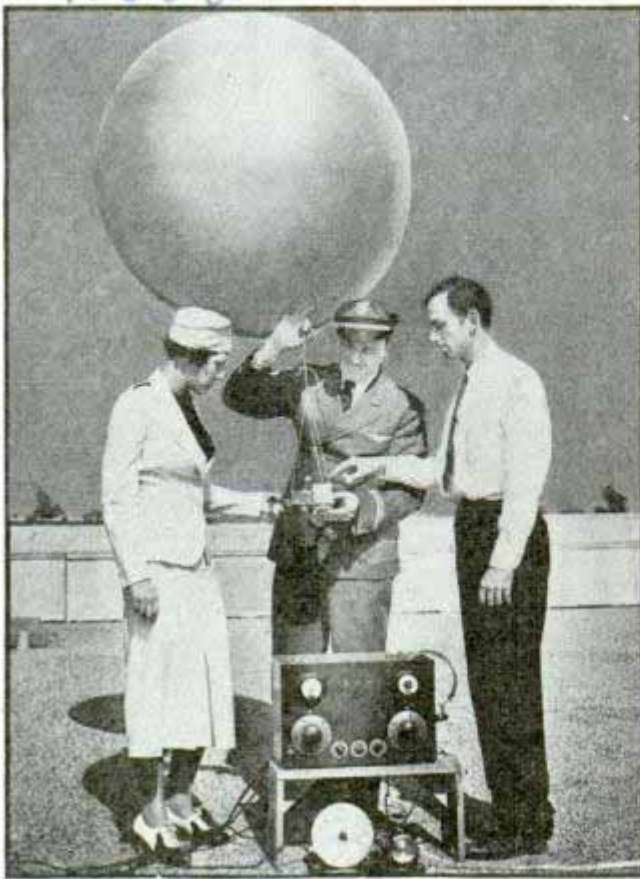
Bolton
How substratosphere transport will appear. Note its streamline shape

altitude. The viscosity of the atmosphere decreases with the temperature, reducing friction between the plane and the air.

Since 1934 we have been studying conditions in the troposphere. Many of the bugaboos that seemed to make passenger-carrying at 20,000 feet a risky business were much easier to overcome than we expected. In the upper air man resembles a fish out of water and he has to carry his own atmosphere with him. The most satisfactory way of doing this is to seal the cabin and increase the pressure inside of it, converting the plane into something like a flying



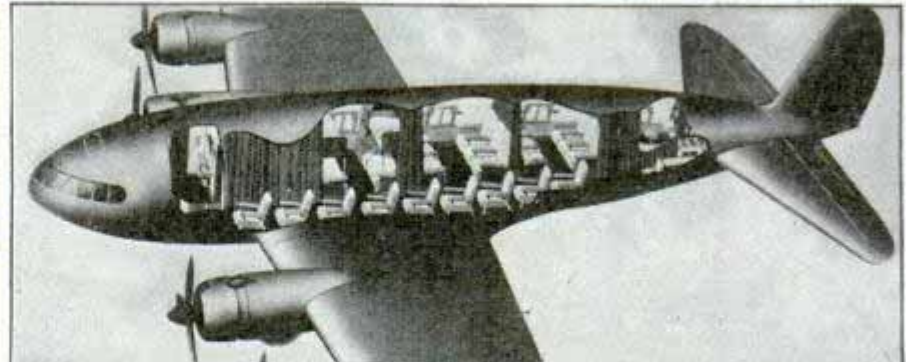
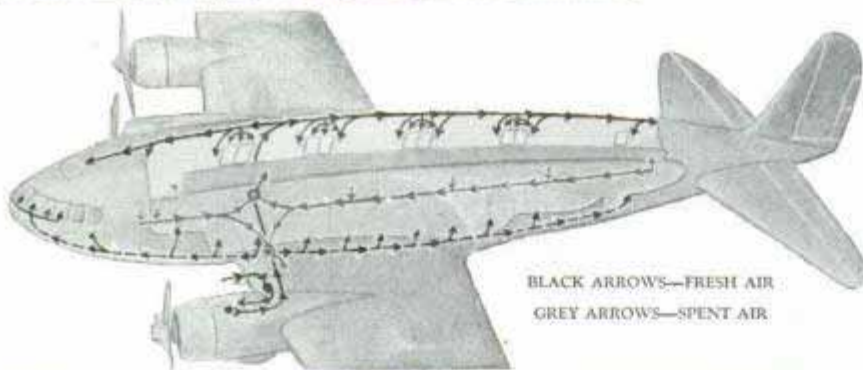
Observer holding oxygen tube in his mouth as he records readings in laboratory plane



with, we decided that since passengers are flying in comfort at 8,000 feet, there is no need to maintain sea-level pressure inside the cabin. An inside pressure equivalent to 12,000 feet is even satisfactory. The planes are being built to withstand an internal pressure of six pounds per square inch, twice as strong as they need to be. As a final check, men have been placed in sealed chambers, the pressure built up to comparable amounts and then suddenly released by smashing a window with a brick. There were no bad effects.

During the last few years I have lived for many hours in the substratosphere as part of a \$100,000 research program conducted preliminary to passenger-carrying. Primarily we were concerned with safety. Also we sought the best means of supercharging the engines and cabin.

Heating the cabin air will be accomplished quite satisfactorily by our present steam-heating system in spite of the low outside temperatures. This is because the



Top, radiometeorograph attached to balloon to take weather readings in high altitudes. Center, left, sketch showing air-circulation system in "upper level" ship. Right, modern kitchenette will be feature of the high-flying transport. Bottom, left, "high-altitude" dressing room. Right, cutaway drawing gives glimpse into sealed cabin.

submarine. One hazard that this suggested was that if the internal pressure ruptured a window the passengers and crew might expire in the upper air. This myth has been exploded as far as the altitudes we are contemplating are concerned. To begin

Boeing stratosphere
incoming air acquires some heat during compression in the superchargers. The ratio of oxygen and other gases remains constant in the atmosphere, hence there will be no need to supply the passengers with special respirators or introduce pure

14800

oxygen into the cabin. One part of the experimental program was to investigate conditions when storms were reaching up into the stratosphere. We found that at 20,000 feet we could fly over ninety-five per cent of all storm conditions. Even in the very infrequent cloud masses that poke up that high there are no true storm conditions such as are found at the bases of the same clouds. There is practically no turbulence or rough air even in the clouds, and the clouds are so thin and dry that they resemble wisps of smoke rather than fog. There is not enough moisture present to build up dangerous ice formations although thin coatings of hoar frost may form on the plane structure occasionally.

Winds at such altitudes are variable. That means, as today, that pilots will still shop around for favorable winds for their trips before they take off and will fly at altitudes that give them boosting tail winds. They will not always climb to 20,000 feet just because they are able to. Sometimes they will be able to take advantage of winds that will boost their speed 100 miles per hour or more. In still air at 20,000 feet the high-altitude passenger transports will cruise at 240 miles per hour on sixty per cent of power.

High-altitude operation, flying at 20,000 feet or higher, is feasible only for distances of 750 miles or more. Likewise, high-altitude hops on the commercial airways will be limited for sometime to distances not greater than 1,000 to 1,500 miles. Longer flights, considering the fuel weights necessary and the power diverted to supercharging, would mean too small a pay load.

Taking off in a pressure-cabin transport, the pilot will head toward his destination as soon as he leaves the ground and will climb steadily at the rate of 500 feet per

(Continued to page 142A)

"Cop" on Beat Is Motorized to Save Both Time and Feet

motor scooter



Three policemen demonstrate how they cover their beats faster by using motor scooters. The transportation is quite economical

Suburbanites in Inglewood, Calif., no longer need feel sorry for the policeman walking his long, long beat through the neighborhood. The patrolmen have been motorized. They ride a fleet of small motor scooters which cover the ground faster and cover the beat oftener, traveling thirty miles an hour and 130 miles on a gallon of gas. Further, the scooters enable the police to respond quickly to emergency calls.

Suction Grip for Auto Headlight Saves Lens from Breakage

To prevent breakage of the lens when removing it from an automobile headlight, a vacuum grip has been developed. It is a bell-shaped tool with lever grip, employing the mechanical vacuum principle instead of natural suction and thus providing a firm and certain grip.



Edto. Co. Hildebrand
 due 6 7 23 Hildebrand

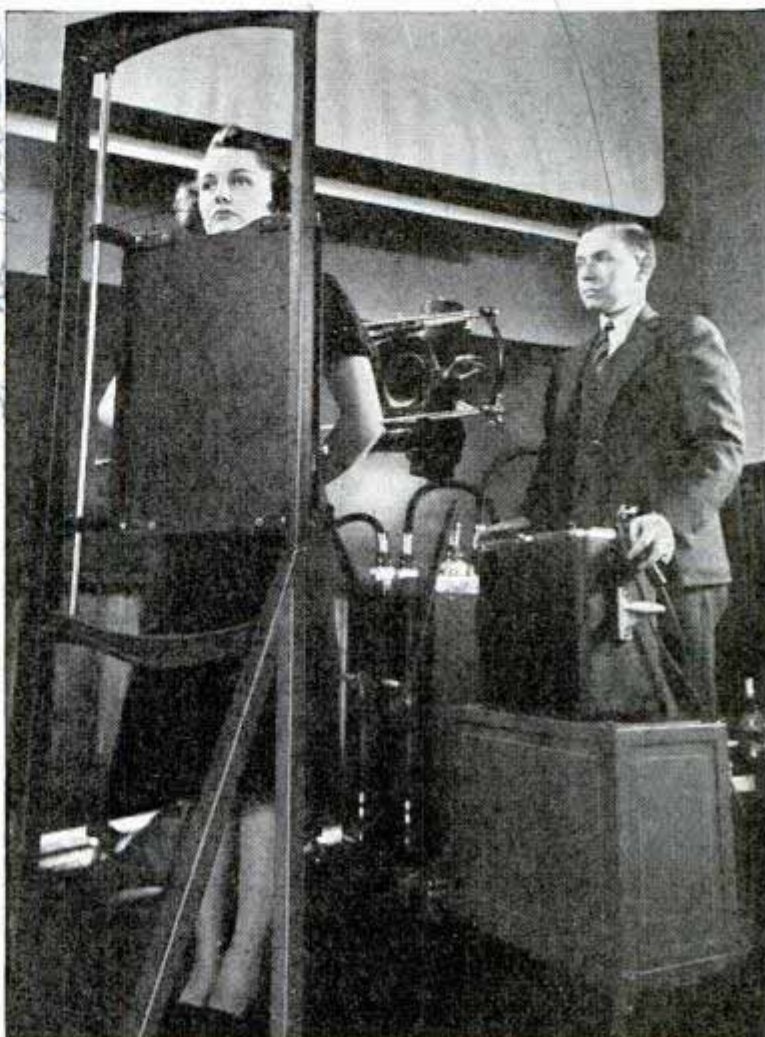
...wishes made by ...
 ...

over the wings is interrupted. To detect a stall before it happens, a sharp edge is built into the leading edge of the wing and just before the main wing reaches a stalling angle, a local stall over the small, sharp edge is produced. A meter detects this local stall by a drop in pressure, and sets off a warning indicator in the cockpit.

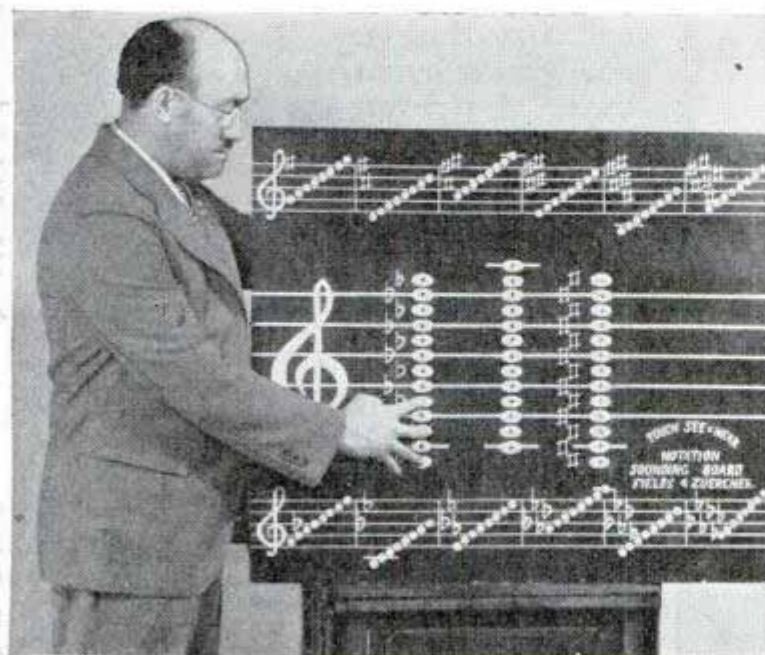
H 12 24
**Electric Music Board
 Is Aid in Teaching**

Operated by an electric motor, a board designed to facilitate the teaching of music permits the pupil to see, touch and hear the notes being studied. The device is a blackboard containing three music staves. The center staff contains the master scale ranging from B-flat to A above the staff. On either side are sharps and flats of various tones. Top and bottom staves show scales from one to six flats and from one to six sharps. The pupil hears the tone played from a soundbox located back of the board. The electric motor blows air through accordion reeds to produce the tones. The board, thirty by thirty-five inches, is portable. Its use is said to speed up instruction in music.

Industrial
**'Candid' X-Ray Picture Snapped
 in One-Hundredth of a Second**



Taking X-ray picture of the chest with aid of "trigger tube" which is powered by ordinary lighting current



Showing position of hands on keyboard is one of the advantages of electric chart designed to teach music

Storing up power drawn from an ordinary 110-volt light socket, a small glass "trigger tube" just developed by Westinghouse makes possible a candid X-ray snapshot of the human chest taken in less than one-hundredth second exposure, free from distortions sometimes caused by heart movement. The tube controls the flow of 110-volt power to condensers, and when a button is pressed after eight seconds the stored power is released as an 89,000-volt maximum discharge through the X-ray tube. This vacuum "trigger tube" incloses electric coils letting power flow from socket to condensers until the coils become heated. then the condensers discharge.

Mr. Victor E. Hecks, Westinghouse
Mr. Charles C. ...
Dr. ...
Chris Guesser
Fields

Seaplane Ramp Submerges to Lift Craft from Water



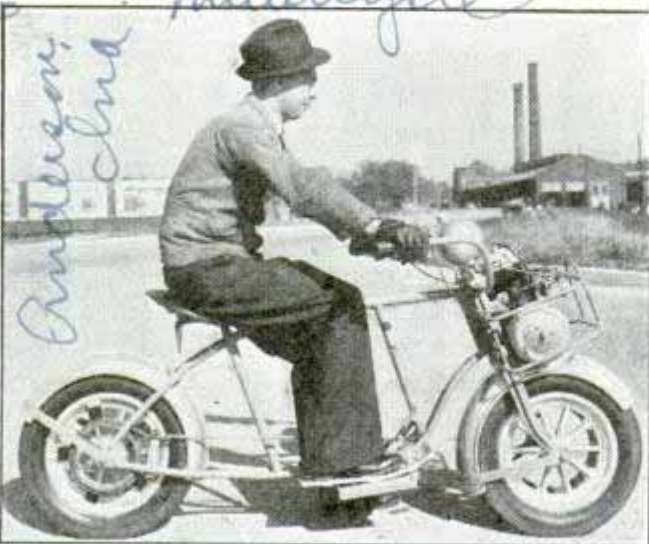
Seaplane on turntable after being lifted from water by the ramp. The plane can be taken from the water in thirty seconds

by Vito Marriano

Designed to lift seaplanes from the water, a portable ramp has been demonstrated. It submerges and the seaplane is maneuvered over it. Then the ramp rises, picking the ship from the water in thirty seconds. It has a turntable on which aircraft may be turned in any direction desired.

Front-Wheel-Drive Motorcycle Carries Engine over Fork

Engine and front fork of a front-wheel-drive motorcycle are built as one unit and the frame and rear wheel form another unit. The two sections can be dismantled in a minute for quick, convenient packing.

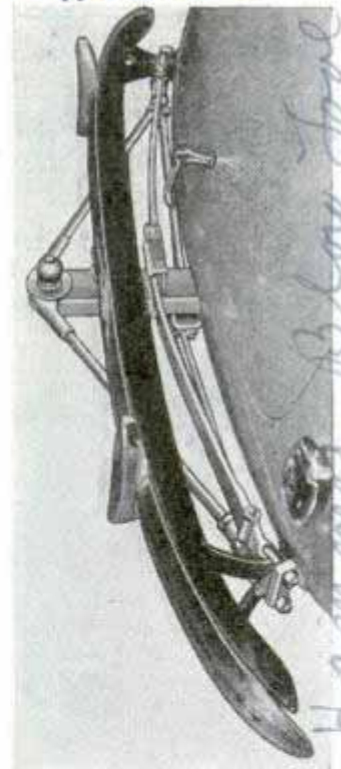


This motorcycle, with engine over front wheel, can be taken apart quickly

The two-cycle, single-cylinder engine is mounted over the front wheel where the air is clean and its cooling power is unobstructed. The wheel is chain-driven through a two-speed transmission, both throttle and transmission being controlled by handle-grips. Rigid brake drums on the rear wheel are operated by a foot pedal. Light and fast, the motorcycle weighs 150 pounds, can carry two men, and travels ten to sixty miles an hour at 100 to 125 miles per gallon. The wheelbase is forty-eight inches.

Adjustable Drawbar for Trailer Switches from Car to Car

Attachable to any automobile without drilling, cutting, welding or otherwise marring the car, a drawbar for trailers can be adjusted to raise or lower the trailer to level position. Easily detached and installed on another car by an unskilled person in less than a half hour, it is of special value to motorists using a trailer for only short periods and to agencies renting out trailers for vacation use.

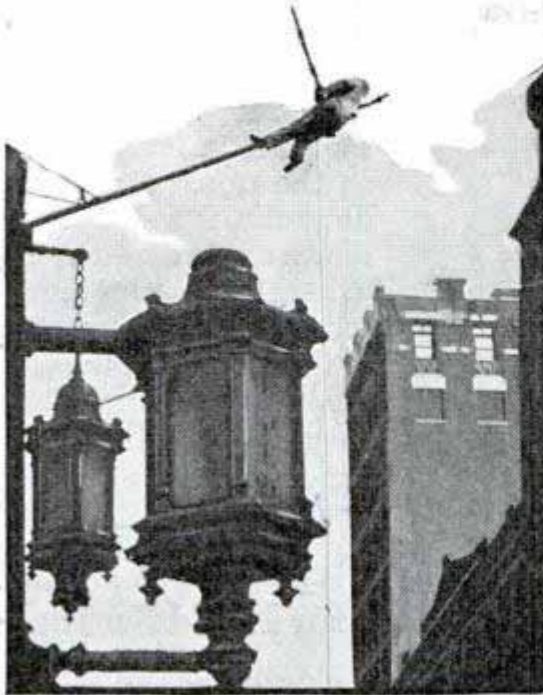


Our Bureau of Information keeps on file the names and addresses of makers of, and dealers in, all devices described in the pages of Popular Mechanics Magazine. We are glad to furnish this information to our readers upon request, accompanied by stamped, self-addressed envelope.

Handwritten notes in the left margin: "at Newark Seaplane", "1208", "1473", "Chas. E. Miller", "1403 Main St.", "Anderson", "Miller", "1205", "14.00", "15.00", "Hammer", "Waller", "Co."

Risking Lives High in Air Is All in Day's Work

Wide World Photos



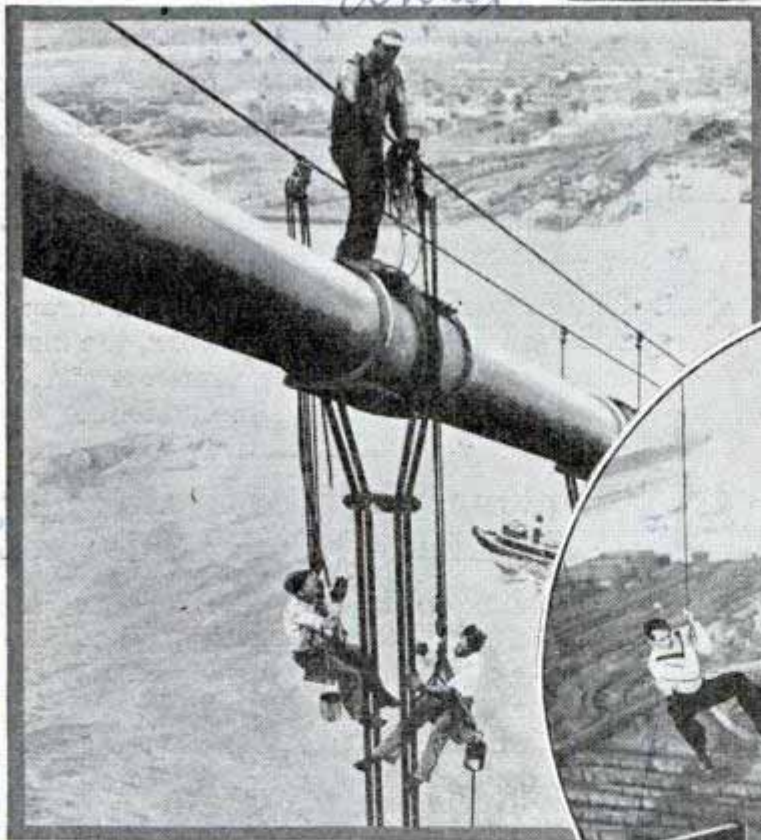
Risking his life high above ground is just a part of the job to this steeplejack overhauling the flagpole at entrance to a New York building

James Amley

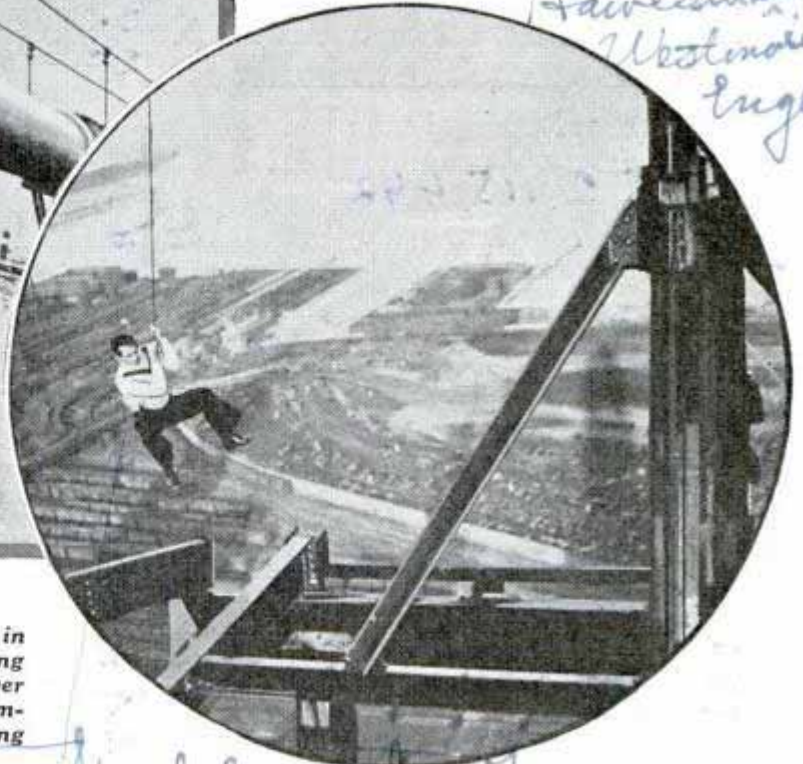


Here another daring worker appears unworried by the fact that he is oiling a skip carrier on a cableway 150 feet above the site of a large dam

Lakeswater Westmoreland England



Above, dangerous to be sure, but it's all in the day's work for these painters dangling 350 feet above the water on Delaware River bridge cable. Right, another steeplejack gambles with death on a forty-two story building as he swings from one point to another



Steeplejack Jerry

Wellough

Family of Nine Rides 'Bike' with Rumble Seat for Four



Count 'em! The five in front do the work; the four behind just ride

Anything less than a bus might seem crowded when a family of nine climbs aboard—yet here is a bicycle carrying dad, mother and seven children! Rather, it is a double bicycle, with front seats for the pilot and his wife, saddles for three behind them, and a "rumble seat" at the rear accommodating four more. This unusual vehicle, owned by a family in Switzerland, is propelled on a "share-the-work" plan.

blades are available for shop work, the blades costing, it is estimated, about one-tenth the cost of making a scraper by hand. The blades stand hard usage, one blade



Hand scraper and kit of blades which reduce cost, outlasting ordinary type of scraper

Low-Cost Insect Sprayer Run by Automobile Exhaust

Farmers and orchard men can fight insects effectively with an inexpensive power



Exhaust gas in large hose blows insecticide in mist

being equal to an ordinary hand scraper reformed five times. When worn, the blade is replaced and you have a new scraper. It need not be reground, simply stoned.

Contour "Map" of Ocean Floor Made by Depth Finder

Standing on the bridge of the new liner "Mauretania," the navigating officer can watch an indicator giving an instant and continuous measurement of the depth of the sea under his keel. Taking soundings formerly was the work of ten minutes or more. The radio echometer, using a high-frequency beam reflected from the ocean floor, records the depth of water many times per minute by a "peak" of light on a calibrated scale. Thus it plots a graph of the contours of the sea bed and helps the navigator verify his position by comparison with charts of known contours.

as Lindenger

H 1264

2 145 442

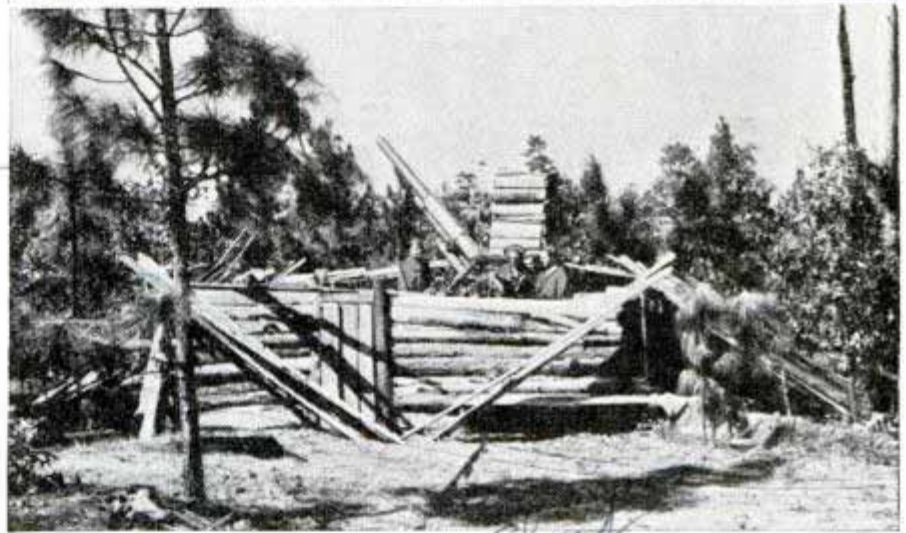
d. w. W. T. Emery

Handwritten notes and signatures including 'Cunard White Star', 'Mauretania', and 'Dinner'.

Vertical handwritten notes on the right side of the page, including 'Packard' and 'my Co'.

Log Cabin in Woods Hides Anti-Aircraft Gun

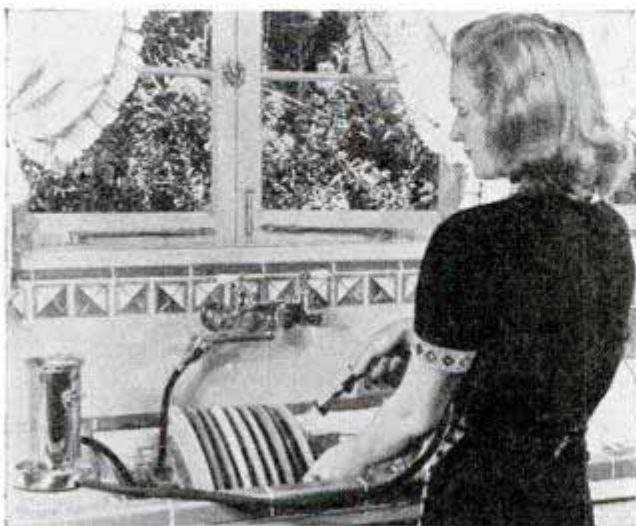
To observers in enemy planes riding far overhead, this ramshackle log hut in the midst of a forest of scrub pines seemed harmless enough if, indeed, it could be spotted at all by airmen flying thousands of feet above. But when air raiders appeared within range, the trap was sprung—the roof timbers were quickly cleared and the hidden anti-aircraft gun elevated into firing position, ready to blast the invaders out of the sky. This was one of the defense tricks in the recent maneuvers at Fort Bragg, N. C., where army officers demonstrated what they termed the world's finest anti-aircraft equipment.



At top you see an old log shack in scrub pines of North Carolina. Below, it is suddenly revealed as hiding place of anti-aircraft gun

Motorless Dishwasher Uses Water Pressure and Soap

Operating without motor or moving parts, a simple home dishwasher now on the market uses water pressure and com-

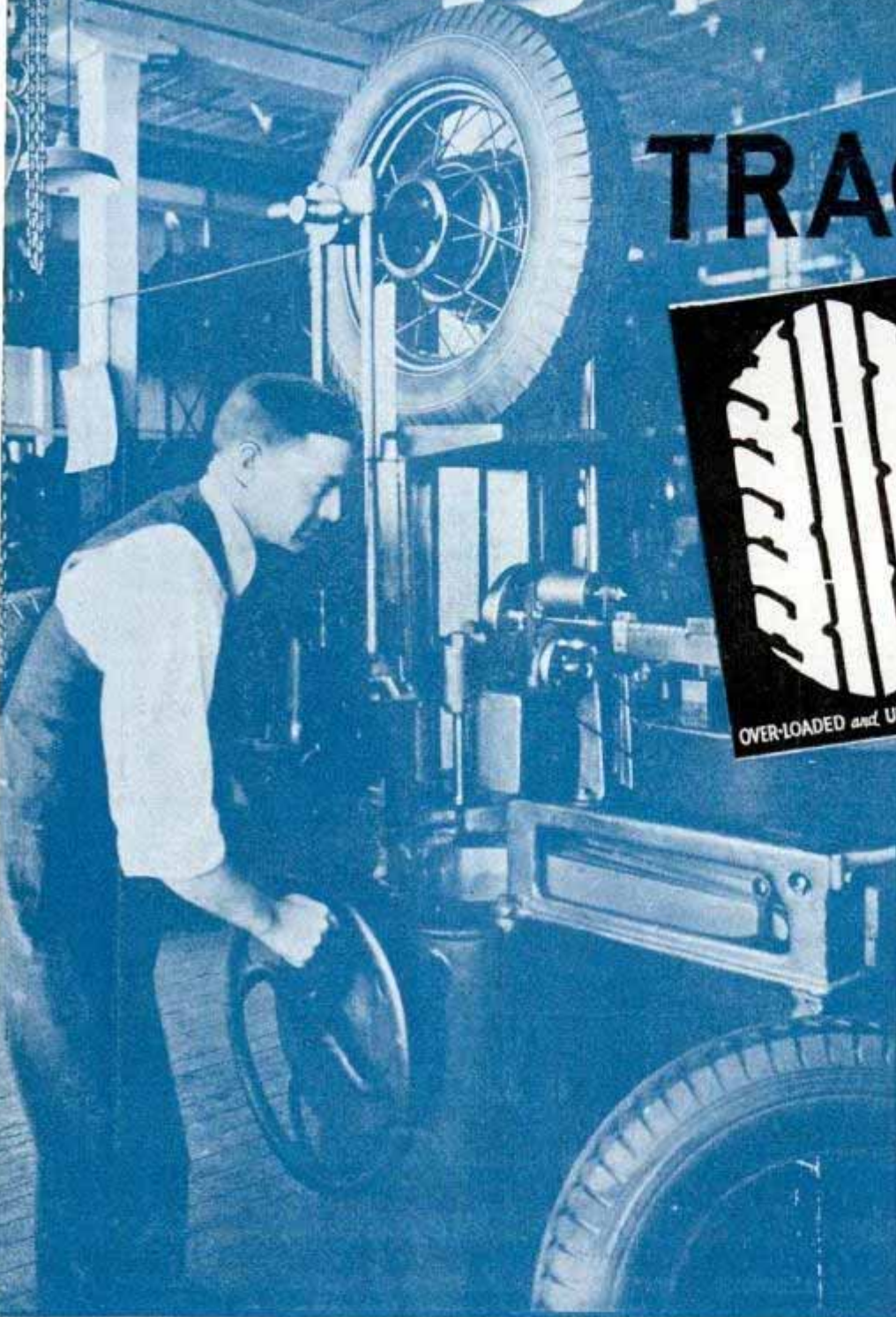


Using the home dishwasher. Note soap container (at left) with hose connection to faucet

mon soap. It consists of a small chromium-plated soap chamber three inches in diameter and eight inches high, with hose running to a faucet adapter and to a needle spray head. The adapter, made of rubber, fits any size faucet. It is held securely to the tap by a small chain. By flicking a lever on the side of the soap chamber, the user diverts the water through the chamber to obtain a strong spray of hot suds. Turning the lever back seals off the soap and enables the user to get clear hot water for rinsing. The amount of soap used is controlled by the valve. Dishes are placed in a rack fitted with a sliding panel which may be adjusted to accommodate the number of dishes to be washed, up to the capacity of the rack. A second rack holds the silver. The entire apparatus may be stored in a cupboard when not in use.

Spray foam dishwasher G. 11757 Dan Viscito

TRACKERS



Left, making tire print in Fisk laboratory. Right, two examples of prints. The one at left indicates there were several occupants in car driven by a careless person. The other indicates car had several occupants, front wheels were defective and the driver unskilled, the tire showing results of being banged and scraped against curb

*Chapel
falls
mass*

*Carl Cruise
727
Schuermacher
Park Ave
New York*

JUST as the cunning Indian scouts of an earlier day could "read the signs" of the man whose trail they were following, modern trackers of the highway with scientific precision can tell much about the man who drives an automobile, even if the car has been swallowed up by the 900,000 miles of roads that crisscross the country.

No longer is the automobile the lawbreaker's perfect means of escape. Many times it leaves telltale "fingerprints" which are as individual and revealing to a tire expert as a set of teeth is to a dentist.

Lawbreakers are being tracked down all over the country with the aid of 2,799 tire-tread prints filed in the Bureau of Federal Investigation in Washington. Once a tire

print is obtained at the scene of a crime, the chances are 100 to one that the tire can be identified because the collection of patterns on file covers not only all models made in the United States and Canada but also the products of tire rebuilders.

Tire-sleuthing, though an infant branch of criminology, is an important scientific one. A pioneer in its development is A. E. Benson, product development manager of the Fisk Tire company and one of the world's foremost tire engineers.

"As a growing child develops its own personality," says Mr. Benson, "a new tire as it gains in mileage reflects the peculiarities of the car and owner through irregular wear. Presence and arrangements of

of the HIGHWAY



these peculiarities give the tire its personality.

"Five years ago, tire purchases were based primarily on size and quality, but the development of the automobile for specific purposes has brought about specialty tires designed to meet particular service conditions. Today the tire industry offers such major types as the start-stop for delivery trucks that stop frequently in city service; mud and snow;



Top, left, two prints of over-inflated tires, the one at left indicating preparations for long, fast trip. Right and bottom, broadcasts of tire prints help police track down criminals



edging on design units and along the ribs."

Tire prints also tell the experts many things about the driver. They can tell the approximate number of occupants by the depths of a print. From its width (under or over inflation) they can tell whether the driver is cautious or overconfident and by scuffing at the sides, where he may have hit the curb when parking, whether or not he is

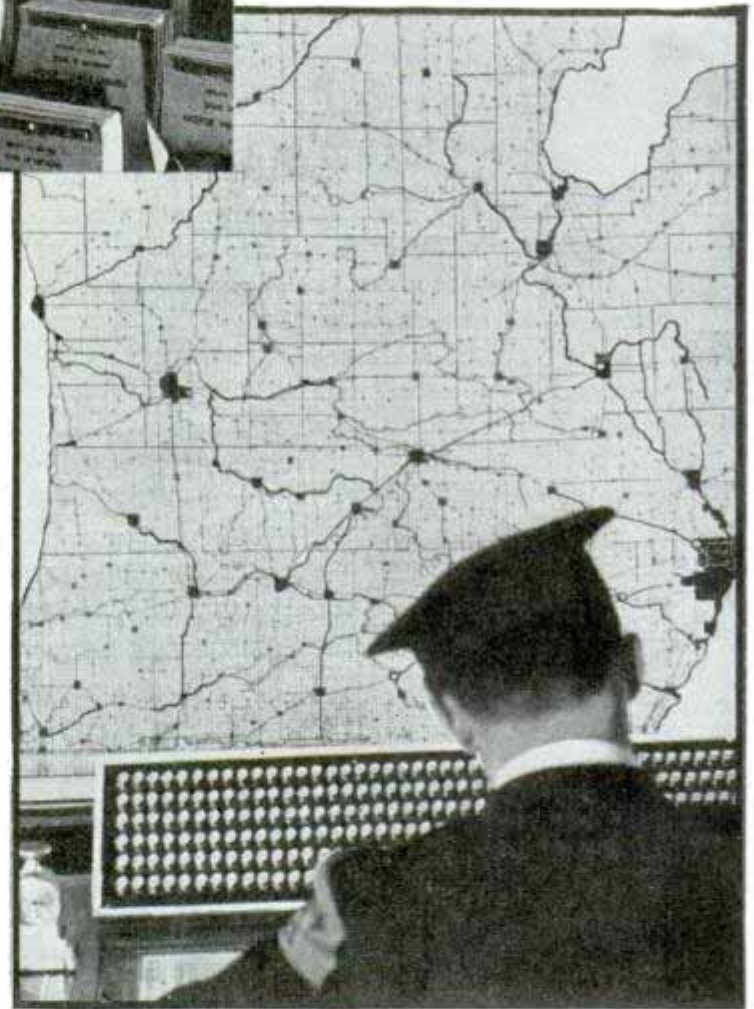
farm tractor; safety and bus, passenger car and truck tires of various sizes.

"First inspection of the print immediately reveals whether a truck, bus or passenger tire was used. If it was a passenger tire, it is a simple matter of deduction, combined with a knowledge of tire sizes, to judge whether the car was in the Chevrolet, Buick or Cadillac class. At times it is possible to determine precisely which one and its age, because a Chevrolet, for example, may carry a certain manufacturer's tire for a particular year.

"If the car was in an accident, the probabilities are that the wheels were knocked out of alinement. Before the car has been driven many miles in this condition, excessive wear will begin to show in the tire tread.

"Front wheels only half an inch out of alinement will drag tires eighty-seven feet in every mile. Such wear is immediately evident to the expert's eye, as revealed in the print. When brake drums are out of round, another condition will soon become apparent. Gripping always in the same spot, the tread will be worn in egg-shaped spots while the remaining tread will show only normal wear.

"Caster, camber, toe-in and toe-out action in the front wheels all leave their identifying marks. Too much camber results in gouged-out front tires. Excessive toe-in or toe-out action leaves feather-

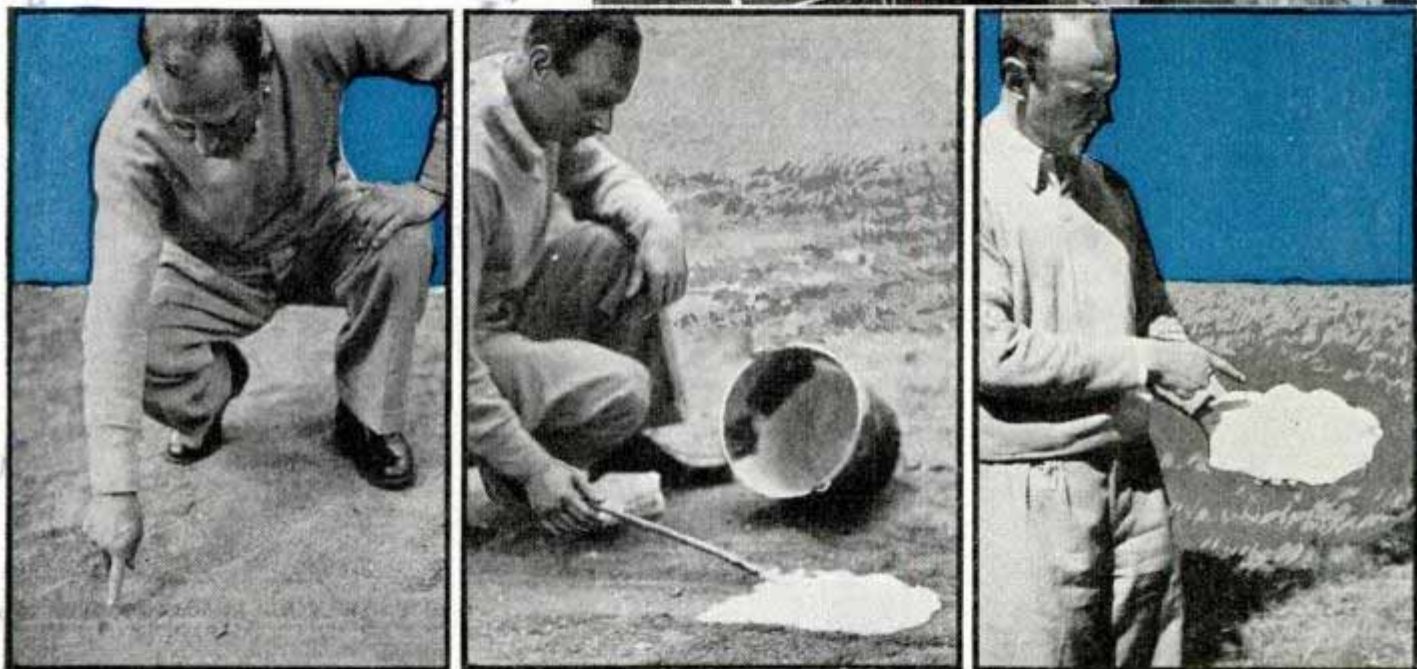


Top, checking motor license plates. Bottom, radio dispatcher at control desk with road map in front of him is ready to help trap escaping car

careless. A tire leaves a "positive" design when it passes over a wet road or ground, marking its wet track over a dry portion similar to a printing process. If the same tire stamps its track in mud or other soft substance the tracks become a mold or a "negative" impression. In the Fisk laboratories, experts have developed their own

method of making impressions by machinery. Federal experts, when assigned to a case, will photograph a positive impression and make a cast of a negative impression, using paraffin, white wax or plaster of paris in the mold to preserve every detail.

With almost 1,100 hit-and-run tragedies annually leaving few if any clues to the killers' identities, the tire print has become an important aid in the solution of crimes of this type. Such tire prints have been found at the side of the road where the



Top, "lie detector" frequently is used to check clues in hit-run cases. Bottom, left, examining tire track. Center, pouring in plaster of paris. Right, tire print recorded in mold

motorist swerved in a vain attempt to avoid his victim, in dirt positives on concrete roadways after similar swerving and in rubber "scorched" on the asphalt as the driver futilely applied his brakes; and printed in the victim's own blood.

Recently a Connecticut policeman, graduate of the National Police Academy of the Bureau of Investigation, tracked down a hit-and-run driver who had killed a boy. The policeman made a mold of the track left by the death car. He found a car with a tire that matched the cast. A comparison of glass found near the tire track aided the identification. Confronted with that evidence, the driver confessed.

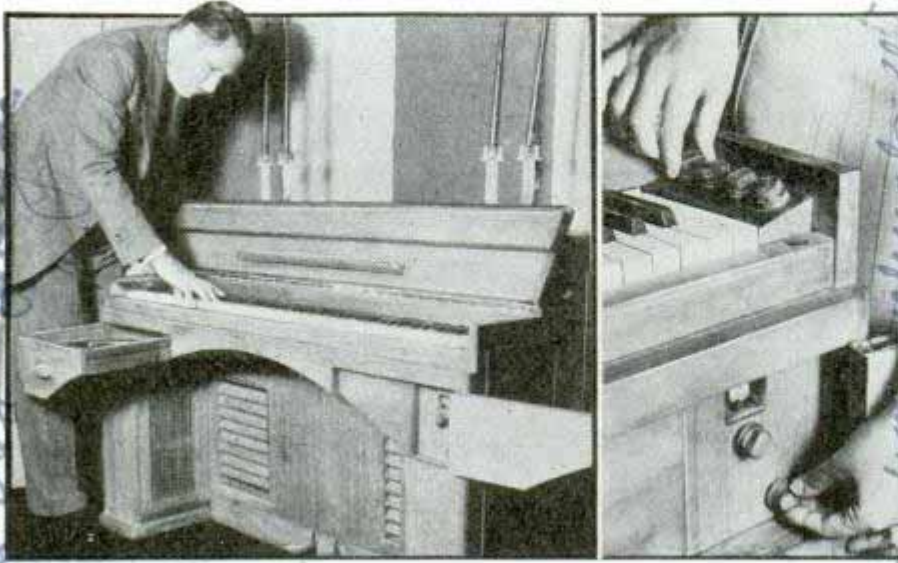
"Apprehending hit-and-run drivers requires all the facilities of a modern police department," says Commissioner Oscar G. Olander of the Michigan state police. "Every possible contact between police officers and garage men, managers of parking lots and the general public must be made to secure information as to the whereabouts of the violator's car."

With more and more police authorities throughout the country adding "tire-sleuthing" to their scientific equipment, officers are now able to piece together more information than formerly in sending out general alarms—and with prompt-

(Continued to page 136A)

Newark Ohio

Piano Without a Soundboard Is Four Instruments in One



© Andrew Halbram
Two views of combination musical instrument. Left, phonograph and radio compartments open. Right, operating the radio

Phonograph, radio, electronic piano and conventional piano have been combined into a single instrument. With a full eighty-eight note keyboard, it is, first of all, a conventional piano with the usual hammers and strings, but minus the soundboard. When played in this manner it possesses an exquisite tone but, because of the absence of a soundboard, the vibrations do not carry far enough to disturb neighbors. At the turn of a switch the piano is converted into an electronic piano, the vibrations of each string being picked up electrically, amplified and reproduced through the loudspeaker in its base, thereby producing tones of a different character. Sliding out a compartment on the left converts it into an electrical phonograph and opening a door on the right makes it a long and short wave radio. The instrument is three feet high, two feet one inch deep, and four feet six and one-half inches wide.

Glass Fibers Used to Insulate Electrical Equipment

Glass insulation for electrical equipment, including wire and motors, is being used in steadily increasing quantities. The insulation comes in the form of yarn, woven tape, braided sleeving and cloth, and is applied by manufacturers. Fiber-

glas, made by the Owens-Illinois Glass company, is one of the insulating materials on the market. It has superior electrical properties, is resistant to high temperatures and will not burn, does not absorb moisture and is undamaged by occasional overloads. In addition, it permits reduction in size of equipment, such as a motor, with resultant savings in materials. Fiberglass is composed of extremely fine fibers, .0002 inch in diameter, made from the remelting of glass marbles. One marble three-fourths inch in diameter makes approximately ninety-eight miles of fiber. Deltaglass is the name of glass fiber insulation used for magnet wire manufactured by the General Electric company. The wire is recommended for apparatus windings where the temperature does not exceed 125 degrees centigrade. The insulation is flexible, has high dielectric strength and resists abrasion, due to a coating of special varnish.

Midget Car Built from Junk Has Eighty-Mile Speed

Made from junk automobile parts, a midget car constructed recently has a speed of eighty miles per hour. It is equipped with small tires of a standard make. Acetylene and arc-welding equipment were the principal tools used in the work.



Midget automobile constructed from junk parts

wheelbase 44" x 82"

*2/1-10-49 ck
Arthur C. Anzley
Anzley Radio
L. J. ...
C. Anzley's ...*

*insulation ...
Jameson, N.Y.
Harold J. Lagg
General Jr. & Co.*

Fireboat Hangs 20,000-Gallon Screen of Water



Two views of New York's newest fireboat undergoing trial tests. It can pump 20,000 gallons per minute

Its hoses raised in fanlike formation, New York's new fireboat hung a thick curtain of water over the Hudson river in its trial demonstrations recently. Its Diesel-electric engines can pump 20,000 gallons a minute at a nozzle pressure of 150 pounds per square inch, and propel the boat at better than sixteen knots.

Rubber Heel Snaps on the Shoe without a Trip to Cobbler

Rubber heels that can be clipped on the shoe by the wearer himself are being introduced in England. Metal plates are screwed to the shoes, and the heels are easily snapped on by means of simple locking clips molded into the rubber.

Automatic Fuel System Saves Airplane from Gas Failure

Promising added safety by eliminating the danger of running out of gas while landing, taking off or flying low, an automatic fuel system for airplanes automatically switches from an empty tank to a full one. The device relies on falling fuel

pressure in the emptying tank to turn the fuel cock to the next tank. Should it be empty, the fuel cock would continue turning until it did come to a tank containing fuel enough to boost the pressure above the level at which the device operates.

Swan June 10/6/58

U.S. Army Air Corps, Material Div.

Agent
Park Lane
11 Park Lane
Let's

see Aug. 1939 - 242.
see June 1942 - 39

NEW JOBS *on the*



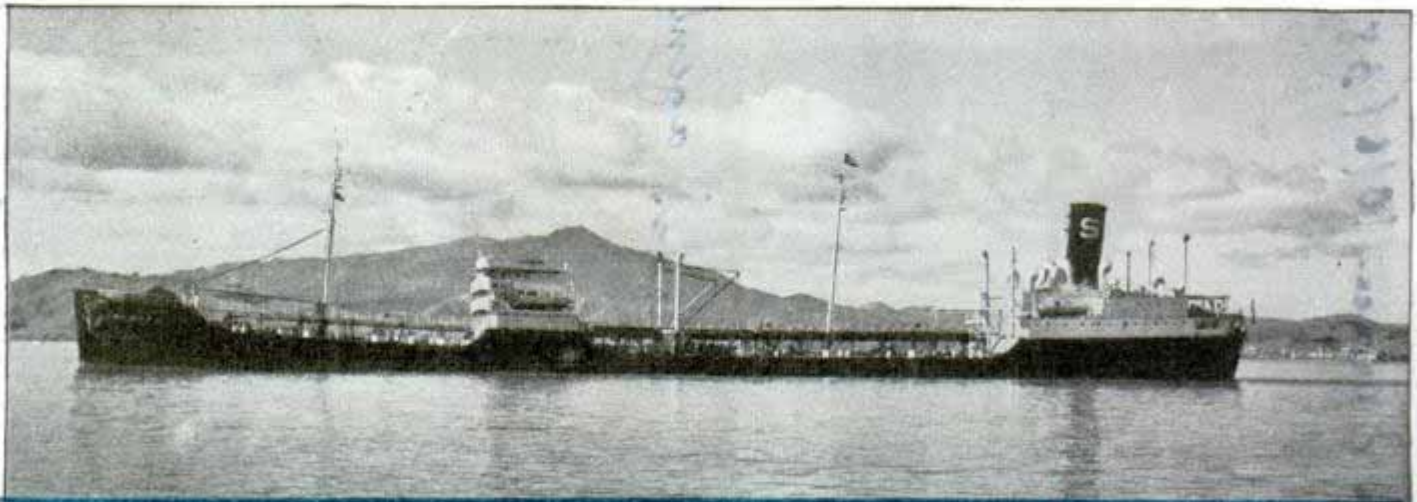
from freighters to giant passenger liners are going to be built under the American flag. Though some will take the place of vessels wearing out, an army of about 10,000 new sailors, including steam and Diesel engineers, captains, navigators and radio men, will be needed to man the new fleet.

Technical skill has already replaced brawn at sea and a new breed of sailormen is in demand. The derisive jeer of old tars, "wooden men and iron ships," is as out of date now as the iron men and wooden ships that the first vessels propelled by steam replaced.

IF YOU want to go to sea, Uncle Sam will do all he can to help you rise to command. Nearly all the officers of America's merchant marine worked their way from the fo'c'sle up to the bridge and today the Maritime Commission is starting a serious effort to help young men make a success of their seagoing careers.

In the next ten years 500 ships ranging

Specifically, the commission is opening seamanship schools at which men who have already shipped to sea can be trained to increase their rank and pay. The commission is also overhauling the cadet system by which young men receive instruction at sea. In the past cadets sometimes regarded their ocean trips simply as vacations but now an applicant for such a post must apply to the



Plotting exact location of ship at start of voyage, top, by taking bearings on objects ashore. Bottom, the "W. H. Berg," one of new oil tankers of Standard Oil Company of California

HIGH SEAS

director of maritime personnel, United States Maritime Commission, Washington, D. C., who makes sure that the young man really wants to go to sea before signing him on. Each vessel sailing under an operating or construction subsidy is required to carry a small number of cadets who receive personal instruction from the officers after they have finished their daily duties.

The cadet plan is intended to train young men to become competent offi-



Cadet on passenger liner testing public-address system by which passengers and crew can be commanded during emergencies. Top, the "Tusitala," full-rigged sailing ship just after she had arrived in Honolulu from New York. She made the trip in eighty-four days



cers so they will be qualified for jobs in the growing merchant fleet. Prospective cadets must be between eighteen and twenty-three years old and must be high-school graduates with fourteen standard credits. There are other classifications for those who have had other training, such as instruction on a state school ship.

New marine schools, to be operated jointly by the Maritime Commission and the Coast Guard, are being established at Hoffman and Swinburne islands in New York, at Government island in California, and at a site on the Gulf Coast. The

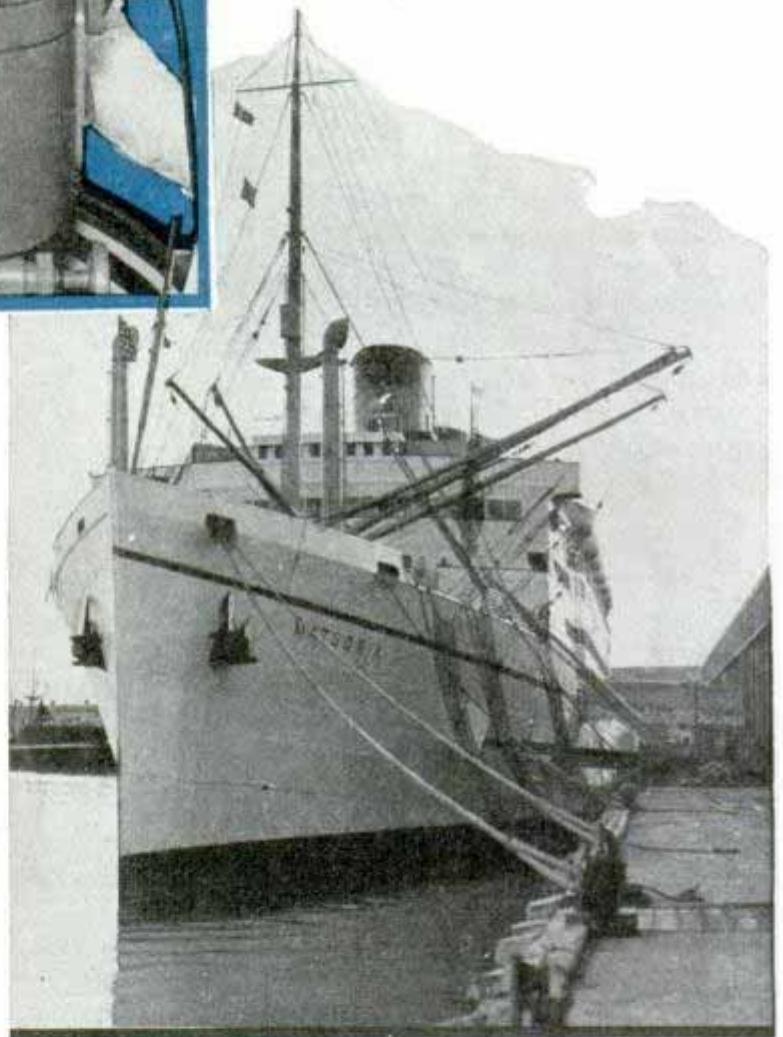


schools will use the S.S. "Edgemoor" and the full-rigged sailing ships "Tusitala" and "Joseph Conrad" for training cruises. Bona fide merchant seamen who are unemployed are eligible for enrollment and will receive a three months' course with pay, food, clothes and quarters. Pay runs from \$36 to \$125 per month, depending on the rank of the applicant. The requirements are that the student must be a citizen, twenty-one years of age or older, and must have served a minimum of twenty-four months at sea. Instruction in the schools will include lifeboat drill, abandon ship drill, care of staterooms, overhauling of equipment and engine room and deck machinery, with special instruction for radio, electrical and clerical ratings. The commission expects that the schools will graduate 3,000 men and 300 officers per year, providing a reserve of capable men for the expansion of the merchant marine.

Life at sea today is nothing like the life of the past. Working conditions and pay on American vessels are the best in the world, having been improved considerably

in the last few years. Men in the deck and engine-room departments work eight hours a day, four hours on and eight hours off, and are paid extra when overtime is necessary. Safety at sea is always more important than punching a time clock.

Seamen box and wrestle on their off watches and engage in other sports. In the tropics they sleep on deck if they desire. Libraries of several hundred volumes are provided on most ships. You get



Quartermaster, top, at hand steering wheel on bridge. Below, trans-Pacific passenger vessel at dock

Sundays and holidays off when the ship is in a safe harbor. At foreign ports, with the captain's permission and depending on port regulations, seamen go ashore to see the sights and shop for curios.

Instead of the traditional damp, cramped and smelly forecastles the crews live in comfortable quarters on modern ships. On the two new oil tankers recently put

in commission by the Standard Oil company of California each normal crew of thirty-seven men live and sleep in light, airy cabins. Ordinary seamen get quarters as desirable as officers' staterooms. No room is occupied by more than two men. Each bunk has a deep spring mattress, sheets, and blankets. There are reading lights, rugs on the floor, hot and cold water in the porcelain washstand, desk and chairs, and even a built-in antenna for personal radio sets. There is warm and cold air circulation for each room, regulated with the weather, as well as electric fans. A harmonious color scheme decorating the walls, furnishings and curtains makes each cabin a comfortable home at sea. Old seamen used to shipping on freighters built twenty years ago can't believe their eyes when they see the quarters.

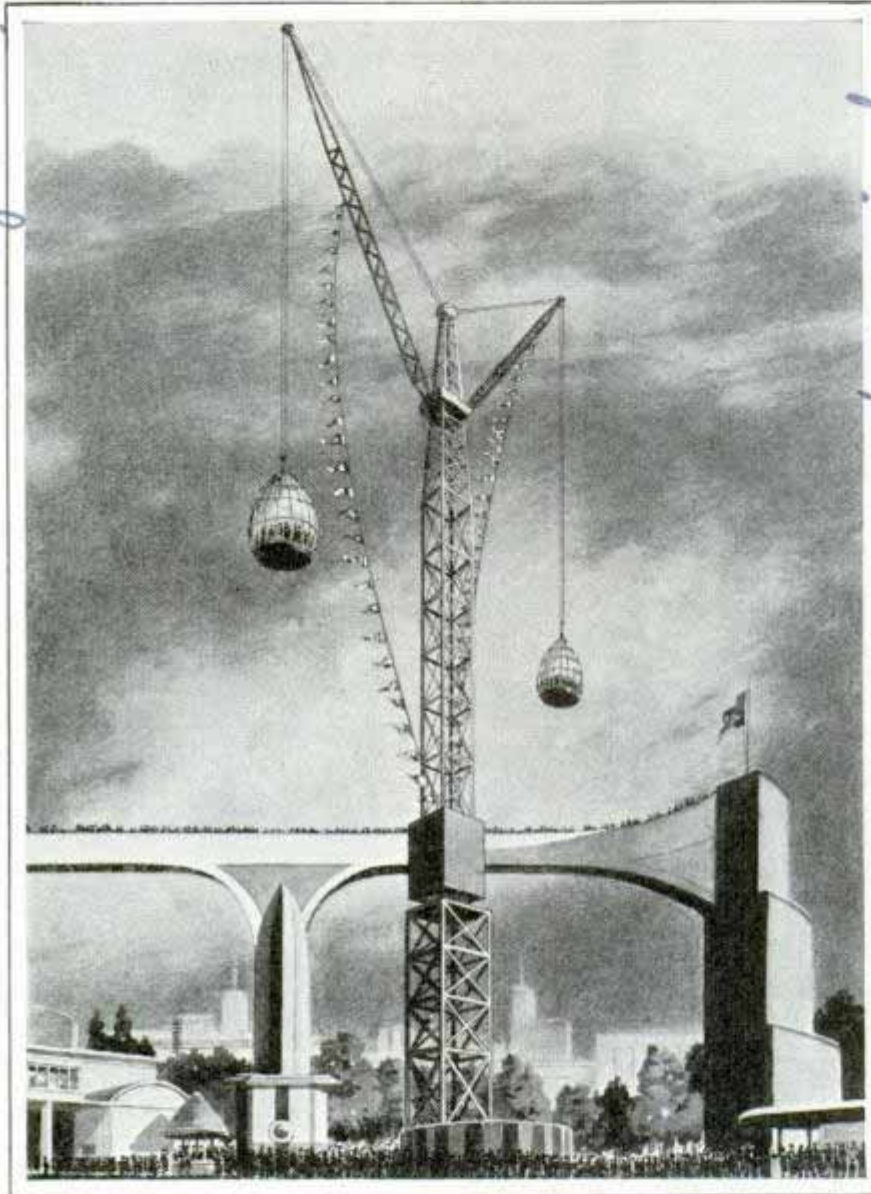
When crew members on tankers go off duty they may loaf in the unlicensed personnel's recreation room, fitted with upholstered furniture, where they will find others reading, playing cards and swapping yarns. The crew's messroom is just as modern and the ship's galley is equipped on a small scale like a passenger liner's. These two ships have the most up-to-date living quarters of any vessels afloat and they are serving as models in the designing of crew's quarters for other new ships.

(Continued to page 119A)



Some of crew of the "W. H. Berg," top, in their recreation room. Center, crew's messroom of this modern oil tanker. Food similar to that served to passengers on the big liners is served to crews these days. Bottom, crew's quarters for two men on oil tanker. Note the commodious quarters which are the men's floating home

Giant Crane to Lift Riders in Cages to See Exposition



Drawing of huge crane which will lift two cages, loaded with visitors to exposition, high into the air for view of fair

Visitors to the 1939 Golden Gate International Exposition on San Francisco Bay will be given a thrill ride by a giant crane. Swinging two large steel cages 166 feet into the air, the crane will provide a new kind of sky ride. The cages will accommodate twenty-five passengers each and will be swung out over a wide arc as the crane revolves, giving the spectators a dizzy view of the exposition.

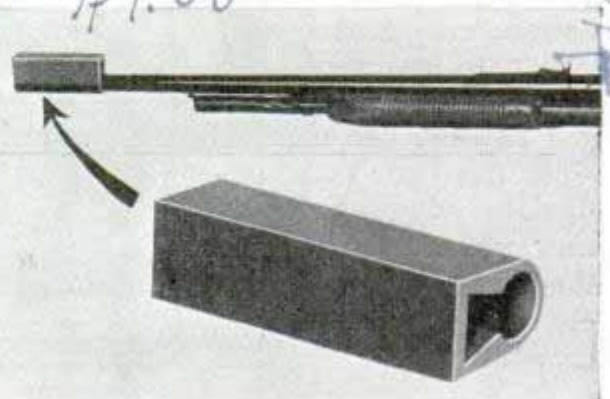
Radioactive Grease Finds Flaw in Surface of Metal

Tiny flaws in the surface of metals are being hunted by means of radioactive

grease and sensitive photographic paper. Weakly radioactive compounds of thorium are mixed with amber petrolatum and smeared over the metal, which is then placed in a chamber where a pressure of 1,000 pounds to the square inch forces the grease into any surface crack. An alcohol wash removes all the grease except that which has penetrated into cracks. Then the metal is wrapped in the sensitive paper and stored for a week, during which the traces of radioactive matter leave their imprint on the paper.

Gun Sight Protected from Damage by Rubber Sheath

Knock your gun sight accidentally against a fence or tree and the jolt may ruin the accuracy of the rifle. If the sight is a hairbreadth out of line your aim at a target a few hundred yards away is uncertain. A rubber sheath, however, prevents any injury to the sight. It slips over the gun sight and the end of the barrel, thus keeping dirt and dust out of the barrel while it protects the sight.



Rubber guard fits over gun sight as shock absorber

Designed by the M. E. Engineers, Ltd. London England

Prepared by American & early for metals

Patent 10/14/38
Navajo

Naval Research Lab.

Har & equip protectors

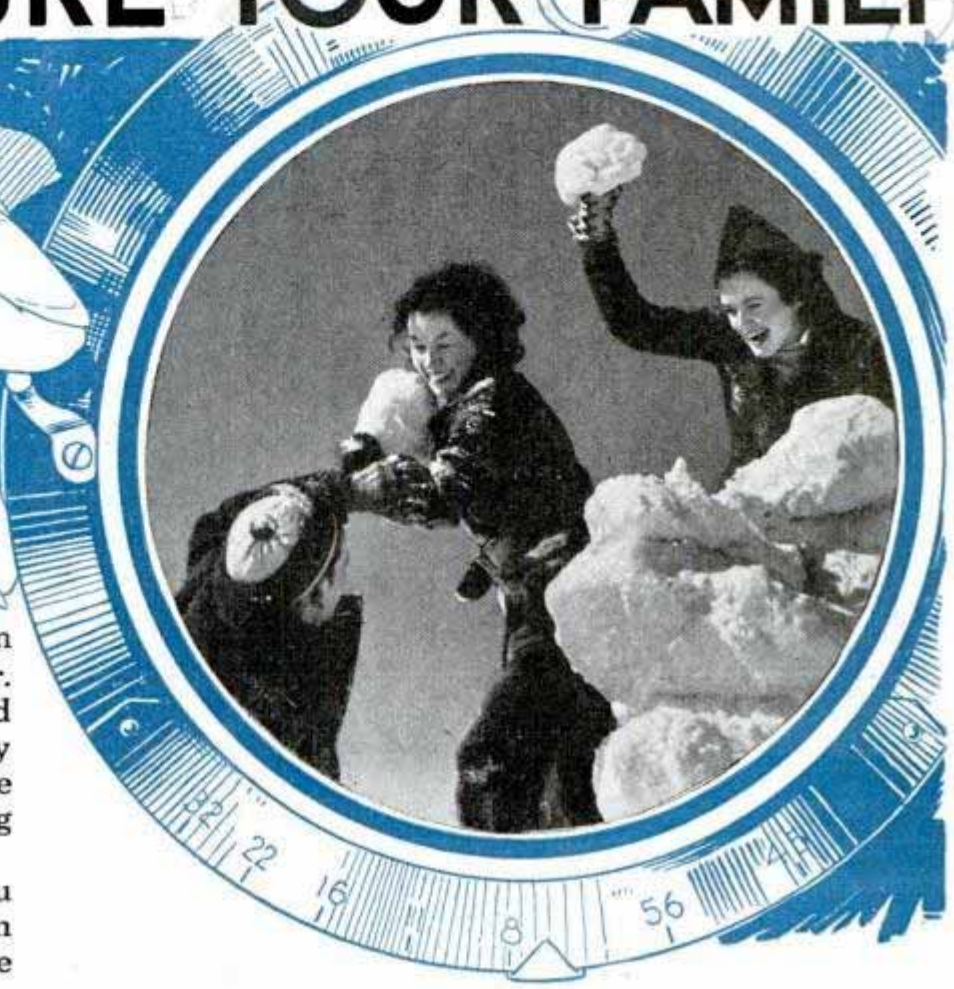
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\$1.00

Comp. ...
Edelweiss Service Bureau,
Eastman Kodak Co

PICTURE YOUR FAMILY

Rochester
ny



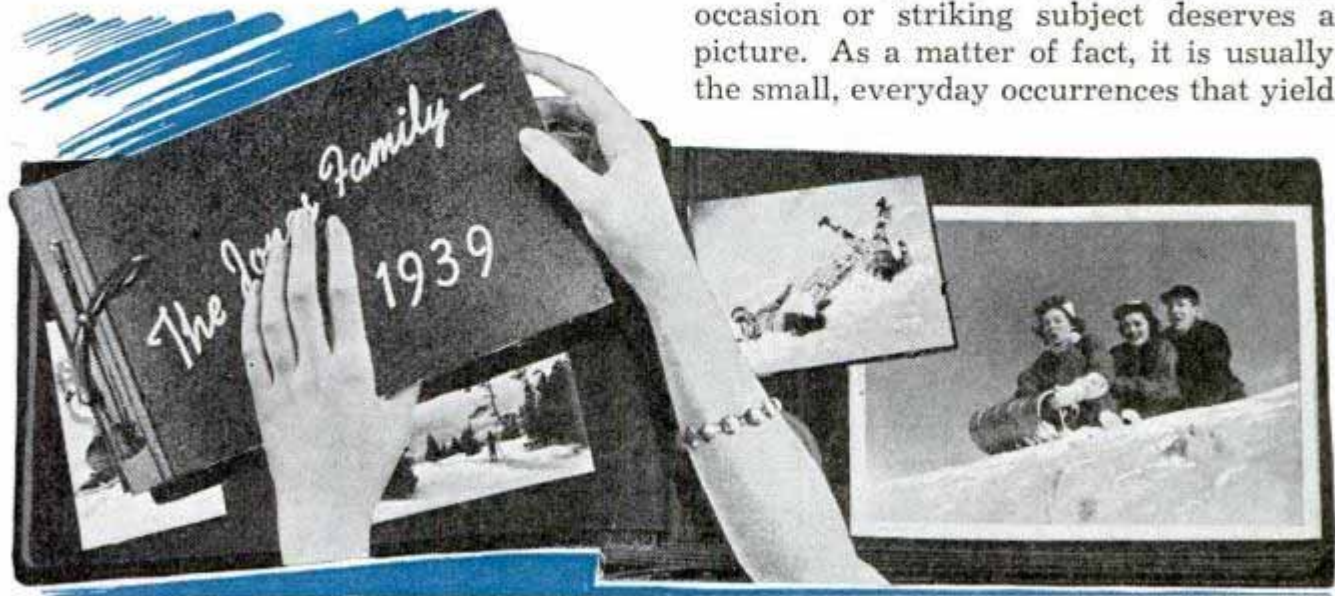
YOU had a lot of fun during the last year. Do you have any record of it now—any quick way of turning back to those good times and enjoying them again?

The chances are you haven't. Yet, if you own a camera you have the perfect means for keeping a record of all the things you do and enjoy, so that you can review them whenever you wish.

Any family should keep such a history of its good times. The results are a constant delight—not only when the pictures are viewed for the first time, but in later

years. As a person grows older, nothing is more cherished than memories, and a camera is the ideal means of crystallizing memories in enduring form.

Many people overlook the hundreds of picture opportunities that occur every year in any home, thinking only an unusual occasion or striking subject deserves a picture. As a matter of fact, it is usually the small, everyday occurrences that yield



Top, an animated "still" makes a lively entry in the pictorial annals of the family. Below, the family history book. It should be a loose-leaf album to permit additions from time to time



Baking of a historical cake is good for a series of pictures—and watch the candles grow on a cake from birthday to birthday! Silhouette, below in center, adds decorative quality to family record. And don't neglect the pets

pictures with the most appeal. A traveler can make a grand picture of towering mountains or a lofty waterfall somewhere in the west; such pictures are certainly well worth while. But a picture of your small son with pencil and paper, trying to draw circles around an inverted saucer, is far more valuable to you than the grandeur of all the mountains in the world.



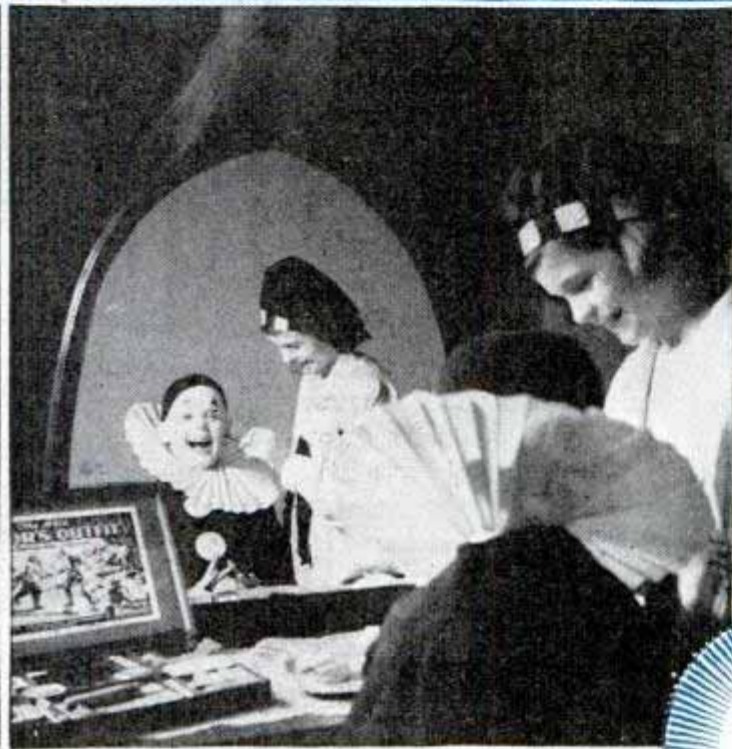
What pictures belong in your family book? Pictures of anything you want to remember, whether it be some special celebration, or the baby smiling to display a brand-new tooth. Around the home, an alert snaphooter can find picture opportunities twenty-

four hours a day, 365 days in the year. Just take down your 1939 calendar and note the special occasions: New Year's Day, Easter, Fourth of July, Christmas and the rest. Each means holiday activities. Each has a story to be told in pictures. Now, note the family birthdays and anniversaries, graduation days, the opening of school, and possibly a wedding day.

But hundreds of other occasions, not so special, are replete with picture opportunities. There are outdoor and indoor sports—baseball on the

lawn, checkers in the living-room, sleigh rides and skating parties. There are week-end trips, a summer camp, and a vacation that certainly demand ample picturing. Fishing and hunting excursions are full of picture chances.

What about pictures around the house? Homes and furnishings change, so take pictures of the rooms for comparison



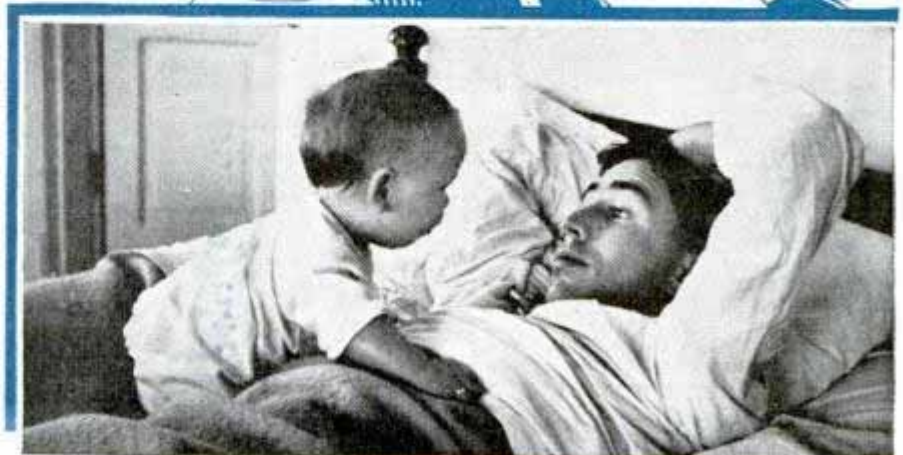
Top, the family orchestra rehearses. Don't fail to picture children dressing for a party. Drawing shows how to enlarge from movie film; below, a bedroom scene worth remembering



from year to year. Details are interesting, too; the sunny corner in the bedroom, flowers in the kitchen window. Outside, there are improvements in landscaping, new shrubs, new flagstones in the garden walk. Before-and-after pictures tell the story well, and to make it complete, catch a few in-between snaps of the actual placing of the flagstones, the planting of flowers.

There are opportunities for biography, too. Indeed, each member of the family deserves a special section of the family

(Continued to page 114A)



Cotton Runway for Airport Is Covered with Asphalt



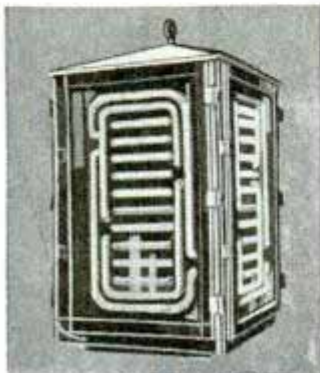
Three men unroll cotton binder on airport runway after truck lays down adhesive coating of tar

Airplanes are taking off from a cotton runway at Reilly field in Alabama. Cotton fabric was used as a binder for the surfacing. A tar preparation was first sprayed over the runway; then workmen unrolled the long "blanket" of cotton. This was covered with asphalt and then rolled smooth.

Skimming Milk Made Impossible by Crushing the Cream

Milk can be fixed so that the cream cannot be skimmed off, it has been found. The feat is accomplished by distributing the fat, which forms cream, so thoroughly through the milk that it is never able to unite. A cream-spreading machine drives fresh milk through small openings under pressure of 2,000 to 2,500 pounds, crushing the fat globules into tiny particles.

Five-Barred Neon Traffic Light Costs Less to Operate

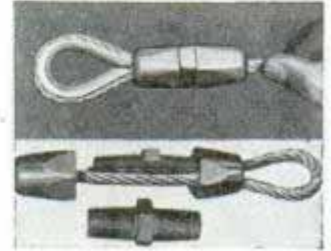


Motorists watching a five-barred traffic light know just how soon the signal will change. The bars are neon tubes which gleam through the thickest weather; when one-fifth of the time cycle has

elapsed, one of the light tubes goes out, another is extinguished after the next fifth, and so on, and the driver can always tell how long he must wait for the change to red or green.

Clamp for Splicing Wire Rope Eliminates Tedious Work

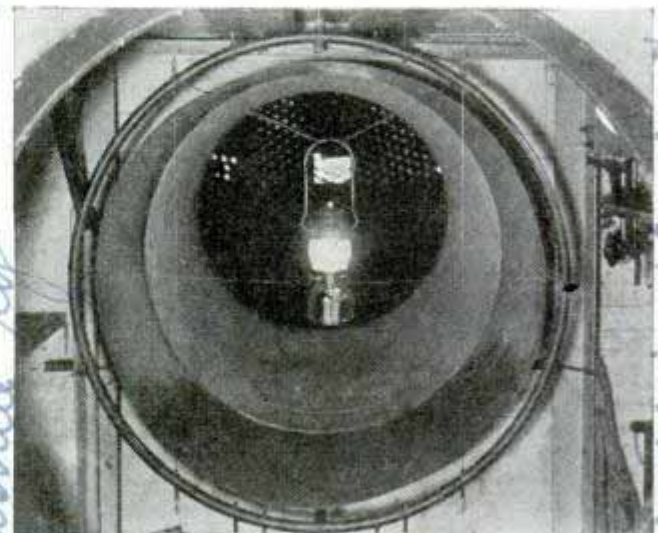
Hours of cable-splicing can be reduced to minutes of easy work by a clamp, which is available for all standard sizes of wire rope.



The necessity of calling in a skilled cable rigger is obviated, for anyone can apply the clamp. Inside the clamp are two half-sleeves which fit snugly around a section of the cable and join together to form a threaded core around the joint to be made. This core tapers slightly from the center so that the sections of cable are forced together tightly as the heavy locking nuts are screwed toward the center.

Lantern Defies a Hurricane in Wind-Tunnel Tests

Hurricane blasts exceeding 100 miles per hour were employed recently to test a pressure mantle lantern. Placed in a wind tunnel used for testing airplane parts and construction, the lantern was not extinguished by the hurricane-like wind created by the big propeller.



Lantern suspended in wind tunnel for test in hurricane blast of 100 miles per hour

Conaburg cotton see perf

Corvill University d. chava, ref

James J. Robertson

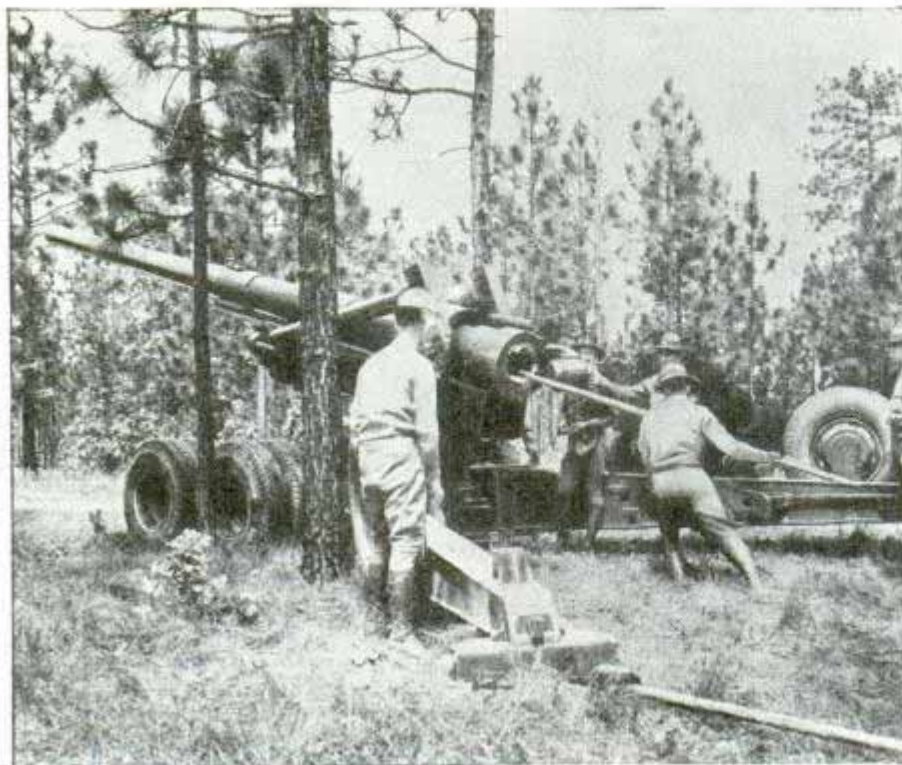
3178 Bellense to Electric, reel

12207

1226

Stare to Wichita, Lane Coleman Camp

Fifteen-Mile Field Gun Hurls Ninety-Five Pound Projectile



Official photo by U. S. Army Air Corps

chf
Big field gun being cleaned after firing ninety-five pound shell. The weapon rides on a carrier fitted with ten rubber-tired wheels

tested at Holt Wragg, N.C.
Firing a ninety-five pound shell at the rate of one a minute, the U. S. army's new 155-millimeter gun has a range of about fifteen miles. The shell reaches a height of 30,000 feet at the top of its trajectory. Complete with its heavy, ten-wheeled rubber-tired carrier, the gun weighs fifteen and one-half tons, but is towed in one load. It can be set up in firing position in thirty to forty-five minutes. Developed in the last two years, the gun is one of the few field artillery guns of purely American design.

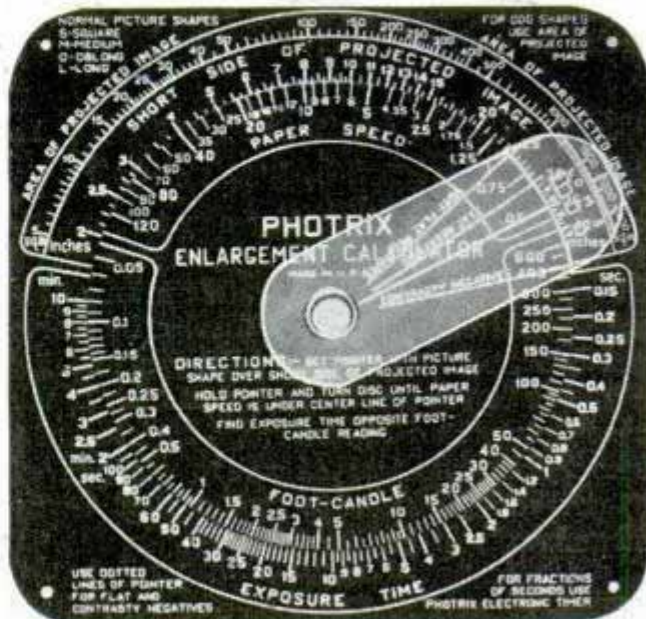
Hosiery Fiber Made from Coal Is Elastic but Strong as Steel

H 1279
From such common raw materials as coal, water and air, du Pont chemists have developed a synthetic fiber for hosiery, fabrics, bristles and plastic products. Given the name "Nylon," this fiber can be drawn into filaments as strong as steel and yet more elastic than natural fibers, fine and lustrous. It is described as the first organic textile fiber made by man from minerals. Already toothbrush bristles are being made from the new product. One of its most promising uses is in the manufacture of hosiery of extreme sheerness, elas-

ticity, strength and resistance to runs. Other possibilities are sewing thread, knit goods, racket strings, fishing lines, transparent wrapping film and clothing fabrics.

Photrix Calculator Figures Enlarging Time

H 1209
Exposure time for enlarging photos can be arrived at accurately and simply with the aid of a "slide rule" calculator just brought out. The strength of the light emerging from the enlarger lens must first be measured with a light meter, and the emulsion speed of the paper must be known. Then the calculator is put to work, figuring proper exposure time from the area, emulsion speed, and flat or contrasty quality of the negative. The picture size scale extends up to forty by sixty inches, and the exposure time scale from ten minutes down to fifteen-hundredths second.



This simple slide-rule calculator helps to find exposure time for enlarging photos

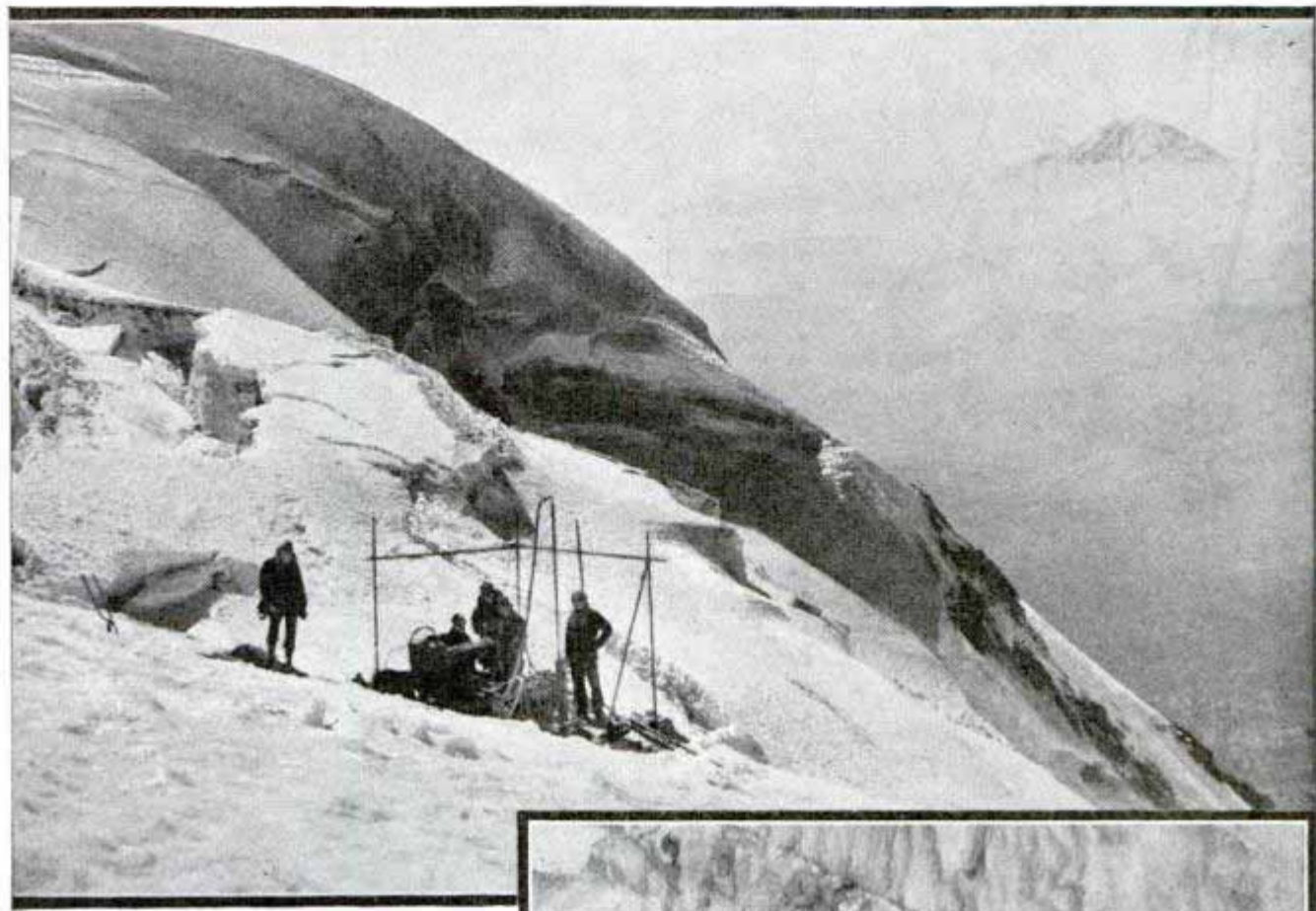
E. d. du Pont de Nemours & Co. Wilmington, Del. Nylon fiber

W. W. of other media of cloth, just...

*International
Mar. between Cuba*

Adams Island
Mount St. Helens

MINING *a* GLACIER

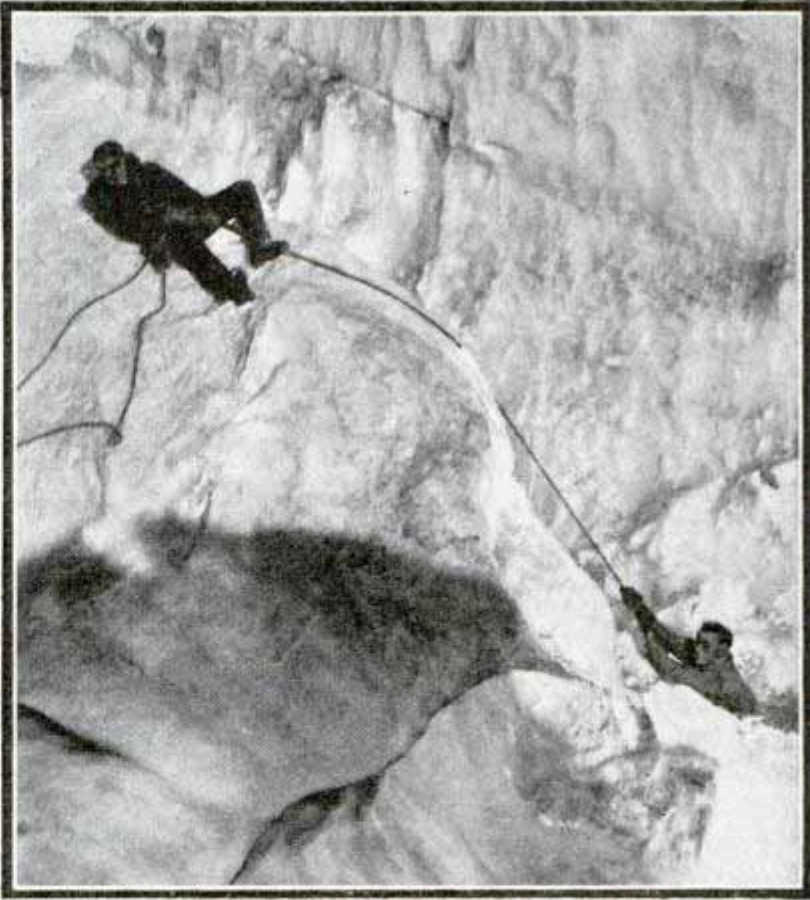


Top, drilling at lower edge of crater.
Bottom, rope taut, and nerves taut, for descent into crevasse

IT TAKES from three o'clock in the morning until noon to climb up the steep rock walls and over the treacherous glaciers to the summit of snow-capped Mount Adams in southern Washington. More than once you are tempted to give up as your lungs heave for more oxygen and your muscles cramp from cold and overexertion. When you get there, 12,307 feet above sea level, you expect to find a storm-ripped flag, and little else.

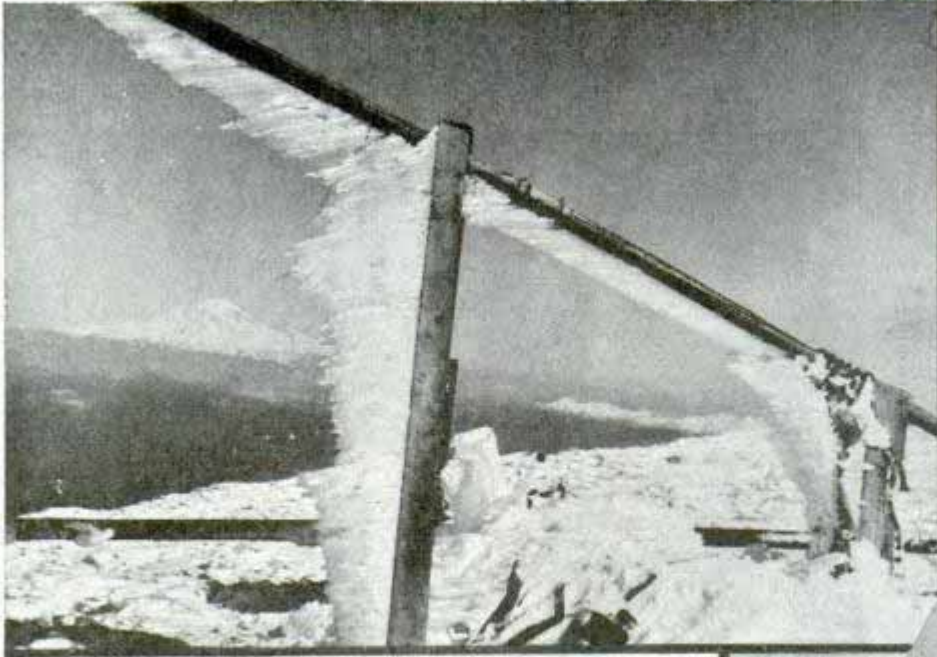
But the shriek of the wind over the last hump brings with it the whinnying of horses and the throb of a gasoline engine. Impossible as it seems, the scene on top of the Pacific Northwest's second highest mountain is one of industry.

The reason is a fortune in sulphur ice-bound in the summit crater. Blinding bliz-



zards, tremendous ice crevasses and all the dangers of Arctic-like high-altitude conditions stand between it and its market, but determined Wade H. Dean doesn't care

Cont. Harold Mansfield 9677-47th Ave. S.W.

Mount Rainier in background

Left, storm-streamlined ice on overturned drill jig. Below, a sulphur prospector goes climbing near mountaintop mine



about that. He said eight years ago that he would "lick that mountain" if it took him fifteen years, and now his goal appears within his grasp.

His crew of fur-clad prospectors has made a home on the bleak summit and between blizzards has succeeded in digging enough holes through the flinty ice to "prove up" a million-ton deposit of fifty per cent sulphur ore, more than 100,000 tons of thirty-three and one-third per cent alum (aluminum sulphate) and substantial deposits of gypsum. Now plans are being laid for a nine-mile aerial tramway to bring the ore literally out of the sky.

The Mount Adams project is considered commercially practical because of the ready Northwest market for the sulphur as a farm fertilizer and a chemical reagent used in paper mills. The gypsum may be used either as a fertilizer or in the making of plaster of paris. Alum is widely used in the purification of water, and interesting prospects for its use as a source of aluminum are being investigated.

Upon reaching the top you stand in a chilling wind and survey the unusual scene from the ice-covered roof of a little cabin which is the prospectors' headquarters. Built in 1921 as a United States Forest Service lookout station but later abandoned as impractical, the cabin is anchored with heavy cables so the wind cannot toss it over a 1,000-foot precipice just a few yards away.

The icy surface of the crater slopes slightly downward to the north—a great

white 200-acre shelf ending abruptly in the emptiness above the clouds. A black rock projection which Dean identifies as "the Pinnacle" juts skyward to the left, a remnant of the west crater rim. Where the other crater walls long since have been carried away, the ice is bent over at the edges, cracked into mighty crevasses, perched perilously before beginning its near-vertical descent in the tumultuous Adams Glacier. Beyond, in a sea of clouds, Mount Saint Helens protrudes its symmetrical white head to the left, and over more cotton carpeting on its right the defiant high summit of Mount Rainier looks deceptively close.

The Sky Mine has few visitors, but when one appears, he and Dean rope themselves together for safety to descend a steep ice



embankment to the crater's flat surface.

"Chock-full of ice," Dean shouts in the roar of the wind. "Most of the sulphur's underneath."

He points out three dark ridges of sulphur rock, each about 400 feet long and varying from 100 to 400 feet in width.



Top, oil barrel serves as bathtub. Bottom, pack train headed for the mine. Circle, pack horses and crew on the summit



"Here's South Island—it's an island in ice. . . Over there where we're going is North Ridge," Dean calls out the sulphurous landmarks. "You can see the end of

another ridge farther over to the right. That one hasn't been named. It's a bad spot—full of hydrogen sulphide gas. Some of the boys have had some mighty narrow escapes in the fumes."

The smell of sulphur is all over the mountaintop, and workmen near the source of the fumes find silver coins in their pockets tarnished in only a few hours. On one end of South Island a fumarole exhales the gas and water vapor at a tem-

(Continued to page 129A)

Giant Landplane Has Space for Forty-Two



With a passenger capacity of forty-two, one of the largest landplanes in regular service has retractable undercarriage which folds into the engine nacelles when the ship is in the air. The plane weighs twenty-one tons, has a top speed of 200 miles per hour and cruises at 160 miles an hour. Its wing span is 123 feet. The plane, Imperial Airways' new "Ensign," was built for European and Empire service.

Twenty-one ton passenger-carrying landplane in flight. Note that undercarriage has been retracted into the engine nacelles

Winch Pulls 55,000-Pound Load aboard Up-Tilted Truck

Cargoes so tremendous that they tilt the truck cab up in the air are loaded with the greatest of ease by a winch truck, the winch being geared to the truck motor. The triple-motored machine being loaded in the photograph shown here weighed 55,000 pounds. As it was pulled forward, of course, the front end settled to the ground. The winch is controlled by the driver.



This unusual photo shows front of truck tilted into air while powerful winch pulls a load of 55,000 pounds onto the truck bed

Electric Secretary Rides Along for Dictation in Plane or Automobile

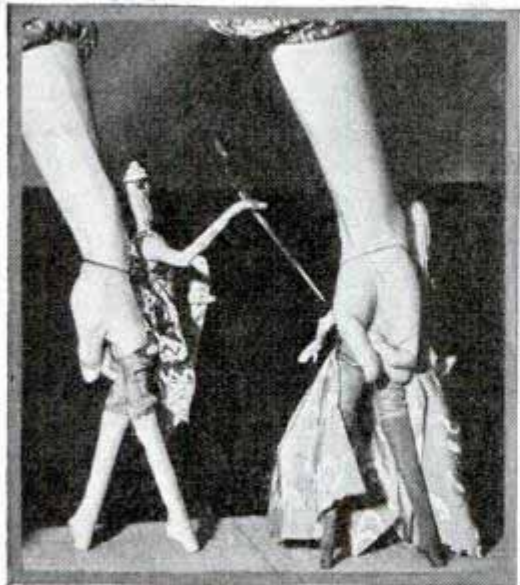


Dictating to the "electric secretary" in auto

You can take your secretary along on your next business trip by plane, train or automobile and dictate a "talking letter" that folds into an envelope and is mailed for three cents. It is an electric secretary, recording and reproducing the dictator's voice on a material so thin that ten average-size letters weigh only an ounce. The apparatus itself is about the size and weight of a portable typewriter. It can be operated by automobile batteries. The salesman or executive can dictate letters while driving his car, play the record back to himself immediately, and listen to "pep talks" received from the home office.

General Communication Products Co. Lexington, Va.
 Cont. H. Earl Gold
 207 1/2 E. Second St. Tulsa, Okla.
 Tulsa Winch Mfg. Co. 823 E. 12th St. Tulsa, Okla.
 White Motor Co. 842 E. 79th Cleveland, Ohio
 at Vine, Hollywood, Calif.

Fingertip Puppet Show Fits in Overnight Bag

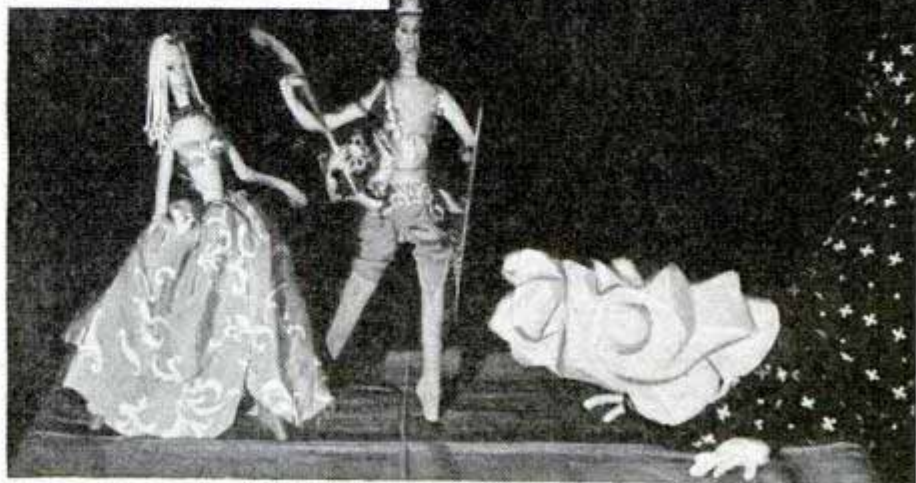


Above, "backstage" view of operator's hands with dolls on fingers ready for action. Cloth-covered pencils are used here for long legs. Right, new and old puppets demonstrated; three lower dolls are "fingertettes." Without strings, bulky stages are unnecessary



Black backdrop near table edge brings out light-costumed dolls by contrast and operator's arms, wrapped in black, are almost invisible. When room is darkened for show, ordinary battery flashlight provides spotlight effects. Operator at left is holding colored glass in front of flashlight

There are no strings to the puppet show staged by a Chicago couple. Theirs is a fingertip performance—and the whole table-top troupe fits neatly into an ordinary overnight bag. The dolls are fashioned in the usual manner, but without legs. Two holes in the lower part of the costume serve as openings for two fingers of the operator's hand, which form the marionette's legs. In the bottom picture, one operator controls two dolls at left, another controls the dragon, a cloth over the arm becoming the dragon's body



Sea-Going Postman Picks Up Floating Mailbox



Sea-going postman finds floating mailbox dropped from ship and removes the letters to be forwarded to their destinations

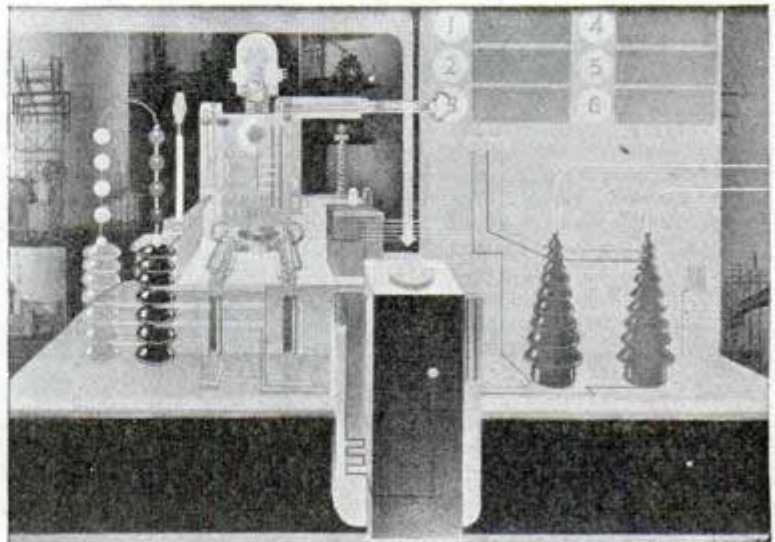
Floating mailboxes, dropped overboard by passing ships, are picked up offshore by wading postmen. The boxes are carried to shore by the tide and the mail in them is forwarded to destination. Thus ships save the time of putting into port for nothing more than mailing a few letters.

Two-Tone Tongs Handy for Darkroom

Red tongs that show white under the ruby light of the darkroom, and black tongs that stay black, are offered as an aid to the photographer to keep from mixing chemicals. Made of unbreakable plastic, acid-proof and stainproof, they are sold in pairs. The red pair is intended to be used only for handling prints in the developer solution and the black one only for the hypo solution.

Electric Robot Walks and Answers Visitors' Questions

Visitors to the Golden Gate International Exposition this year may be surprised to find an electrical robot at the information desk of a public utility company's exhibit. It will answer questions, move about and perform simple actions. You step to the information desk and dial your question to the "clerk in charge." The robot, at a microphone, tunes in by remote control and reacts to the question by giving complete information on rural electrification, family budget and other power-industry problems.



Robot ready to answer questions of visitors

H 123.6

at meadow, N.Y. are New York

H 1285
Two-Tone Tongs Handy for Darkroom
Shuckell 756
Raygram Corp. 425-4th

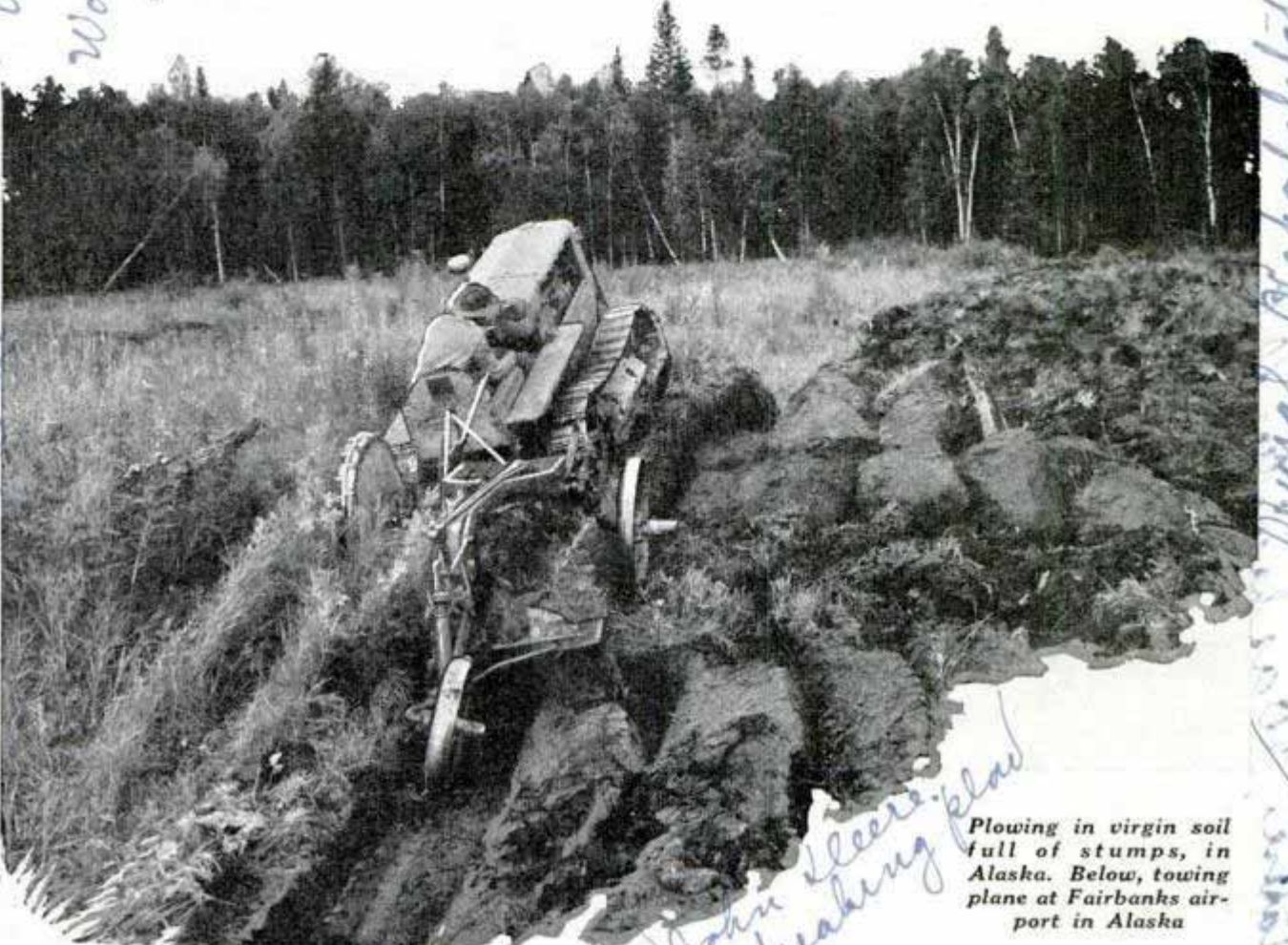
H 1263

Parke Loosand
Electric Co.

#1147
 Model # 22
 Peoria, Ill.
 Dept. of Agriculture
 Washington
 D.C.

A NEW FRONTIER

Write Aural Rehabilitation Div.



Plowing in virgin soil full of stumps, in Alaska. Below, towing plane at Fairbanks airport in Alaska

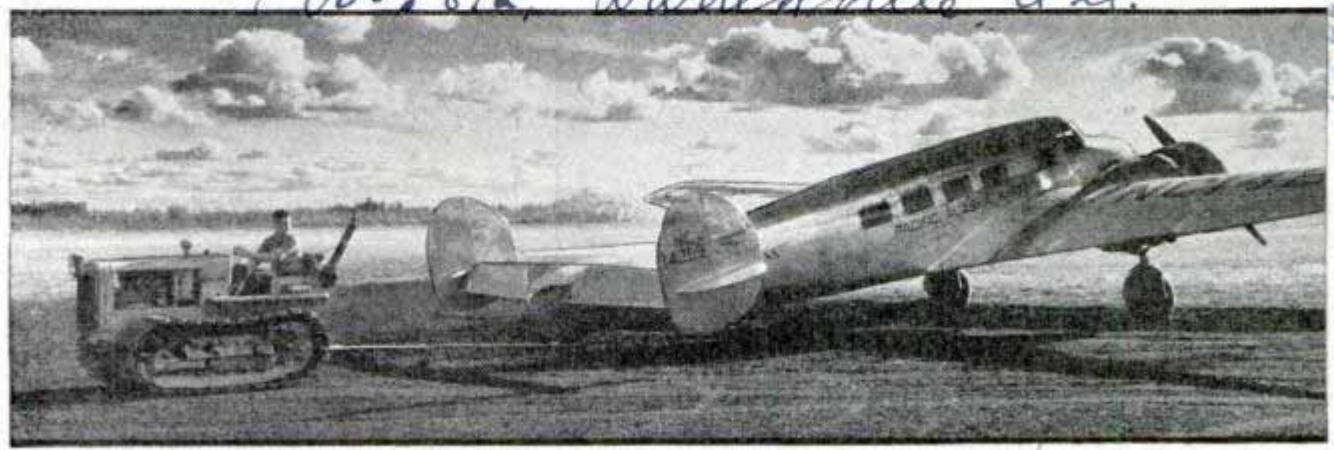
John Deere
 breaking plow

By Ruth and Bill Albee

WEST of the Mackenzie river, and stretching northwest from central British Columbia to Bering strait, lies an area half as large as the United States. Here are vast unpopulated areas containing resources of farm lands, grazing lands, timber, minerals, oil and water power, all waiting for the modern pioneer or adven-

turer to come and claim as his own. This area has as great a range of climate and almost as many opportunities as the northern half of the United States had when our forefathers settled there. Economists claim that one reason this last depression was severe was that there were no more new frontiers where the un-

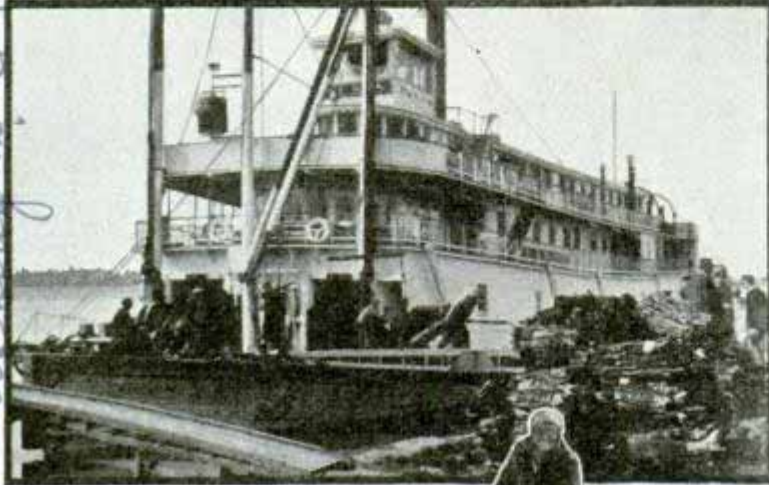
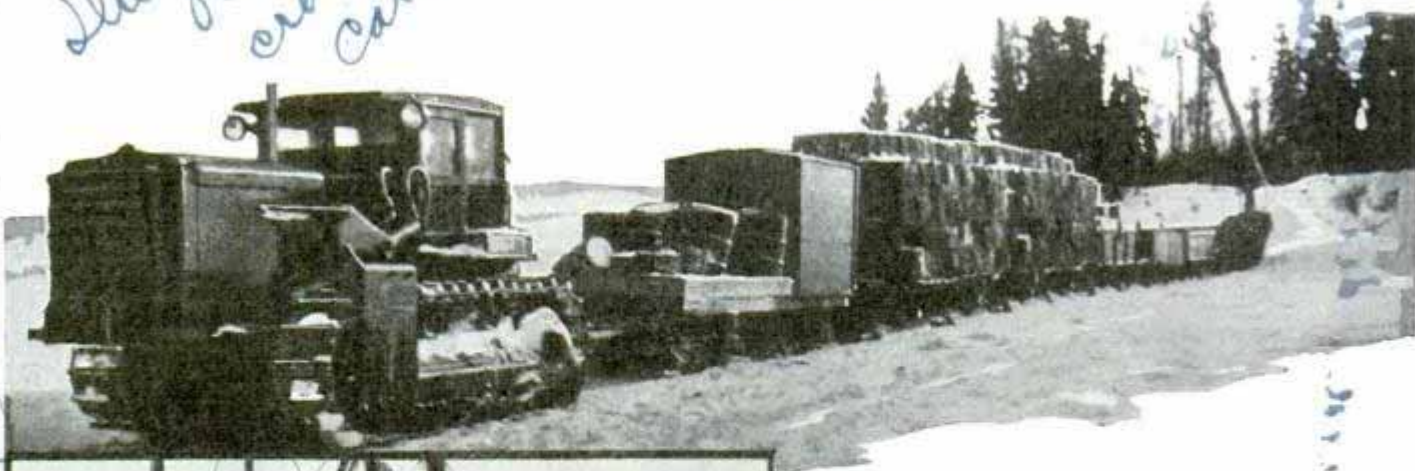
William Albee & Harry Beardsley
 Peoria, Ill.



#22

Pacific Alaskan Airways

Special Rehabilitation work
 at Fairbanks Alaska
 2604 W. Harrison
 Peoria, Ill.



Top, a northern freighter with a load of supplies. Below, unloading baled salmon at Fort Yukon, a road roller made of logs in Yukon territory, and using dogs as pack animals in summer. In winter the dogs are sled animals

employed could start life anew, acquire a "stake," and develop new sources of wealth and new markets for goods. The depression has developed in the hearts of thousands a yearning for the security and independence for which the frontier has become a symbol—a piece of land they can call their own, a shelter, however crude, against cold and storm, and the opportunity to live off the land regardless of the booms and depressions of the industrial world.

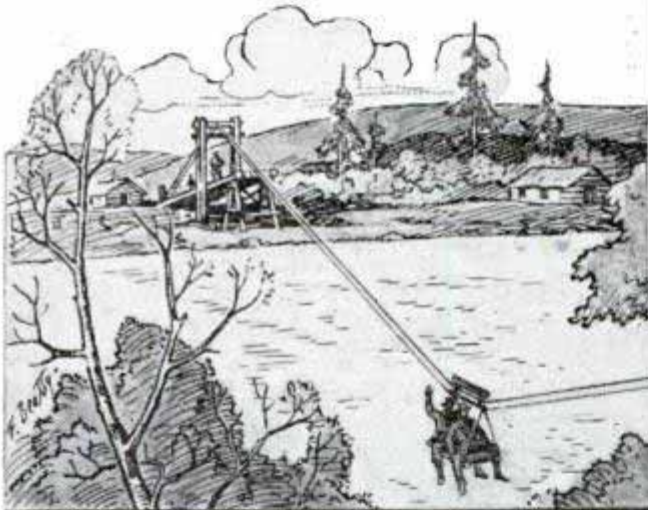
There may be no new frontiers within the geographical limits of the United States, but what of Alaska and northwestern Canada? The opportunity is there for those who really want it. Why, then, haven't more people taken advantage of it? The answer seems to be, first, the widespread misconception of the country; second, the general lack of pioneering knowledge and temperament among the younger generation.

No one wants to send a horde of tenderfeet into the "sticks." And yet it is likely that a young man or woman is in less danger out in the wilderness than in the modern city. You hear of people torn apart by grizzlies, freezing to death in blizzards, drowning in rapids, getting lost and starving in the wilds. But they are no more representative of life in the far north than the daily stories in the newspapers about shootings, kidnappings and auto accidents, are representative of life in the cities.

Fishing and trapping - Alaska, is postman / Cotechkan, Alaska
 (Alaskan Representative was hunting)

Serial
 Pilot
 crossing
 Carrol

On the edge of the frontier boys of twelve often are found doing men's work—driving dogteams, tractors, running swift rivers in poling boats, shooting moose and butchering them for the family larder. Today the pioneer has available all sorts of modern devices with which to conquer the wilderness if he has the money to buy them. The continuous-track tractor goes where there are no roads, and hauls enormous loads over snow and ice. The airplane brings the most remote localities within a few hours of civilization. The outboard motor makes possible the navigation of the swiftest and shallowest streams. The radio



connects the isolated cabins with the entire world. Gasoline lamps are common. Some northern pioneers have individual electric power plants with all the modern electrical conveniences.

Even though the average pioneer may not be able to afford these mechanical aids at first, he benefits by their mere presence. The airplane, for instance, is always available to rush a doctor or medical supplies to remote localities in emergencies, often at government expense. Actually, the ax, the rifle and a few simple tools are all that the modern pioneer needs, if he has the will to use them.

(Continued to page 149A)

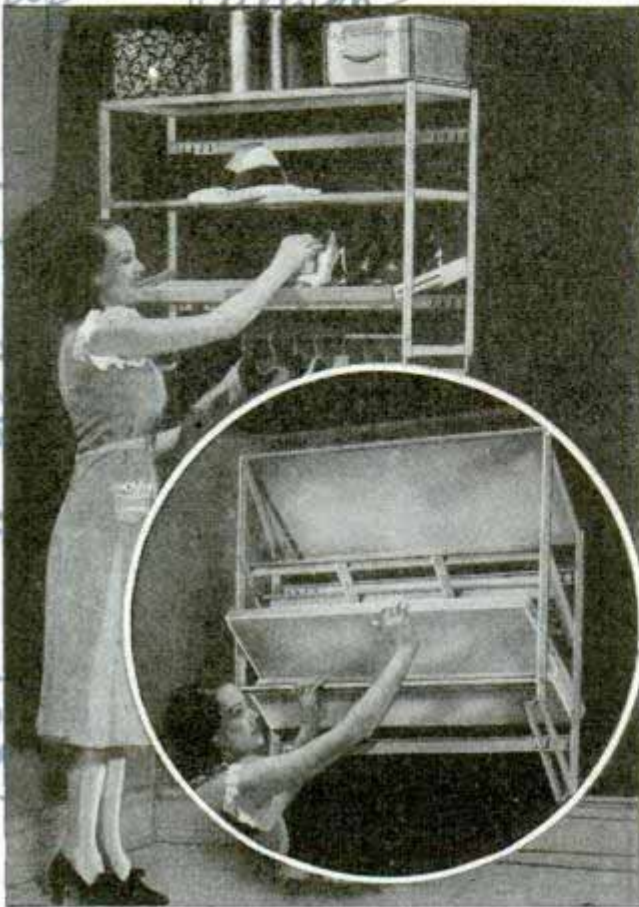
#22.
 Top, seining salmon, a major Alaskan "crop." Center, using a cableway to cross an Alaskan river. Bottom, bad roads or even lack of roads do not stop freight "trains" like this in Alaska

Owner: Frank Lee

From Peter Creek

*Kingston-on-Thames
England*

Rack for Clothes Closet Eliminates Crowding



Clothes closet rack in place. Inset, folding rack against wall of the closet

Increasing closet capacity by permitting storage of clothing more efficiently, a folding rack for home, apartment or office is on the market. Made of steel, it comes in standard lengths of two, three or four feet, or may be obtained in sizes to fit some particular closet. The rack is mounted on the wall with four screws. It provides a full-length hanger bar for coats, suits and dresses, a full-length shoe shelf, a ventilated hat shelf with dust cover, a general utility shelf and two belt and tie racks.

Flashlight Tray for Change Helps Sell Batteries



Sales of flashlight batteries multiplied when stores introduced a counter tray for change which flashes "thank you" when the

customer reaches for his money. On each side of the tray there is display room for three batteries, serving as a reminder to the customer.

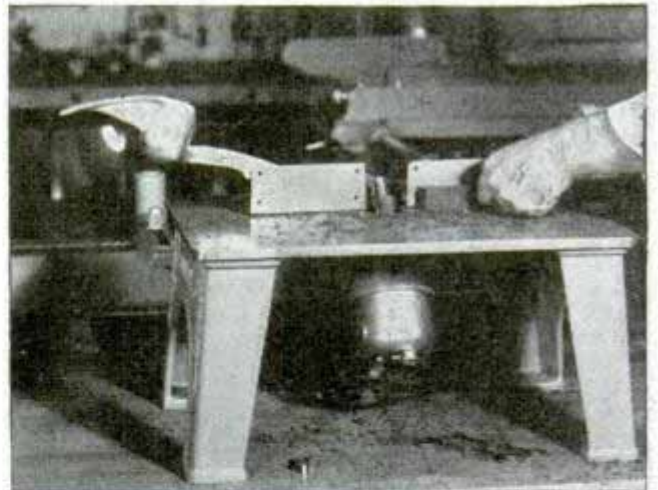
741239

Speedy Single-Seat Fighters Lead Aerial Offense

Claimed to be two of the fastest single-seat fighting planes in the world, the "Hurricane" and the "Spitfire," shown on the opposite page, are being produced in quantities for Great Britain's Royal Air Force. The "Hurricane" has a rated speed of 350 miles per hour, but has attained slightly more than 400 miles an hour in some tests. It has a liquid-cooled Rolls-Royce twelve-cylinder engine which develops 1,100 horsepower. The ship can climb to 15,000 feet in six minutes and has a service ceiling of 39,000 feet. Split flaps enable it to land at sixty miles per hour. It carries eight guns, four in each wing. The "Spitfire," an all-metal plane, is reported to have a speed of about 400 miles per hour. It also is driven by a Rolls-Royce engine.

741265

Table Shaper for the Workshop Has Tilting Motor Holder



This table shaper with tilting motor is handy for the home or professional craftsman

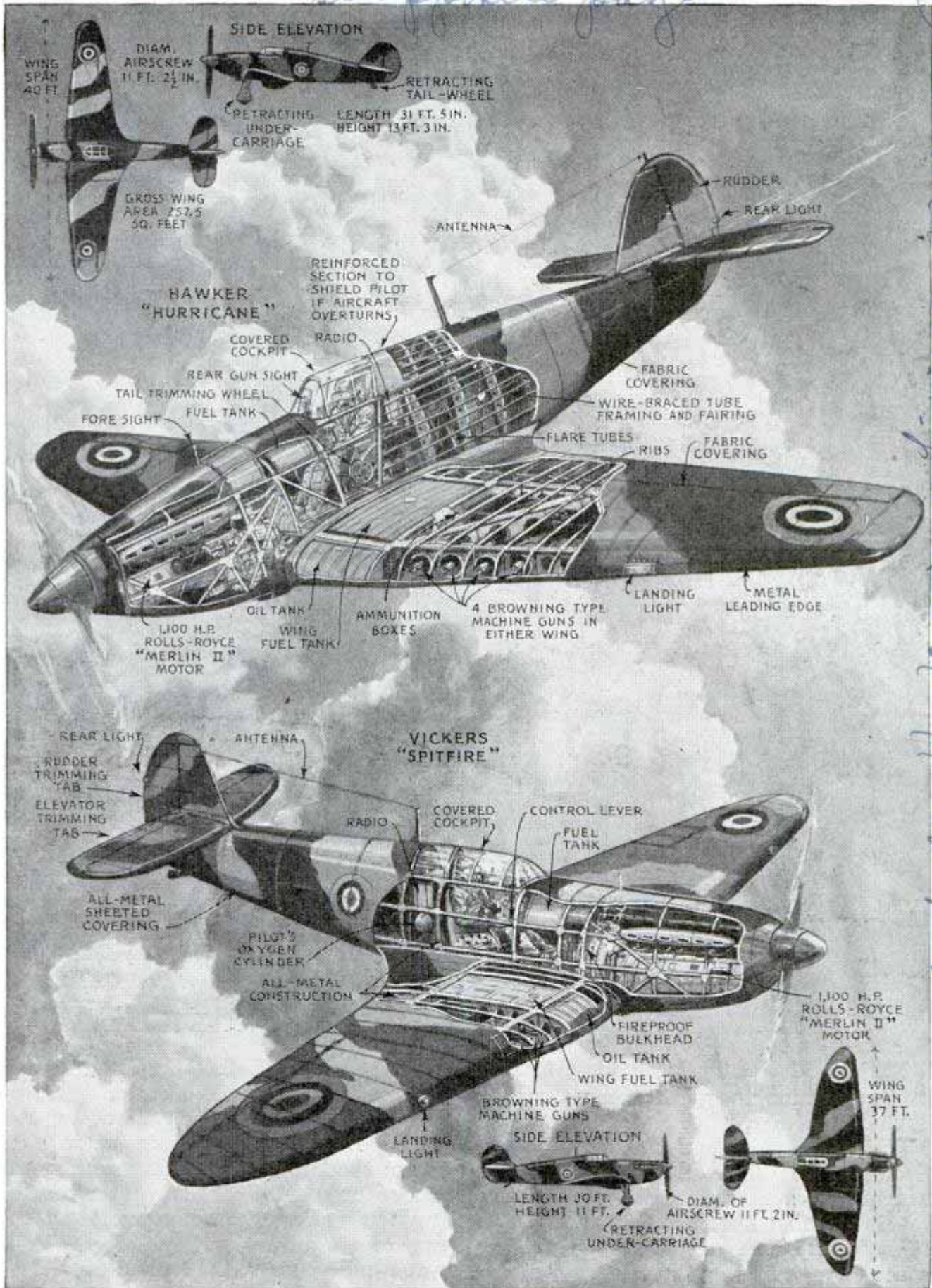
With a tilting motor holder that permits changing the angle of the motor, a table shaper can be used for tonguing and grooving, rabbeting, rounding over corners and all types of molding cuts. It has a three-eighths horsepower motor. An adjustable straight guide and a safety guard with spring tension are available for use with the shaper.

*Stanley Tools
195 Elm St*

*Vogel. Peterson C. Chevy. Chicago
H. J. Wolcott
Ray-O-Vac Co
Madison Wis
H 1217
3012*

Latest Fighting Planes Fly Six Miles a Minute

see opposite page

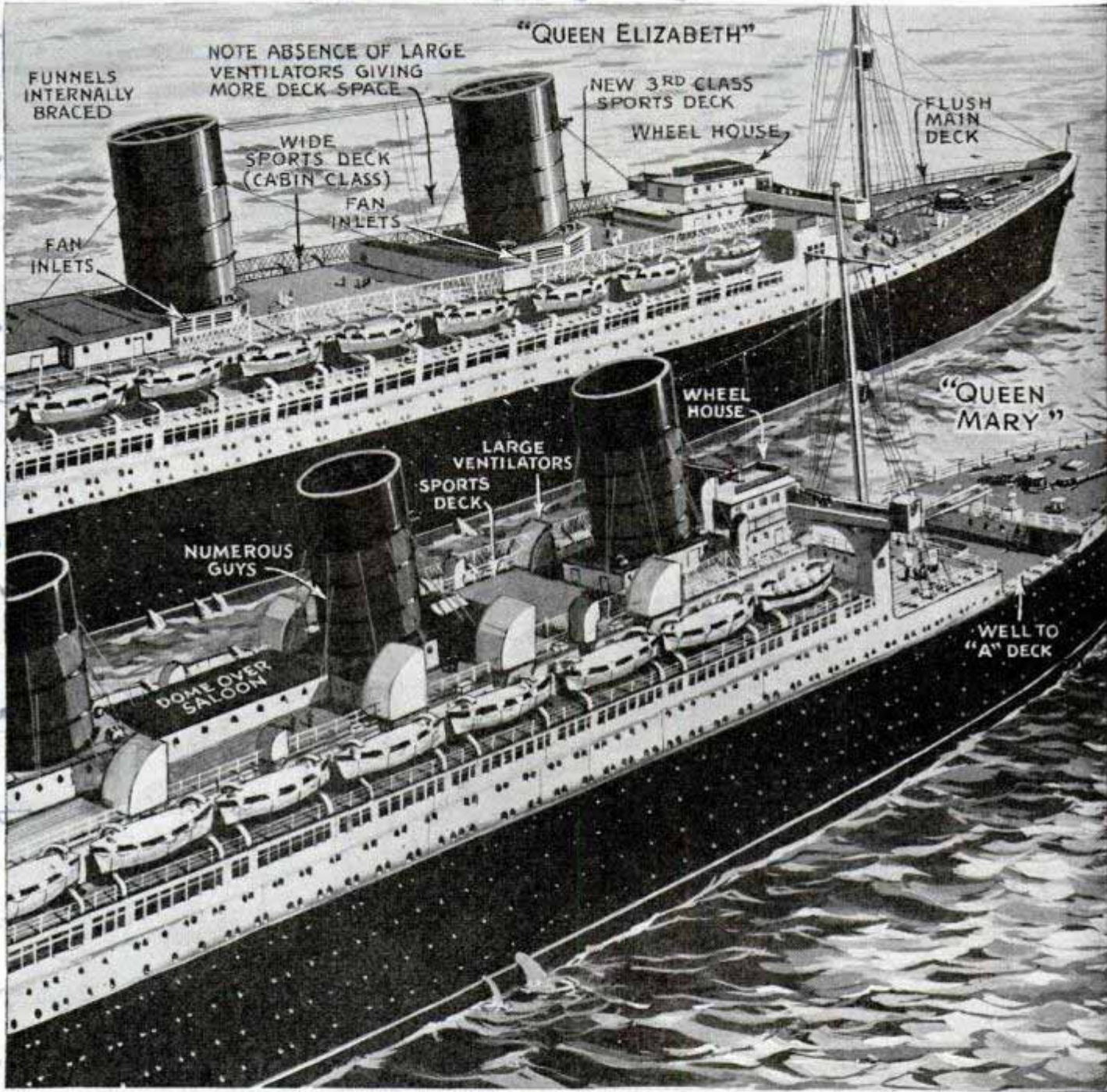


Cont. to H. Davis' 'Lemmers', 'Hellside Road', Surrey, England

Here are drawings of England's latest fighting planes, both of which are rated at speeds around six miles per minute. Note Browning-type machine guns in wings of both ships

Cont. to H. Davis' 'Lemmers', 'Hellside Road', Surrey, England

Latest Liner Is Larger than the "Queen Mary"



Outstanding in this comparison of "Queen Elizabeth" and "Queen Mary" is the vast increase in deck space. Note, in the new liner, that provision has been made for a third-class sports deck

INTRODUCING the latest ideas in ship construction, the gigantic new Cunard-White Star liner, "Queen Elizabeth," was launched recently at Clydebank, Glasgow, Scotland, and the work of fitting begun. The great passenger-carrying vessel is ten feet longer than her sister ship, the "Queen Mary," and offers considerably more deck space than either the "Queen Mary" or the big French liner, "Normandie." This is due to the absence of large ventilators and to the lowering of the main saloon's height on

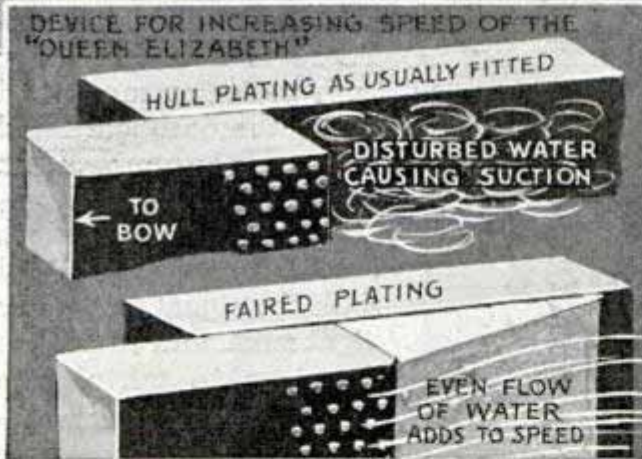
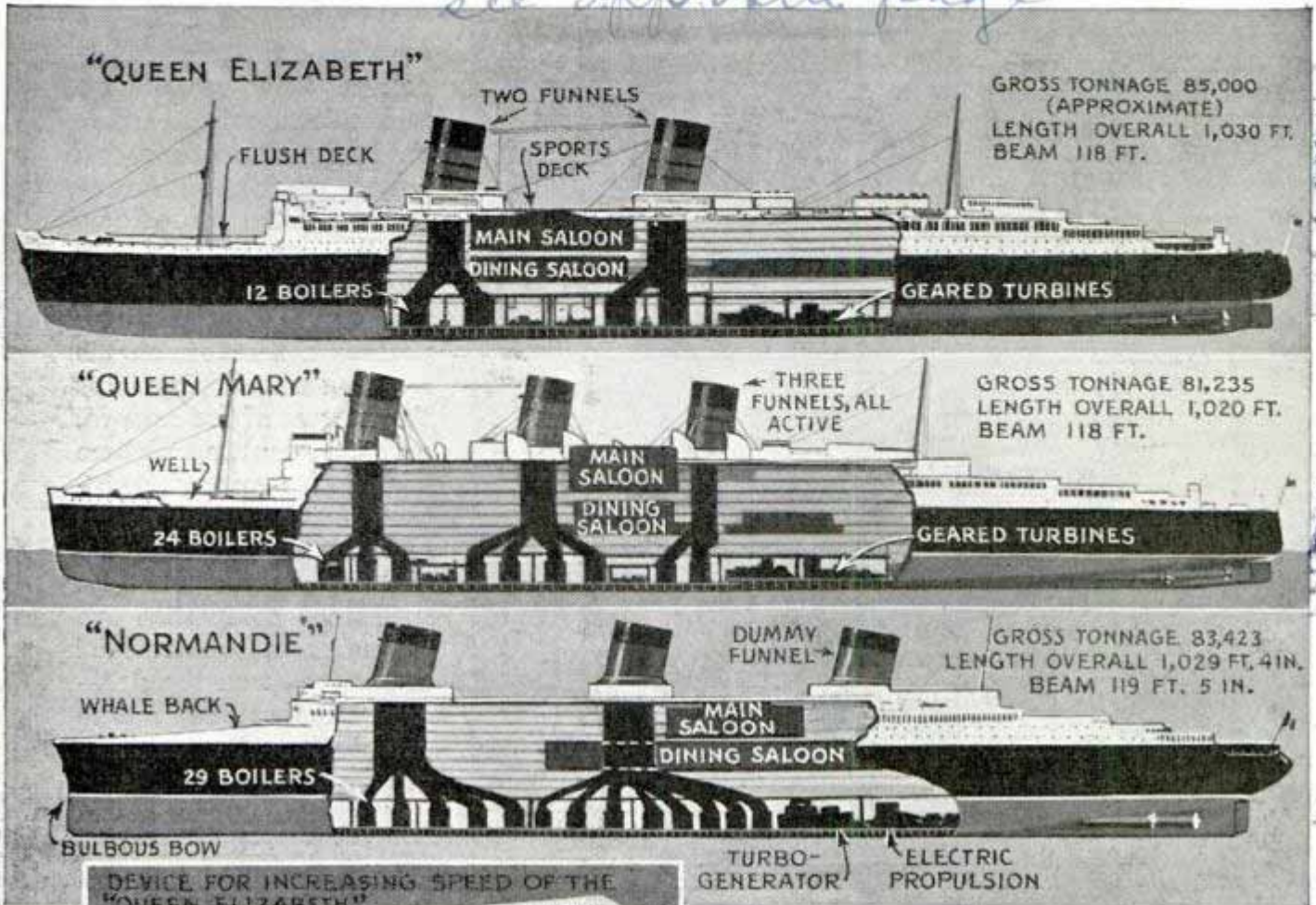
the "Queen Elizabeth." Space on deck is reserved for sports activities of first, second and even third class passengers. Reducing the height of the main saloon eliminates the necessity for interrupting the run of the sports deck, as was the case on the "Queen Mary." Another feature of the new ocean queen is the use of very large water-tube boilers, the largest ever fitted into a ship. They are so large that they could not be lowered into the vessel in one piece, as is usually done, but had to be

Built at Shipyard of John Brown & Co. Ltd., Glasgow, Scotland

Sumner, Hillside Road, Ewell, Surrey, England.

Queen Elizabeth is 10 feet longer than the Queen Mary.

Giant Boilers to Drive the "Queen Elizabeth"



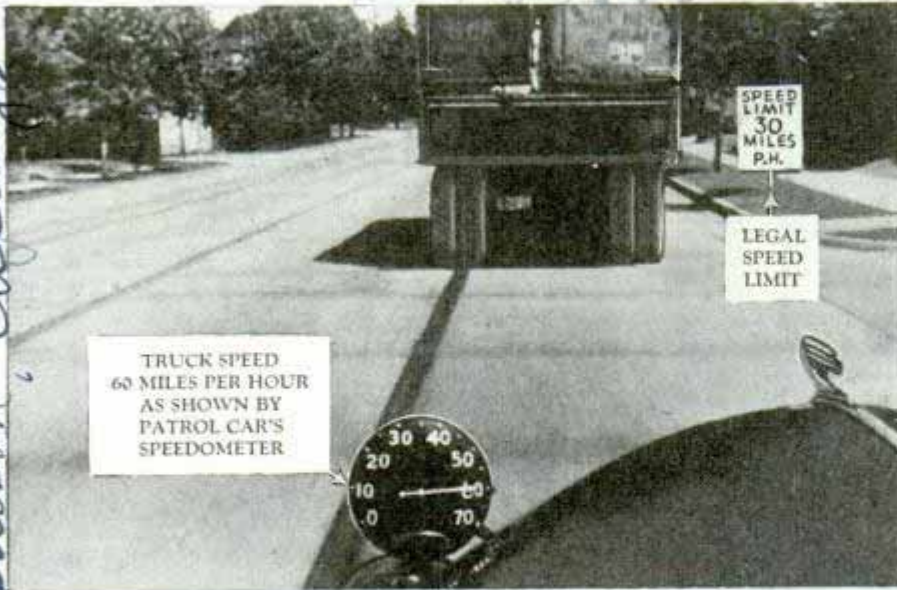
made in sections and then fitted together in the boiler rooms. The boilers are in four stokeholds, making it possible to fit only two funnels. The "Queen Elizabeth" has finer lines forward than the "Queen Mary," with a greater rake to the bow. When it was found that very little water came aboard over the bows of the "Queen Mary" in a gale, for which she was provided with a well, this type of construction was eliminated in the "Queen Elizabeth" and the main deck was carried forward flush to the stem. Still another feature is the provision of expansion joints to take the strain off

Above, note difference in number of boilers in each ship. Left, fair plating gives new liner more speed

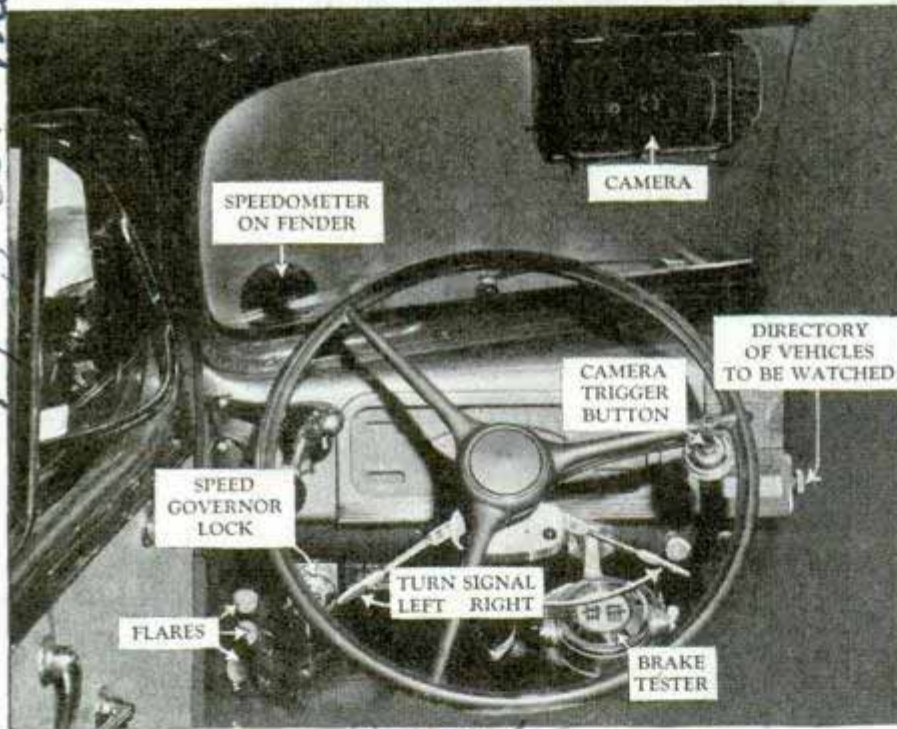
the lighter metal of the superstructure when the ship is "hogging" and "sagging" in heavy weather. To decrease skin friction and "drag," all the underwater plating has been faired, producing an increase in speed without adding to the power plant. The "Queen Elizabeth" has only twelve boilers, compared to twenty-four in the "Queen Mary" and twenty-nine in the "Normandie." Her tonnage, approximately 85,000 tons, is larger than either of the other two vessels, the "Queen Mary" having 81,235 tons and the "Normandie" 83,423 tons. Thus the new ship will offer large cargo space. Instead of big ventilators that robbed passengers of deck space, the "Queen Elizabeth" has fan inlets through which air is drawn to ventilate all parts of the ship. The inlets are located inconspicuously around the funnels at deck level. Another deck-clearing device on the new liner is bracing of funnels internally, eliminating numerous guy wires, such as are found on the "Queen Mary."

Windshield Camera Snaps Speeder with Proof

maker - Traffic - I am going to submit at national safety congress 1933 W. Madison, Chicago



By mounting a speedometer on the front fender and a camera on the windshield, police or private investigators can collect photographic evidence against speeders. As the car trails a law violator on the highway, the pursuing driver presses a button on his steering wheel. This trips the shutter of the camera, and the resulting picture shows the speed registered on the meter at the moment, the car ahead and its license number. Insurance companies are using this method of checking up on the drivers of insured cars. One private investigator's car outfitted with this "candid" camera carries also a variety of safety devices and test instruments. There is a brake tester with indicator mounted below the dashboard and a speed governor lock which helps in checking speed violators. Levers below the steering wheel flash the signal for left or right turn, and there is a directory to which the driver can refer for numbers of cars to be watched.



Top, picture snapped by windshield camera shows speedometer, speed limit sign and truck violating law. Below, "cockpit" of investigator's car

Typewriter Sends on Telephone to Telegraphic Printer

Newspaper reporters covering a news event in the field may soon be able to typewrite their stories and transmit them simultaneously to the city editor over telephone wires. A simple telegraph printing system which has just been patented makes possible the use of the telephone instead of the private leased wires such as carry the news of the great press associations today. Thus the cost of transmission can be cut to the mere tolls the telephone company would charge for a local or long-

distance call for the actual time the line was kept busy. The invention is that of W. G. H. Finch, formerly assistant chief engineer of the Federal Communications Commission. The transmitting device is a special typewriter keyboard which may be carried by the reporter or any field worker requiring portable telegraphic printing facilities, and is operated from the nearest telephone. It feeds its signals into the telephone line by electrical induction without actually touching the wire.

Science Service 10/27/38

Pat. # 2,133,811 Finch Telecommunications Laboratory 37 W. 57 St

*Electric Co. 12818 Cort Road
Cleveland Ohio.*

Nickel-Lined Cargo Ship Built Like Submarine



Resembling a submersible ship, the "Dolomite IV" is really a tanker plying the Great Lakes and Atlantic. By steam-cleaning its nickel-lined hold it can change cargo overnight from molasses or kerosene to grain

More like a submarine in appearance than the traditional freight steamers of the Great Lakes, a Diesel-powered cargo ship made her maiden voyage recently with 1,200,000 gallons of kerosene in her nickel-lined hold, unloaded her cargo and took on a load of wheat in the same tanks the next day. The entire ship was welded. The hull was made of electrically welded steel channels bent to form the main structure, and this entailed no less than forty miles of welding. The five cargo tanks were lined with sheet nickel welded to the frame, and

at the seams. The nickel lining permits shipment of corrosives in bulk, and immediate changeover from oil or other liquid cargo to grain, for the tank walls are rapidly cleaned by means of steam jets. In regular service on the lakes and between Atlantic and gulf ports, the ship named "Dolomite IV" is intended to carry kerosene, wheat, molasses, lye, oil and other products. The vessel never was actually launched. Built in a dry spur of the old Erie canal, the "Dolomite" was floated by siphoning water into the lock.

Lighted Film Viewer Magnifies Negative for Inspection

Lighted from beneath, a desk-type film viewer has a magnifying lens at the top to enlarge the image for close inspection. An entire strip of negatives can be drawn through the tunnel from side to side for examination. Since the film need not touch any part of the viewer, there is no danger of scratching it. The light plugs in on the house electric circuit.



Examining a strip of film under magnifying glass

Mop with Wringer Attached Is Dried by Twisting Key



Attached to a new household mop is a wringer of its own. A few simple twists of a key winds the mop tight and squeezes it practically dry. Metal parts are cadmium-plated.

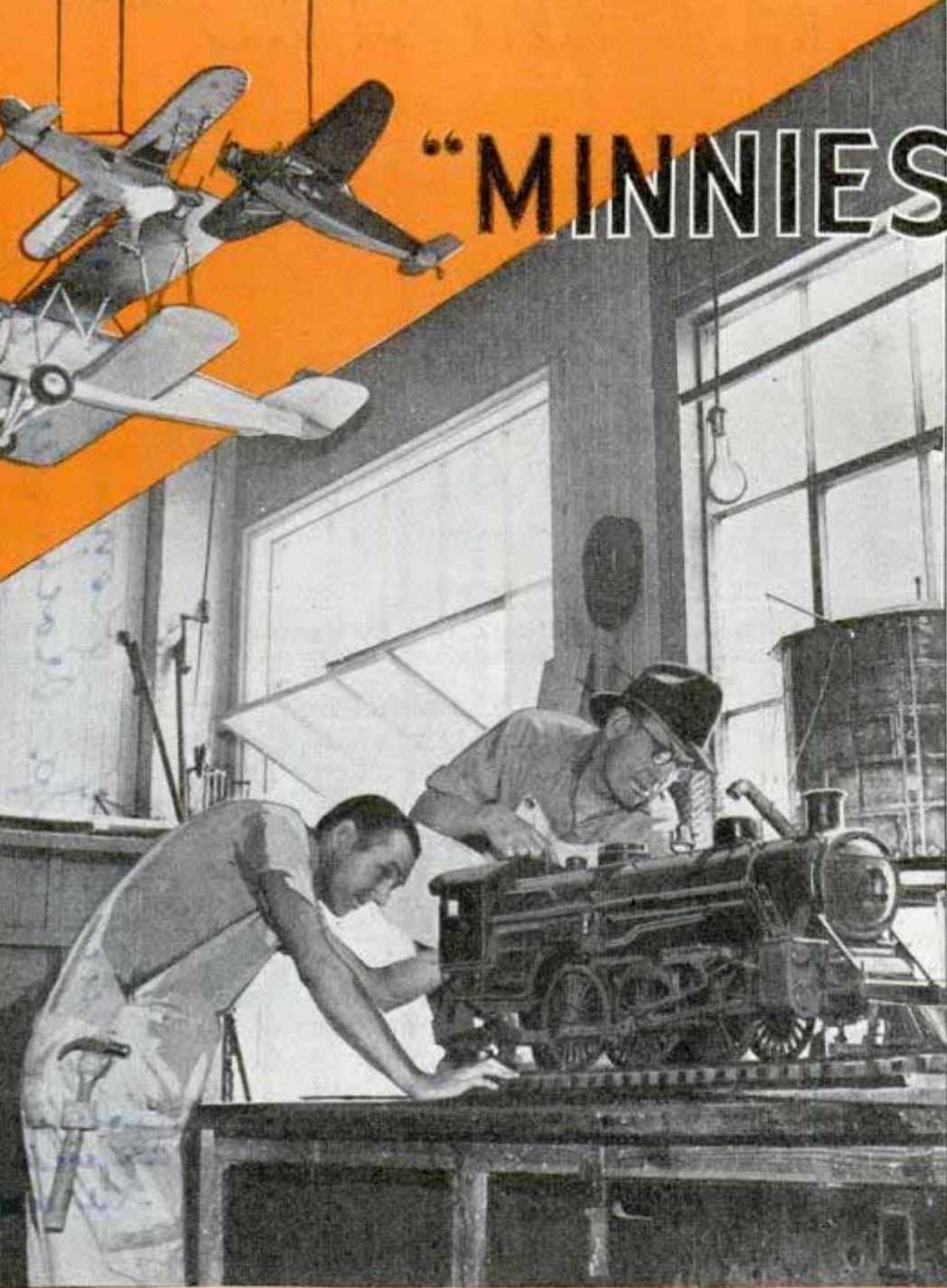
H1183 Quick Lube. \$1.00 up.

*Quick Lube Mop Co.
1523*

Dolomite name built by Dolomite name

*Examining a strip of film under magnifying glass
Dausch & Lomb
Optical Co.*

"MINNIES" Supply



boats and the prow of the ship buried deep in a plaster iceberg that extends to the ceiling. By means of hydraulic jacks, the entire set is tipped to simulate the natural list of a ship. The davits holding the lifeboats are operated by electric winches and with passengers scurrying around in a terrified manner, the commands of the crew blending with distress cries, the crunching of ice on the deck—all amid an overhanging fog—the scene is vested with startling realism.

The actual collision is effected by means of miniatures and the process screen. First, the iceberg is built so it sticks a foot or two above water in a studio tank and is filmed by a camera moving toward it at a speed com-



Top, miniature builders preparing train for movie. Bottom, models of principal sets in "The Adventures of Robin Hood" were used to plan action and determine camera angles before the full-size set was constructed.

ON THE theater's screen, an ocean liner is plowing through a choppy sea. Suddenly, an iceberg appears. A crash is inevitable and there is the crunch of steel against ice, then a grim picturization of tragedy on the high seas.

Engrossed in the story, you do not question the realism of the scene. But afterwards, perhaps, you wonder how such an effect was attained. Filming such a sequence, you know, would be impossible, even though you disregarded the sheer impracticability of it.

The answer lies, partly at least, in miniatures.

In order to weave this action into a film, a slice of an ocean greyhound is built on the sound stage, showing life-

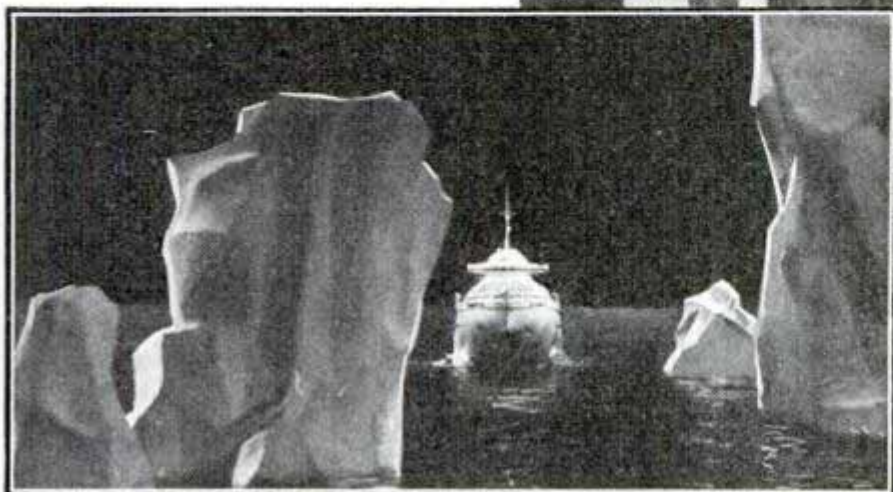
Ent. James Mc Queeny
 439 W. 60 St. Toledo
 Kansas City, Mo

PUNCH TO MOVIES

parable to the speed of the liner.

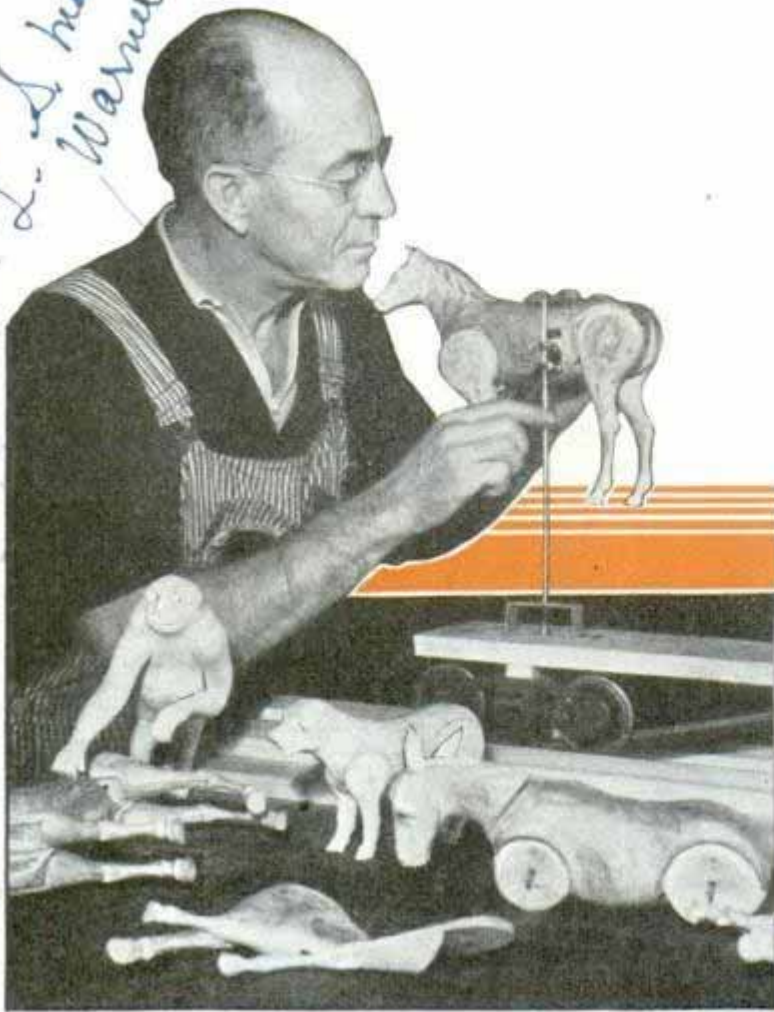
After the life-sized prow has been constructed, a process screen is placed in front of it. On the bridge are stationed two men looking into the transparency as if they were trying to catch a glimpse of an iceberg in the fog. As soon as the first glimpse of the iceberg flashes onto the screen, action on ship-board starts, carrying out the illusion that the ship has ripped into the mass of ice.

This is but one example of the way in which miniatures are being used on the screen. When stage-coaches go over cliffs, don't weep for the horses going to their doom. They're only miniatures. If a submarine is split asunder, a city burned to the ground, or a native village swept away by a hurricane, it's usually more of the same. War films of land and sea, and usually, the air, would be pretty tame affairs if it



Top, preparing inflated figure for "A Midsummer Night's Dream." Bottom, model of modernistic ocean liner used in the film, "The Big Broadcast of 1938"

R. Beresford, Jerequino expert and inventor of the model



In "Submarine D-1," the submarine comes to the surface in the path of a gunboat and the latter rams into its side. Slowly the submarine sinks. A shadow appears on the water and then fades away—the submarine is on its way to the floor of the sea. Expert engineering skill and \$25,000 worth of labor and materials went into a twenty-five-foot submarine controlled from an electric panel on a barge. Under the direction of James Gibbons, Warner's No. 1 special effects man, studio workers produced a working model. Nine one-horsepower motors furnished its power and there were ingenious mechanisms for guiding and submerging it. This plant was in a sealed section and the rest of the underwater boat was so arranged that it would sink in a credible manner. Near the prow

weren't for "minnies" and that goes double for pictures featuring mine blasts as was the case in "Black Fury" and the earthquake in "San Francisco."

Four square miles of buildings were burned and \$2,000,000 went up in the smoke of the great Chicago fire of 1871. Translating this catastrophe to the screen was done with a huge miniature of the city and lake front as it looked at the time.

Covering four acres of ground and costing \$25,000 to build, the model provided for many spectacular effects, including the illusion of huge clouds of gas bursting into flames hundreds of feet above the main blaze; iron girders melting and a river ablaze with burning oil.

For long shots, direct views of the conflagration were spliced directly into the film as part of the running action. These were only momentary flashes, however, as the film makers will not run the risk of having a miniature detected by keeping it too long on the screen. Other angles made of the burning city were projected on a transparency before which the actors performed and the whole re-shot.



Top, building animation into animal carvings. Center, model plane built for film of crash into mountain. Below it is racing plane resting on plaster mountain. Bottom, miniature plane before crash

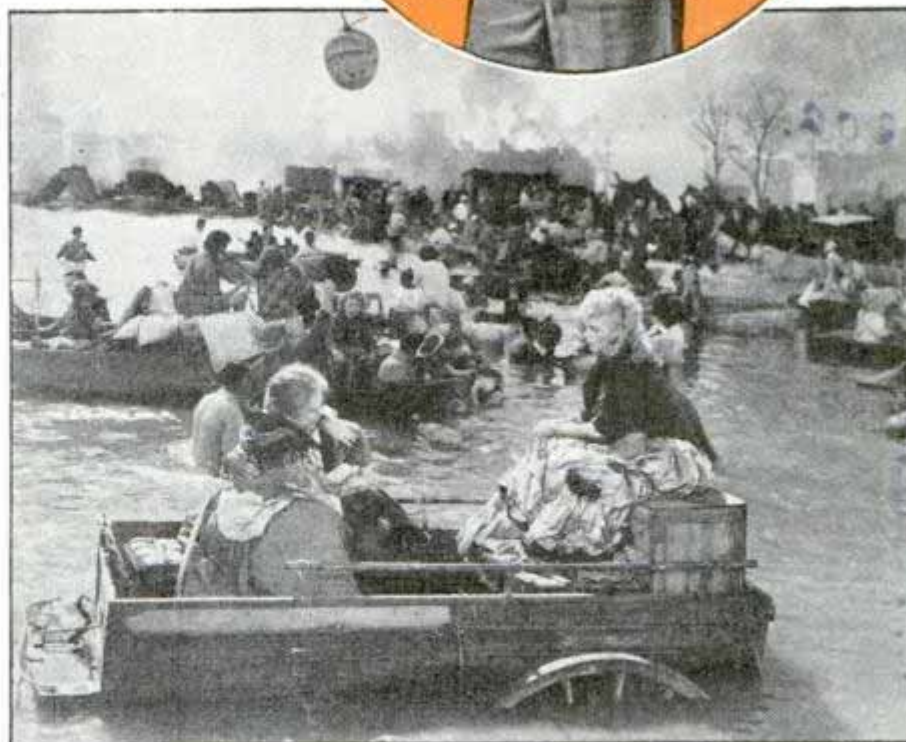
was placed a breakaway plate, a section that would remain airtight while the boat was in operation but which would buckle as soon as the cruiser plowed into it. So perfectly did the costly toy function that an underwater camera made an excellent record of the craft as it sank to its grave.

The effect produced in a miniature is heightened by the completeness of the supplementary close-ups. A recent film called for the wreck of a crack train. Engines were built in the studio shops and the long shots turned out without any trouble. For realistic close-ups a string of Pullman cars were routed into a large shed converted into a sound stage, jacked up and tipped over one another with their trucks being pulled at right angles across the tracks after having been dismantled. Rails were uprooted and twisted; steam pipes were laid from boilers to points where coupling and hose connections would naturally be broken. This escaping vapor, together with the mud-splattered passengers, the first-aid crews, and trainmen gave the scene the proper authenticity.

A miniature is so built that it may be filmed from many different angles and not infrequently does it provide background for dozens of scenes. Generally, they are built one-forty-eighth the size of original objects.

When whole cities are built, as is frequently done, they are complete with pedestrians, motor cars, surface and elevated cars, signal lights and other bits of animation that are found in the metropolitan city.

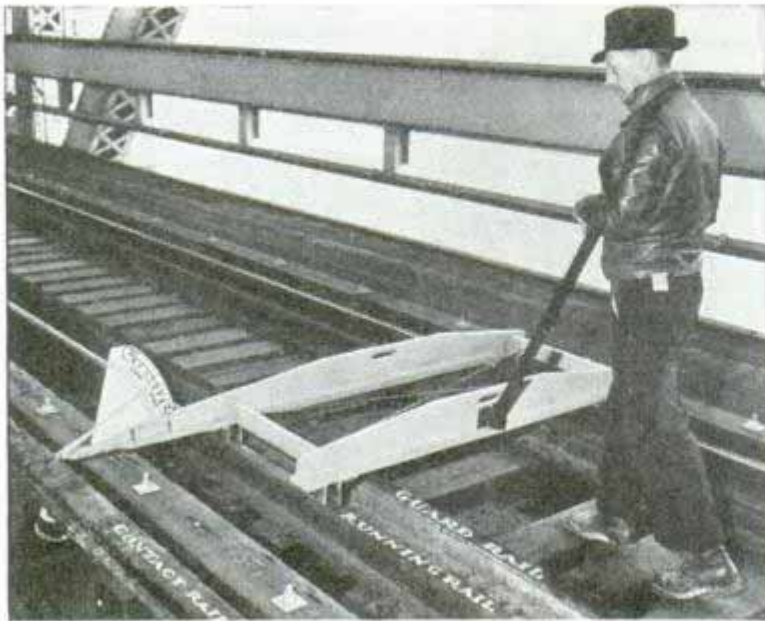
The most elaborate of
(Continued to page 116A)



Top, scene from "King Kong," a triumph for the miniature builders. Center, model transport being strung on guide wire for action in film. Bottom, burning of Chicago in movie, "In Old Chicago"

Handwritten signature or note in blue ink at the bottom right of the page.

Gauge Checks Rail Alinement for a Hundredth-Inch Error



Inspector pushes gauge along interurban track of San Francisco Bay bridge and watches dial showing alinement of three rails

Variations as small as one-hundredth of an inch in alinement of rails can be detected by a gauge used on the third-rail line crossing the San Francisco-Oakland Bay bridge. Pushing the five-wheeled gauge along the track, the inspector watches a dial and measures the elevation of the third rail as fast as he can walk. The gauge at once checks the alinement of the running rail, height of the protection timber above the third rail and the horizontal distance from rail to timber, and the height of third rail above running rail.

Pocket-Size Explosion Meter Tests Combustible Gas



Concentration of combustible gases in the air can be measured with a pocket-size explosion meter which gives an instant reading. A single control knob turns the instrument on or off and adjusts its balanced electrical circuit. The sample of air to be tested is drawn in by a piston-type pump and flows over a hot platinum detector filament

which forms part of a balanced circuit. Combustion of gases on the surface of this filament increases the temperature of the wire and unbalances the circuit, causing a deflection of the needle on the dial. The meter weighs less than three pounds.

Sculptor Models Concrete for Fun as Well as Profit

After working with concrete for thirty-five years, a Wooster, Ohio, man turned to modeling in concrete as a hobby. Some of his sculpture is marketable, some is done purely for fun. A miniature dinosaur was built for display at a gasoline station. One of his most ambitious projects in concrete was a tiny amusement park on a table top. It included fountains, a lake to hold several small fish, a lighthouse and numerous animals, one of them a monkey on a tightrope. Other products of his hobby include a concrete mailbox and various garden decorations, such as animals, frogs and toadstools.



Dinosaur sculptured in concrete becomes an attraction at a gasoline filling station

Designed by L. V. Cantrell, State Inspected.
Designed by L. V. Cantrell, State Inspected.
Mine Safety Appliances Co. Broadway, Thomas and Meade
Pittsburgh, Pa.

#1202.

\$65.00

M. S. A. Explosion Meter

#1177

William A. Stein
318 W. Vine.

Sperry Mag. Brooklyn NY
Automatic Direction Finder Is Aid to Pilot
William R. ... American Airlines pilot

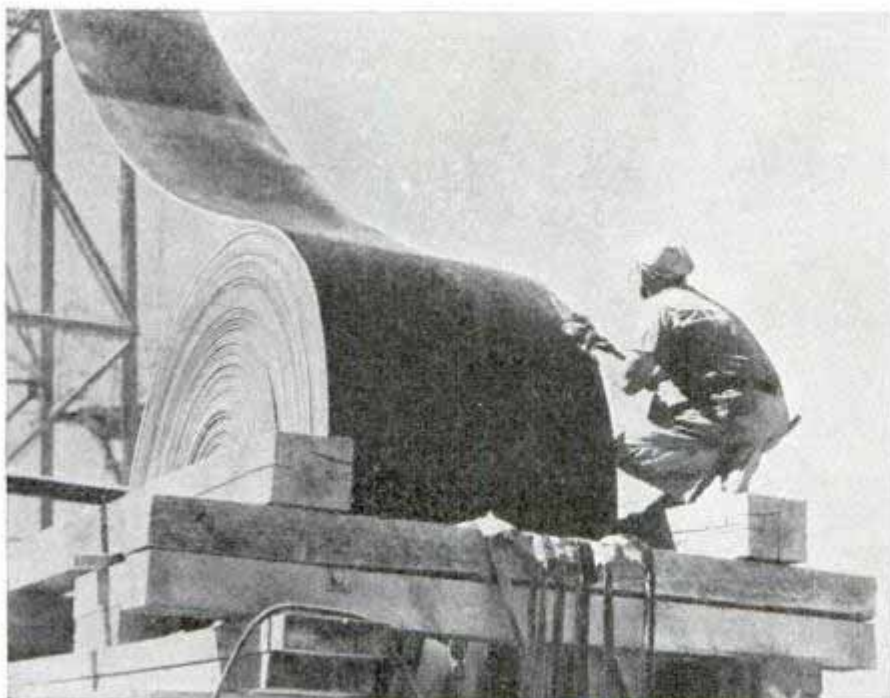
Latest radio aid to air navigation is an automatic direction finder that helps the pilot stay on course. Once tuned to a station, the device points continuously to the station so that the pilot need pay no attention to its operation, merely glancing at the pointer on its face. Developed by engineers of the Sperry Gyroscope company and the RCA Manufacturing company, the instrument indicates the exact bearing of the radio station to which it has been tuned. In addition, it immediately shows the pilot when he has passed over the station and gives positive information to confirm the "cone of silence" which he may have received if he has been flying on the regular radio beam. The direction finder also provides a means of obtaining a drift or "crab" angle at any given time. The pilot may tune in a station toward which he is flying and observe whether or not the heading of the airplane is constantly changing. It is only necessary then to turn the plane to the right or left and note the difference between the actual heading of the plane and



Acme.
 Automatic direction finder in cockpit of plane. Here the instrument is being set to tune in radio station

the direction of the station to know the amount of drift angle the plane must take. When flying along a regular beam, any station on the right or left may be tuned in and the pointer will show how far along the beam the plane has progressed.

H 12 10.
Two-Mile Conveyor Belt Hauls Tons of Gravel to Dam



Unrolling two-mile belt used to haul sand and gravel at Grand Coulee dam

Two miles of belting does a job that would require a tremendous fleet of trucks in hauling material to the Grand Coulee dam. Mounted on roller-bearing rollers, this endless conveyor is capable of carrying 30,000 tons of sand and gravel a day to the site of construction. The belt itself weighs eighty tons.

There were 185,000 forest fires in the United States in 1937—one every three minutes, but eighteen per cent fewer than in 1936.

Dept. of Agriculture

"THEY'RE OFF!" *to* NEW

Cont. Philip Bailey. 122 1/2 5th Ave
Los Angeles. Calif.



THE parade to the post is an exciting time for the thoroughbreds and they grow even more tense as they arrive at the starting gate. The starter, on a raised platform by the inner rail, must exercise the patience of Job and the coolness of a general as he directs assistants and jockeys attempting to line up the jittery animals.

Just as the task seems finished, a nervous horse rears. Seeing its wild actions,

several others bolt from their starting stalls—and the starter has his work to do over. But at last they are all lined up as evenly as a platoon of soldiers. Then the starter presses the button which sounds the bell on the starting gate and the shout, "They're off!" echoes in thousands of throats.

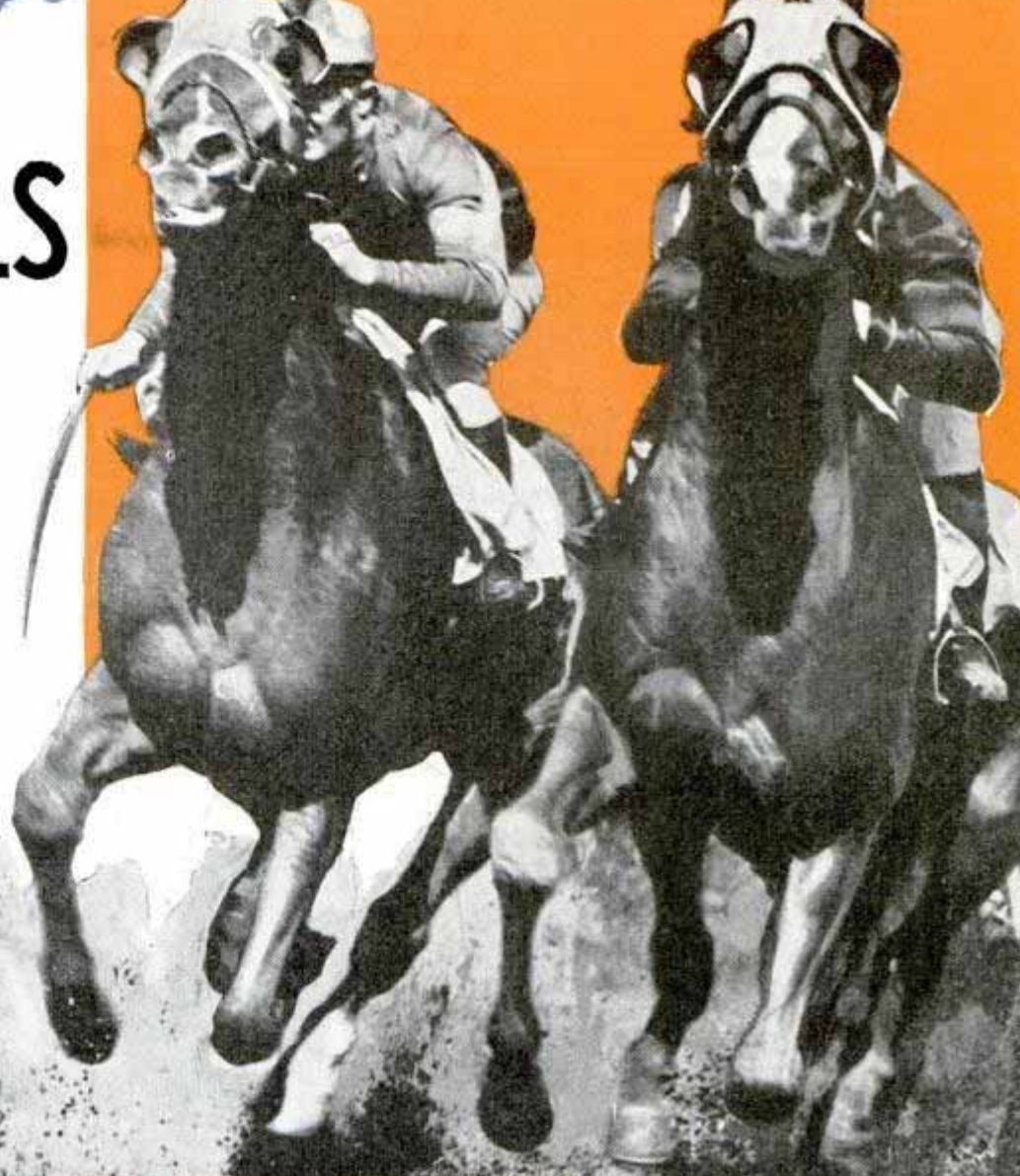
Two-year-olds are the hardest to handle at the post. Before they make their first start, they go through much schooling.



Bunched at the turn and, above, track movie photographer recording start of race at Santa Anita. Rough riding is revealed by the movies taken at various points around the track

THRILLS

They learn how to enter the gate properly and to respond the second the bell sounds. The slightest noise may send these skittish youngsters off. Even a camera click has caused a whole field of two-year-olds to break. Fortunately most horses become better post actors as they grow older,



Neck-and-neck down the back stretch and, below, screen in enclosed paddock at Hollywood Park where finish, as seen by camera, is shown

Hollywood Calif.

but some who develop bad traits often grow worse.

The start is an exciting time for the jockeys too. Each tries to have his mount break ahead of the field at the bell. A horse reared so abruptly at a track recently that he hung his jockey on the starting gate. As he flew off his mount, the jockey's

clothes caught on an overhead part of the gate. He was helped down, not much hurt.

For years Johnny Adams, champion United States jockey for 1937, put on his "crash helmet" before leaving the tack room, just as all jockeys are required to do. The helmets are little black skull caps constructed of an Australian fiber. They are



worn under their silk caps. Johnny often wondered of what value it was to him. At the last Del Mar meeting he was on a horse that had never been started before. As it left the post it bolted for the rail. When the horse hit the rail Adams was knocked from the saddle. His foot caught in the stirrup and he was dragged for several yards before he fell to the turf. At the hospital they found the little black helmet dented and cracked by the horse's hoofs, but it had saved his skull.

Each new race track tries to bring more comfort with racing thrills. Latest of the million-dollar racing projects is Hollywood Park at Inglewood, Calif. Its most unique feature is an inclosed paddock built like an amphitheater at one end of the huge grandstand, which seats over 12,000 people. Here 3,000 fans may view the horses being

saddled at close range. The paddock is soundproof and has an artificial daylight lighting system so the horses will not be bewildered by the sunlight. The ground in the paddock and in tunnels, to and from it, is covered with redwood bark.

The grandstand and clubhouse follows the latest modernistic architecture. It is painted turquoise which has been found to cut off much glare of the California sun. Glass windows in the back of the stands and glass partitions on the sides make it draft free.

Hollywood Park has a sunken infield, in which there are three lakes, each at a different level, and two man-made waterfalls. Swans, ducks, and geese swim on the



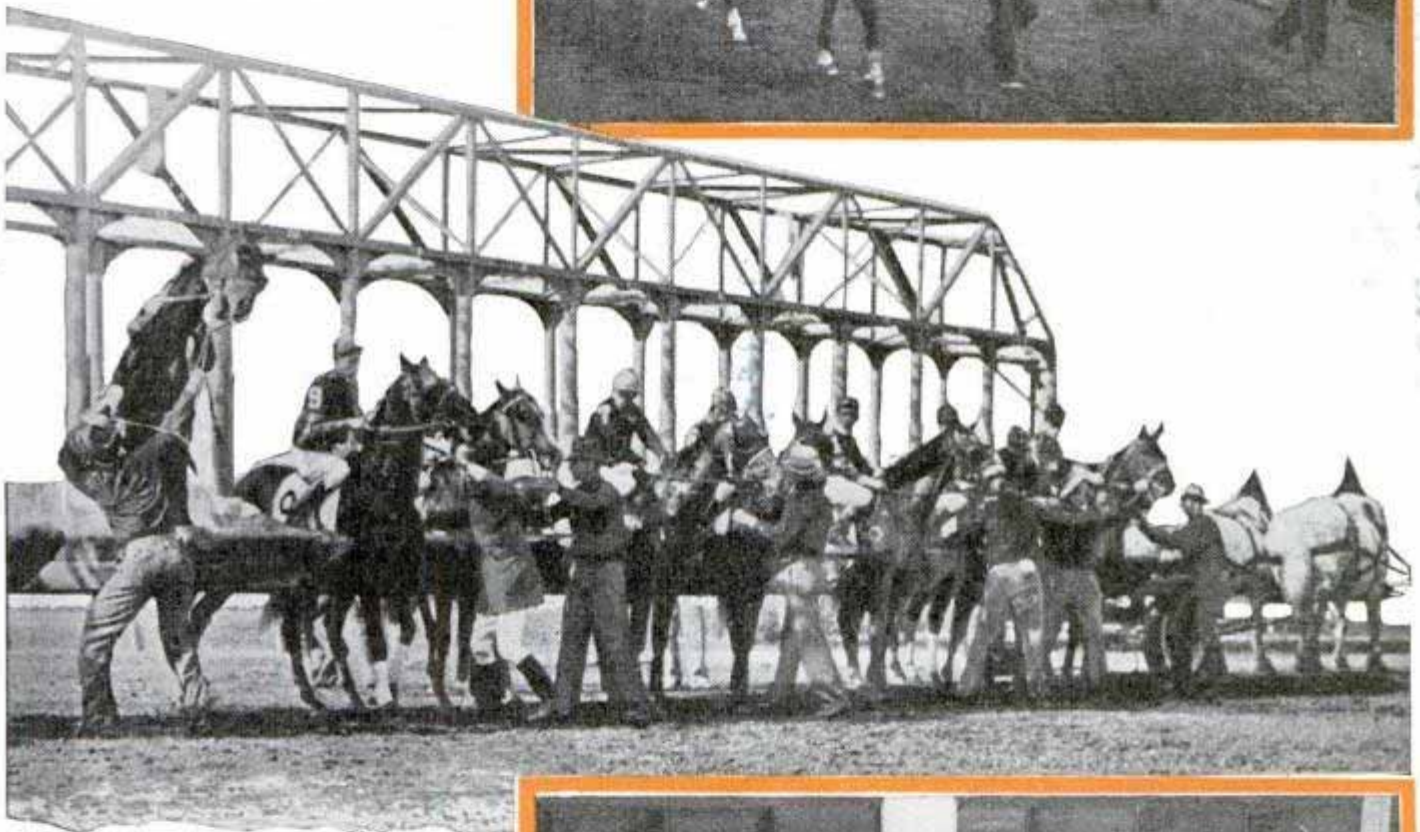
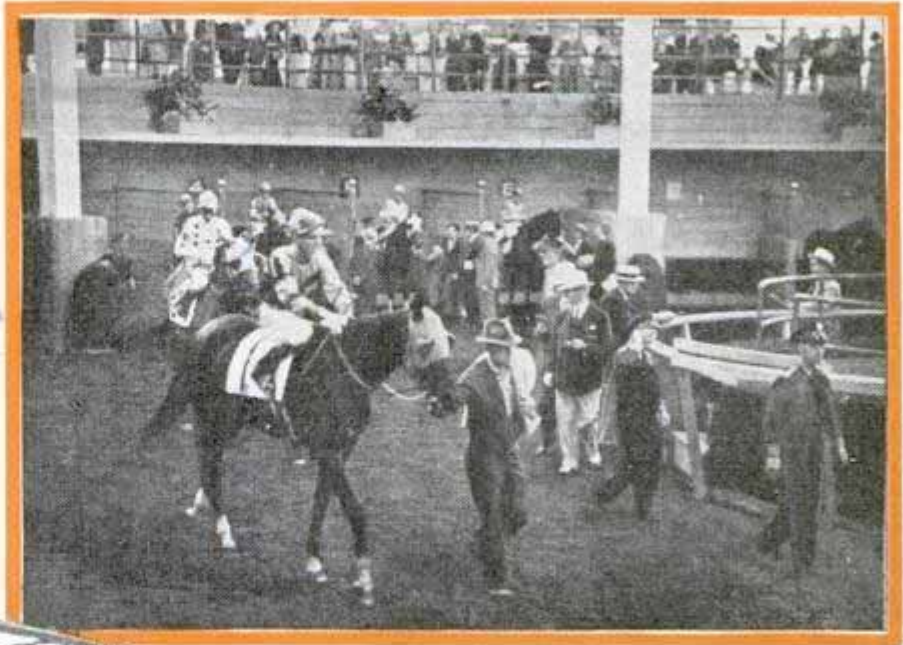
The finish of a close race and, above, a dog which serves as a companion for one of the thoroughbreds.

Jockey - Johnny Adams
lakes and a girl in Dutch costume keeps an eye on them to see that they don't wander out on the track.

The tote board in the infield has been sunken so it doesn't affect the view of fans in the lower grandstand. The stewards' stand is on the roof and the jockeys weigh in after the races in an underground, glass-enclosed booth at the finish line. Thus there

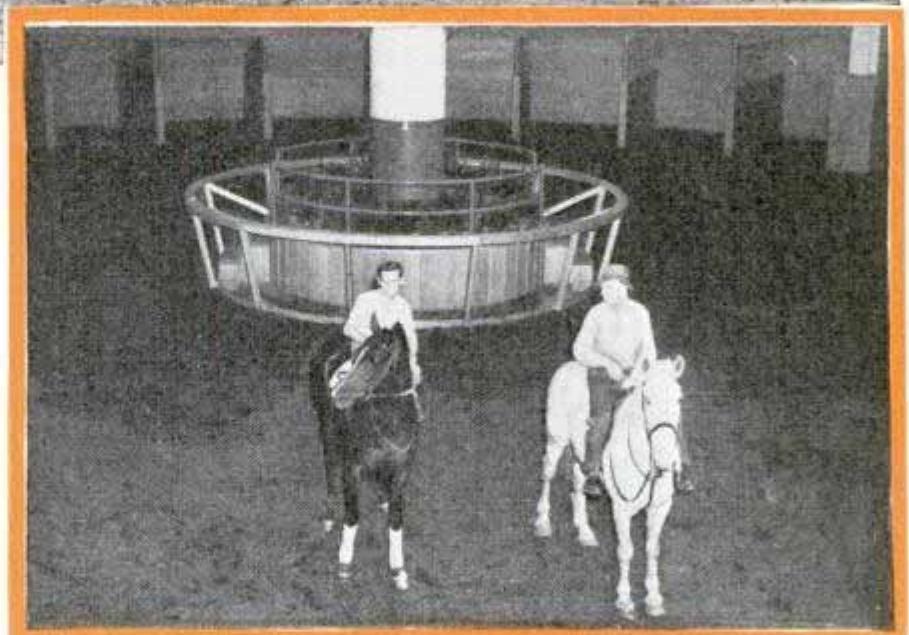
is nothing to obstruct the view of the finish from any point in the stands. Three elevators in the grandstand and clubhouse carry people to the higher tiers.

From inner rail patrol judge boxes, it is easy to watch what goes on along the course. The large race tracks have patrol judges stationed about every sixth of a mile around the



course. It is their duty to watch the horses as they go by their portion of track. They have telephones to notify the stewards if they observe anything improper. The new patrol judges' boxes are mounted on single steel supports sixteen feet above the track. The judge sits on a revolving seat, and is directly over the inner rail as he watches the race through binoculars.

Years ago horsemen
(Continued to page 146A)



Top, horses leaving the inclosed paddock at Hollywood Park. Center, action at the post. Note horse rearing. Bottom, acquainting two horses with the inclosed paddock before crowd arrives

sucked. If these samples contain mercury vapor, some of the blue and ultraviolet light is absorbed, resulting in a slight shadow that is visible to the photoelectric tube at the end of the tunnel. As little as one part of mercury vapor to one billion parts of air can be detected by this means. The photoelectric tube then turns on a red light, warning of the presence of the poison fumes.

Bookshelves Form Building Frame and Save Space

Bookshelves in the Oregon state library at Salem will not only be built like a skyscraper, they will be part of one. Steel cases to accommodate 450,000 volumes form part of the frame of the library structure itself, thus saving not only space but also material and construction costs.

Rubber Disks Set in Asphalt for Non-Skid Traffic Marks



Photo shows successive stages of heating asphalt, preparing recess, lining it with hot tar and then laying non-skid traffic markers in place

Non-skid traffic markers recessed into the pavement are being tested for durability in Philadelphia. They are made of a hard-wearing rubber composition, of high visibility and skidproof qualities under adverse conditions. In laying them, the pavement asphalt is first heated with a blowtorch, then scraped out and the hole is lined with hot tar to seal the marker disk in place.

"Wet Wash" Street Sweeper Maneuvers in Tight Places

Teaming a steel brush revolving horizontally with a tough fiber brush revolving vertically, a street cleaner that washes as it sweeps will pick up anything from dust

to glass, scrap iron and bricks. A single front wheel makes it highly maneuverable, in order to sweep close behind and around parked cars and to clean the curb on narrow streets and sharp curves. It can sweep a "figure eight" on a thirty-six foot pavement. The small horizontal brush at the front sweeps refuse away from the curb to be picked up by the large vertical brush and tossed into a cubic-yard receptacle. The machine has a 140-gallon water tank and sprinkles the entire sixty-six-inch swath, softening encrusted dirt.



Sweeping a "figure eight" on a thirty-six foot pavement. A sprinkler and horizontal and vertical brushes do a thorough job of street cleaning

Austin - Western Machinery Co.

Underwood Engine
W. D. Ames Co. 1.50
Sax 4.00

15/1/80

Farrell Safety Road Marker, Ames
Austin, D. H.

Detector Finds Lost Radium at Hundred-Foot Distance

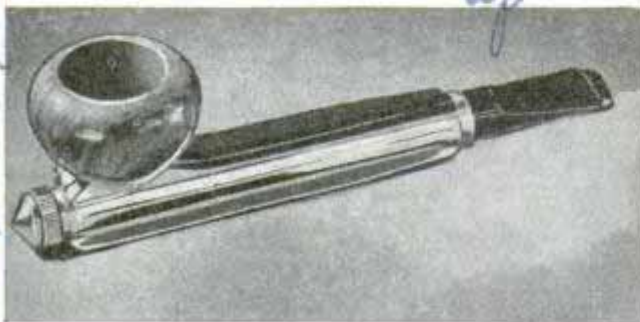


The highly sensitive radium detector goes hunting for a lost bit of the mineral in a wastebasket

Hunting for lost radium is no longer like the proverbial search for a needle in a haystack. So sensitive is a radium detector just invented that it will react to the presence of a bit of radium weighing only 1/29,000 of an ounce, at a distance of 100 feet. The inventor is Dr. L. F. Curtiss of the U. S. Bureau of Standards, shown demonstrating the device in the picture above.

"Radiator" Pipe Cools Smoke and Traps Irritating Tars

For a cool, non-irritating smoke, a "radiator" pipe with briar bowl and duralumin tubes is on the market. Scientifically designed, it has a radiator chamber of sufficient volume to hold the smoke and cool it between puffs, letting the objectionable heavy oils, tars and water vapor condense without reaching the smoker's throat. A



Irritating vapors are cooled and condensed in large duralumin chamber of pipe without reaching throat

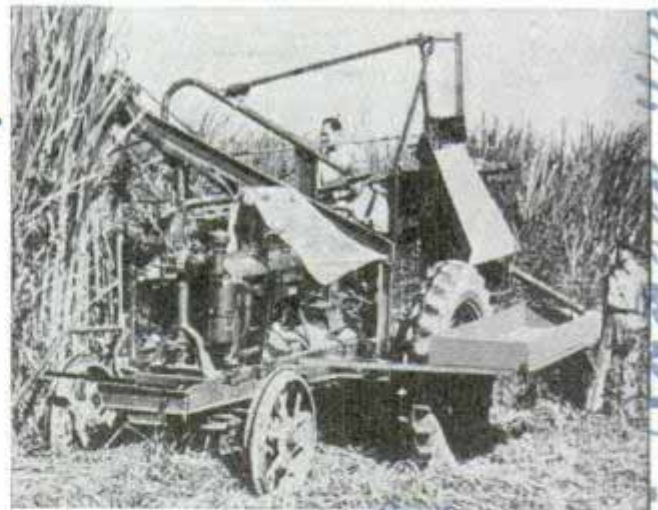
valve prevents these condensed liquids from returning to the bowl. The pipe is readily demountable for cleaning, and its parts are interchangeable and can be replaced if damaged.

Pelican Ash Tray Snaps Its Bill to Swallow Burning Cigarette

Forgotten cigarettes left burning on the bill of a "pelican" ash receiver are swallowed automatically when the heat flips the bird's mouth shut. A thermostatic metal coil does the trick. Placed on the bill, a cigarette will continue to burn until its heat causes the coil to unwind, raising the bill and flipping the cigarette inside the bird. Ashes may be emptied from the base.



Reaper Harvests Sugar Cane at Twenty Tons per Hour



Mechanical reaper cutting sugar cane twice as high as a man. It does work of fifty machete wielders

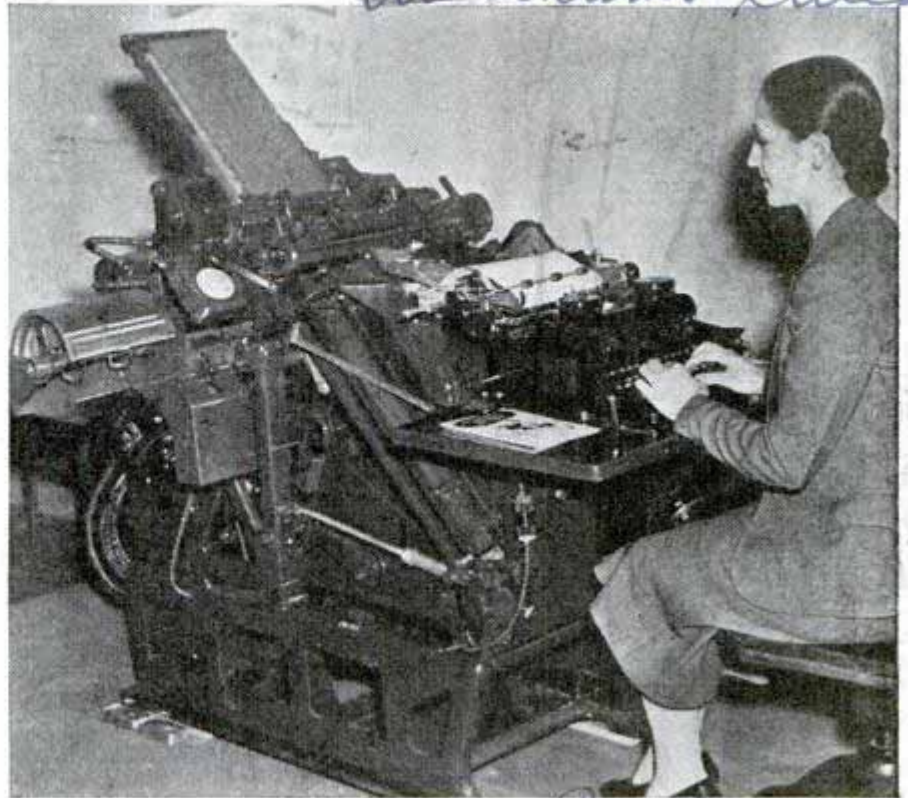
Wading through a forest of sugar cane twelve feet high, a mechanical reaper proved it could top, strip and bunch the stalks at a rate of one ton every three minutes. The sugar-cane harvest has always been a hand operation, the field workers swinging machetes much as they did when Louisiana reaped its first cane crop back in 1795. The mechanical harvester can equal the work of fifty field hands.

Handwritten notes in blue ink:
- Top right: "magnified"
- Middle right: "82.50 retail"
- Middle right: "7' lops. d. l."
- Middle right: "Carpenter"
- Middle right: "Washing"
- Middle right: "Plantation"
- Middle right: "Pouite"
- Middle right: "Duck"
- Middle right: "Allan Ramsey"
- Middle right: "Canehub"
- Middle left: "H 1172"
- Middle left: "H 1129"
- Middle left: "H 1122"
- Middle left: "Wash"
- Middle left: "ap"
- Bottom left: "Kristen Pipe Co"
- Bottom left: "Boys 70-40"
- Bottom left: "Search Wash"

Caslagse Corp. 116-122 Chicago

Setting Up Type with a Typewriter Keyboard

One of the latest short cuts for the business office is a type-casting machine operated by a conventional typewriter keyboard. It was introduced at a recent exhibition of business machines, when a stenographer demonstrated that anyone who is familiar with the operation of a standard typewriter keyboard can cast printing type.



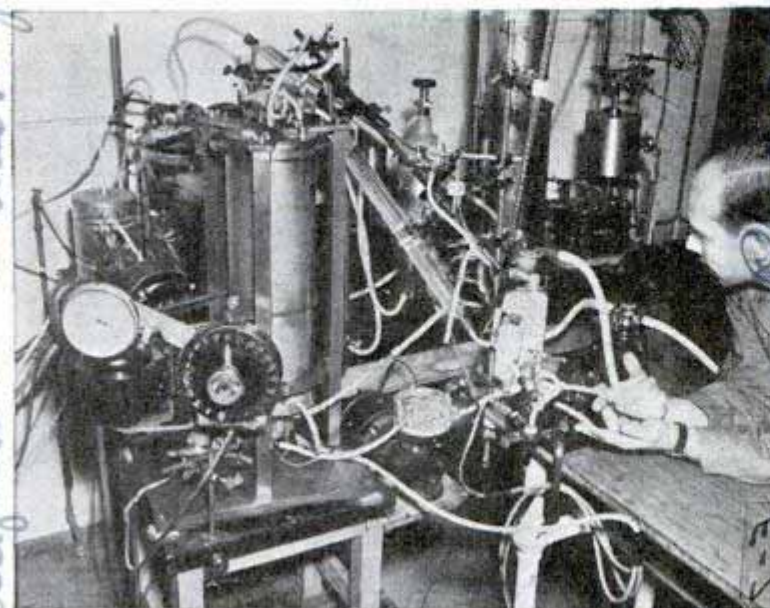
Here is a new way of cutting corners. Instead of typing copy and then turning it over to type-caster for second operation, the stenographer herself sets type with casting machine using a typewriter keyboard.

H. 1198.

Electric Heart Pumps Blood through Mechanical Lung

Human life may be saved some day by diverting the blood stream through artificial lungs and heart outside the body when the natural organs are damaged. Such a mechanism already has been tested in a laboratory, and proved capable of sustaining life in animals. A tube is inserted in the animal's vein and blood is sucked out by an electric pump. As the blood

travels to the mechanical lung, it is kept warm by water circulating in a glass tube surrounding the blood-carrying tube. The "lung" is a chromium-plated steel cylinder, rotating at several hundred revolutions per minute. The spinning spreads the blood in a thin film on the inside wall of the cylinder so that it can readily absorb oxygen flowing through the chamber. The blood thus purified by oxygen is then pumped back into the animal.



Cylinder at left is artificial lung. Slanting glass tube in center holds warm water to keep blood at proper temperature

Pink and Blue Potatoes Taste Just the Same

It may not be long before the corner grocery sells you potatoes to match the table decorations or the wallpaper. Potatoes with "color appeal"—pink potatoes, blue potatoes, reds, yellows, russets, whites; whites with blue eyes or red eyes, and potatoes that are purple all the way through, have been developed. Forty different varieties, all edible and tasty, have been exhibited at the Pennsylvania state department of agriculture.

Designed and built by Dr. John W. Robinson Jr.

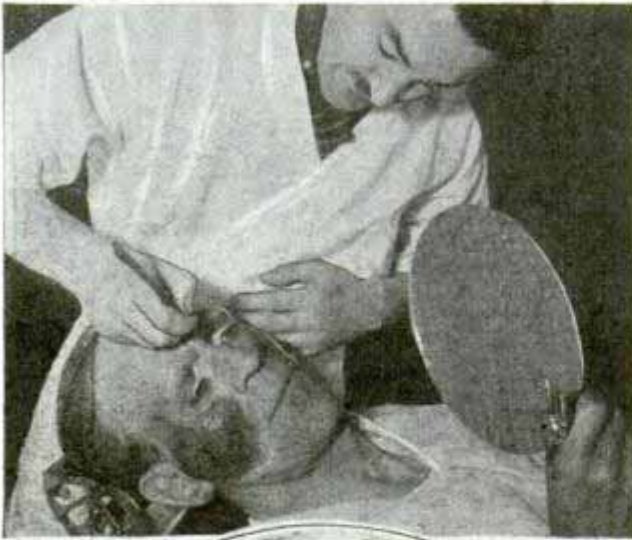
medicine. Philadelphia 1200

Christian Science Monitor 10/8/38

Pellies in Harrison Dept.

Harroburg Pa

How Faces Are Made to Order for the Movies



Faces are made to order for the movies with the aid of a plastic substance known as No. 6, the invention of Jack Dawn, makeup artist. With this material, an actor's features can be revamped to conform with those of a known character or a copy of a historical face can be molded and superimposed on the actor's face. While wearing these thin, gelatine-like masks, a player can smile, yawn, laugh or cry and the plastic will react as though it were a part of his own skin. Being porous, the material absorbs perspiration and can be applied or removed without harming the skin. Its use also permits the actor to be made up in an unusual way without physical discomfort. If he is to be depicted with a deep scar on the forehead, No. 6 provides one quickly, whereas the old method called for the skin of the temples to be pinched together and held by drying colloid. For "Marie Antoinette," Dawn transformed Robert Morley into such a perfect likeness of the original Louis XVI that it was possible to use an actual portrait of the king in one sequence where the actor appeared beside the picture. Dawn changed a veteran character actor into twenty-year-old Franz Josef for "The Great Waltz," then aged him into the seventies.

Top, Jack Dawn making up Boris Karloff for "War Lord." Circle, Karloff ready for camera. Bottom, photos showing transition of John Barrymore into tramplike character for "Bulldog Drummond Comes Back"



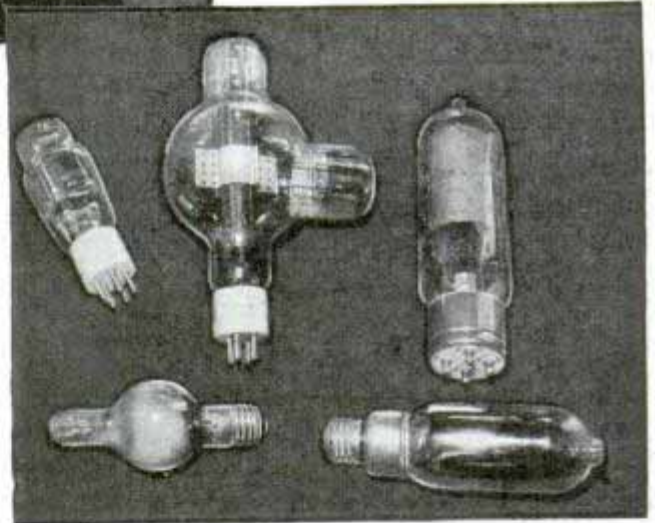
times, the operators' voices rising and falling through heavy static, but today the pilots can hear the messages as easily as if they were connected by telephone.

Aviation radio is making tremendous strides. Scores of improvements to transmitters and receivers have increased range and reliability and have made garbled, distorted voices practically a thing of the past. Static is being controlled much better than before. Radio's new status permits "on schedule" flying through all sorts of weather and enables dispatchers to control the planes with the ease of chess players moving their men. Every kind of situation is handled safely. If three or four airplanes are stacked up in the clouds above an airport at the same time, all wanting to land, the dispatcher holds all except the lowest one in the air, flying different courses on the adjacent radio range and at 1,000-foot differences in altitude until the lowest plane has landed. Then, one at a time, he drops each plane down another 1,000 feet and clears the lowest for its approach. Airways are divided into blocks, and clearances to proceed from block to block, depending upon the weather conditions ahead, are radioed the pilots in flight.

"Radio today is aviation's most versatile handy man," states James Flynn, superintendent of communications for American Air Lines. "Now that we have trained it

to do so many jobs we are going to load still more work on its shoulders."

So rapid is the advancement that radio systems that were brand new last year are partly obsolete today. The modernization program goes on continuously. Similar progress is being made in bringing up to date such radio aids as the Department of Commerce radio beam stations. Some of these radio ranges are being relocated so that one of the beams points straight down the landing runway of an adjacent airport. All



Top, field dispatcher telephoning air-line operations office. Bottom, various kinds of tubes used in airways radio communication

the stations are being improved to eliminate having to switch off the guiding signals while the periodic weather broadcasts are made. The cones of silence above the stations, used by pilots as a way of keeping track of their progress along an airway, are being changed from negative to positive signposts by using small transmitters that radiate identifying signals vertically above the stations.

Useful as the radio beams are, they are sometimes confusing to pilots. Blind spots in which the beams fade out, wandering beams that bend one direction on one day and another the next, and split beams and other quirks have kept pilots from depending on them too completely. The lo-

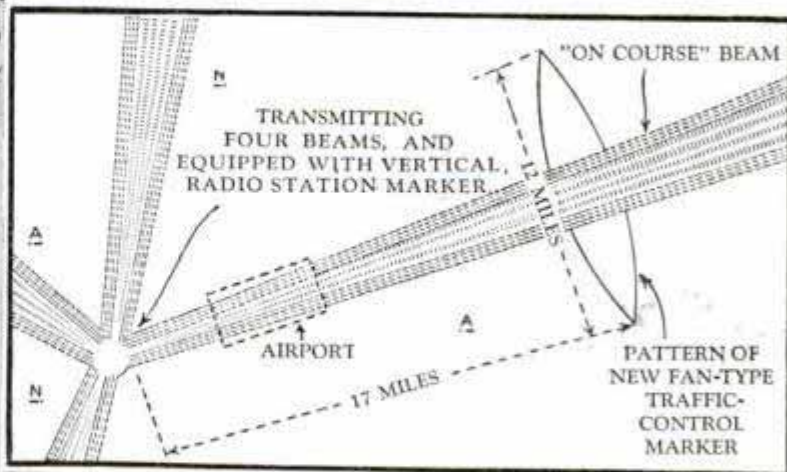
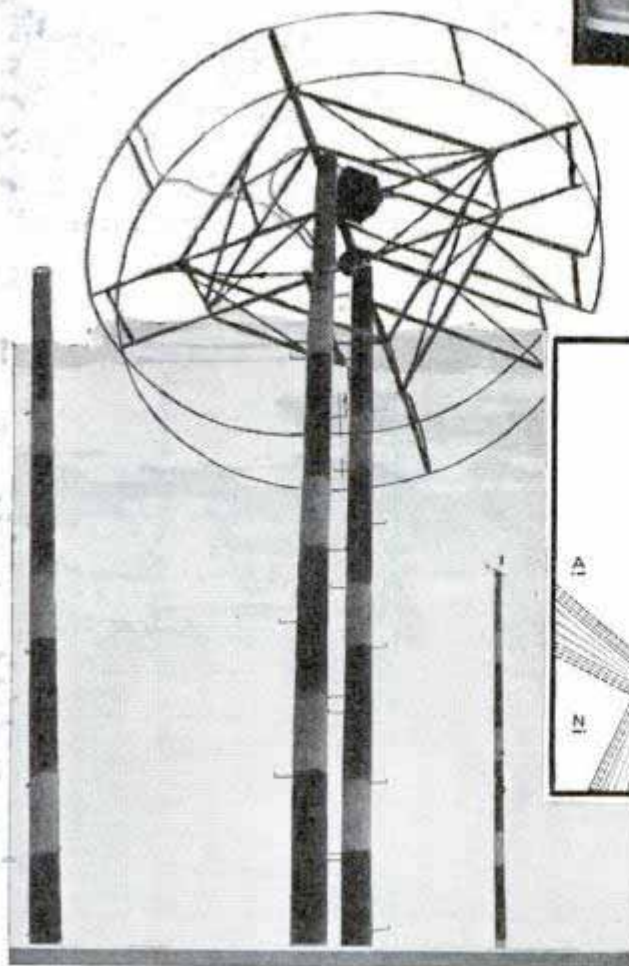
cation of a station seems to have an influence upon its reliability and some of the stations are being moved to new locations. For precise navigation inside small areas "localizer" beam stations are being installed, operating on wavelengths different from the main airways beams. Eventually, the present beams are to be replaced by ultra high-frequency beams that will be even more reliable. In fact, the whole trend in aviation radio is toward short waves since these insure more reliable communication for every purpose.

The first step in this short-wave program is the installation of twenty-two fan-type radio markers along the airways this winter. These marker beacons throw up vertical curtains or fans of signals across an airway, giving a pilot a positive check on his position. They will be used for traffic control, as warnings of the proximity of high ground, and as "let down" markers in making blind ap-



proaches. The radio markers operate on seventy-five megacycles and their pattern at 3,000 feet in the air is three miles wide and twelve miles long. The antenna of the marker beacon consists of horizontal rods

(Continued to page 124A)



Top, another view of dispatcher, showing battery of loudspeakers, each of which is connected to phone system. Left, "squirrel cage" type of transmission antenna. Right, diagram of new fan-type radio marker used on the airways

Tree Trimmer Wears Stilts Made of Aluminum Tubing



Orchard worker speeds his work by walking on aluminum stilts which are adjustable to various heights

Stilts are being used by orchard workers instead of ladders, for greater safety and speed in getting around. The stilts are made of adjustable tubes of aluminum alloy, one tube sliding inside the other. They can be locked in any stage, increasing the wearer's position above the ground from thirty-one and one-half inches to sixty-eight and one-half inches. The cast aluminum footplates are also adjustable for different sized shoes. Each stilt weighs nine pounds. A carrier for pruning shears and other tools is provided on one stilt.

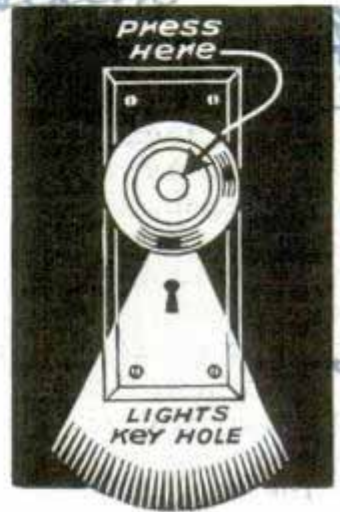
Colored Mirrors Stud Highway to Show Type of Road Ahead

Red, white and amber reflectors to mark the center line of the highway and indicate, by the color, the hazards of the road ahead are proposed by a Texas inventor. The buttons would reflect headlights and would be visible 1,000 feet ahead at night.

If the road is straight and safe, white reflectors would tell the driver so. Amber reflectors would indicate a curve or hill, and red markers would warn of a crossroad or railway. Markers being tested in Texas cities are made of malleable iron finished with porcelain enamel, virtually indestructible, the reflectors being set in the housing to protect them from traffic.

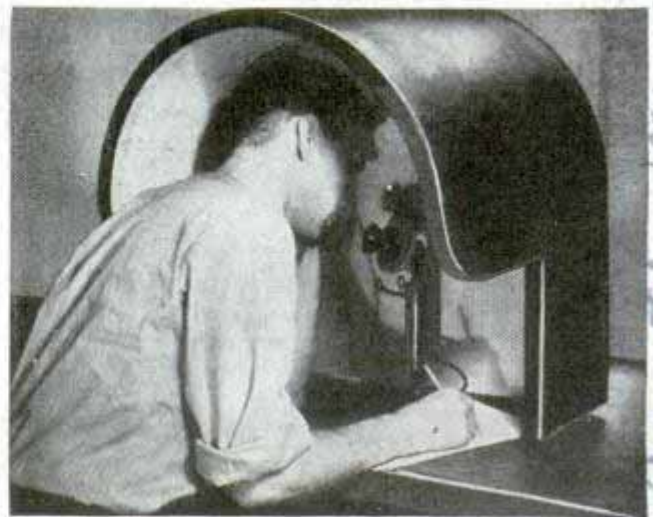
Electric Light in Doorknob Illuminates Keyhole

To light up the keyhole at night, an electric doorknob can be installed in place of the old knob without any wiring. A tiny bulb beneath the knob floods the keyhole with light at your finger touch; entirely self-contained, it is operated by a flashlight battery.



Portable Desk Phone Booth Handy in Noisy Office

Designed for use in noisy offices, a portable soundproof telephone booth is installed by merely placing it upon a desk or table. The booth is twenty-two inches wide, twenty-four inches high and nineteen inches deep, so shaped that users may write as they use the phone. Although it



Using the desk phone booth which is insulated to absorb noises in office

Burgess Battery Co.

(Inv. W.C. Lauch, 1035 Holwood Ave. Kent, Ohio)

U.S. Pat. 2,113,611
H 1136
Presente.
\$25.00 per pair.

H 1123

H 1157

H 1155

Van A. Hamilton

James W. ...
Chicago

has no door, the booth absorbs virtually all interfering outside noise. It is lined with a "quieting sheet" material that absorbs instead of excluding the noise, thus creating a zone of silence around the telephone. The quieting sheet consists of an outer layer of perforated metal plate, behind which is a thick, soft sound-absorbing blanket. Similar sheets are being used on engine mufflers, air ducts, airplane cabins and other places where noise is a problem.

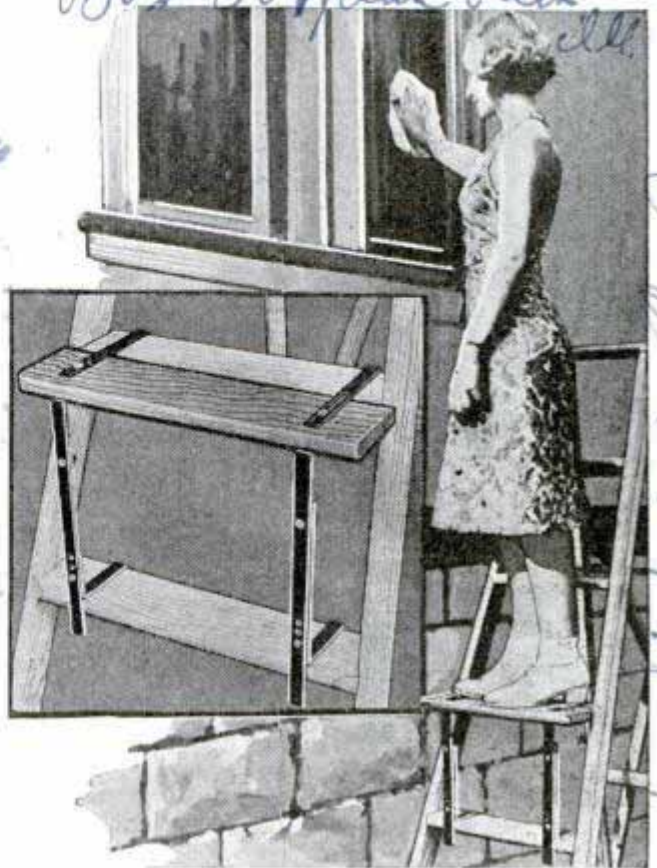
41120
Compressed Air Opens Doors of Homemade Tool Chest

From scrap lumber and metal, Lyman Loetscher of Livingston, Mont., has built a tool kit whose compartments open, close and lock by compressed air. It is a bird's-eye maple chest large enough for 1,600 tools, compact enough to be portable, and consisting of three rotating trays, four drawers and two special compartments. One lever opens the lid, unlocking the lower doors and drawers. Another lever lifts the trays which then are hand-rotated to select tools. A third lever cuts off the air. The chest is connected to a compressed-air nozzle, a one-inch cylinder eighteen inches long being sufficient to raise the lid. It requires only thirty pounds of air.



Compressed air, controlled by three levers, opens lid and drawers of this maple tool chest

Box 301, Oak Park
Adjustable Step for Ladder Adds Safety and Comfort



Inset shows that width of the step is doubled by attaching the adjustable step, which fits any ladder

Work on a stepladder can be made safer and more comfortable at the same time by installing an adjustable step which fits any ladder. It makes the platform wider, and is adjustable either for higher riser or for wider step. Rigidly built, it will support a 250-pound man easily.

41153
Portable Electric-Oven Unit Will Roast, Bake or Broil

Big enough for the family dinner, a portable electric oven brings the advantages of electric cooking to the small home. It weighs thirty-five pounds and has a cooking area of 1,415 cubic inches.



For roasting, baking or cooking, the oven unit is placed in the bottom of the oven; for broiling, it is placed in the top.

Landers, Harry's Clark
 1937, Pinball Sts

The
 inst
 Thank

Comfy Step mfg. Co., 10-23-37

380 Whitehead Road 9/29/38

Portable Car Brake Tester Helps Equalize Wheels



Taking a reading of the braking power of one automobile wheel with the portable tester

Braking power on each wheel of the automobile can be measured individually by a portable tester just introduced. Accurate and easy to operate and read, it is mounted on rubber-tired wheels and weighs only forty pounds. By testing each wheel separately, it helps to equalize opposite wheels and distribute braking action properly between front and rear wheels.

H 1150

Bags of Rock Dust Guard Mine from Coal-Dust Explosions

Clouds of inert rock dust form an effective way of preventing and limiting coal-mine dust explosions, the U. S. Bureau of Mines has found. Coal miners soon may see paper bags on little platforms near the ceilings of mines, if the new method is widely adopted. The bags contain limestone treated so that it does not absorb water. When the first shock wave of an explosion sweeps down a coal mine and blows coal dust with it, the vibration shakes the bags off their platform. A wire rips open the bags and the rock dust spreads to form a barrier that has two functions. If it falls into coal dust so heated that it is about to explode, the rock dust will absorb the heat

Washington

and lower the temperature below the ignition point. Too, the presence of the rock powder in the air helps to dilute the coal dust and makes the explosion less severe.

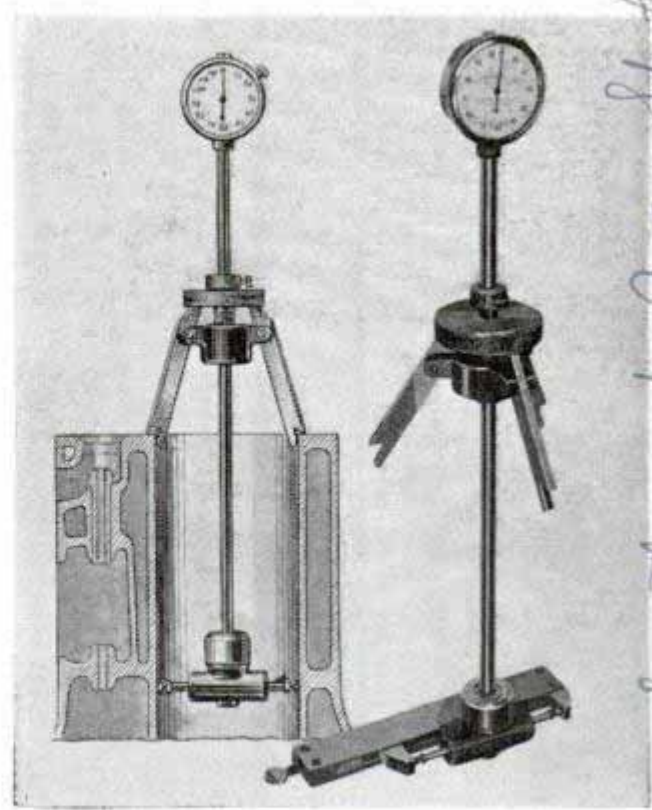
Rubber Lines for Tennis Court Let Concrete Expand

Rubber expansion strips such as are laid in concrete pavement joints are now being used to line tennis courts. The white rubber strip is permanent, making it unnecessary to renew paint, lime or tape. At the same time the rubber joint protects the surface of the court, letting the concrete expand and contract without cracking.

H 1124

Cylinder Gauge Reads Directly on a Dial Indicator

Cylinder size, taper and out-of-roundness can be read directly with micrometer accuracy on a gauge that has a dial indicator. It has a tripod centering device and can be used to measure over the entire length and circumference of the cylinder, showing up any pockets, distortion or wear at any part of the wall. The dial can be read at a distance easily. There is a master gauge for setting the dial to standard cylinder size.

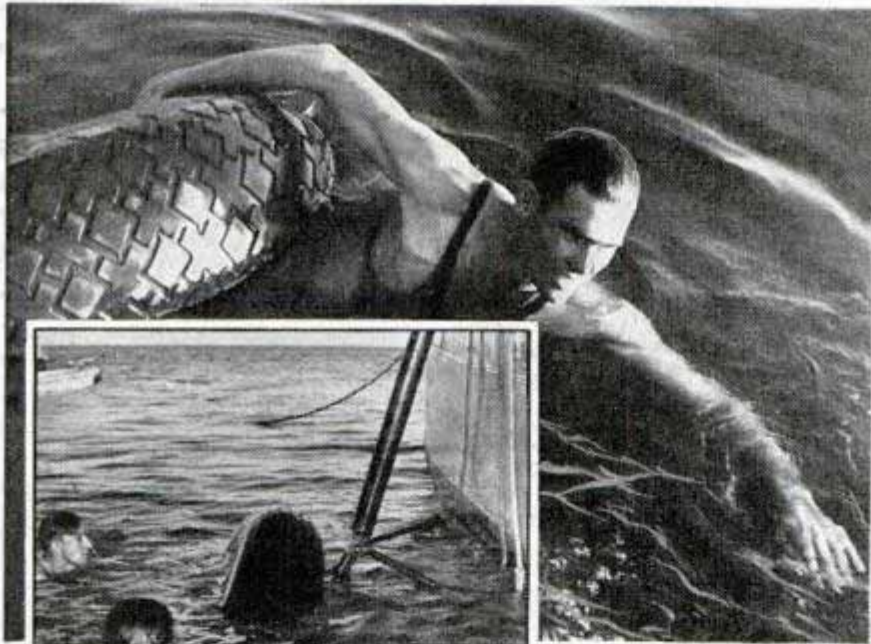


Tripod cylinder gauge and a drawing showing how it takes inside dimensions of cylinder wall

mechanical drawing school
and Southwest Av. St. Louis, Mo.

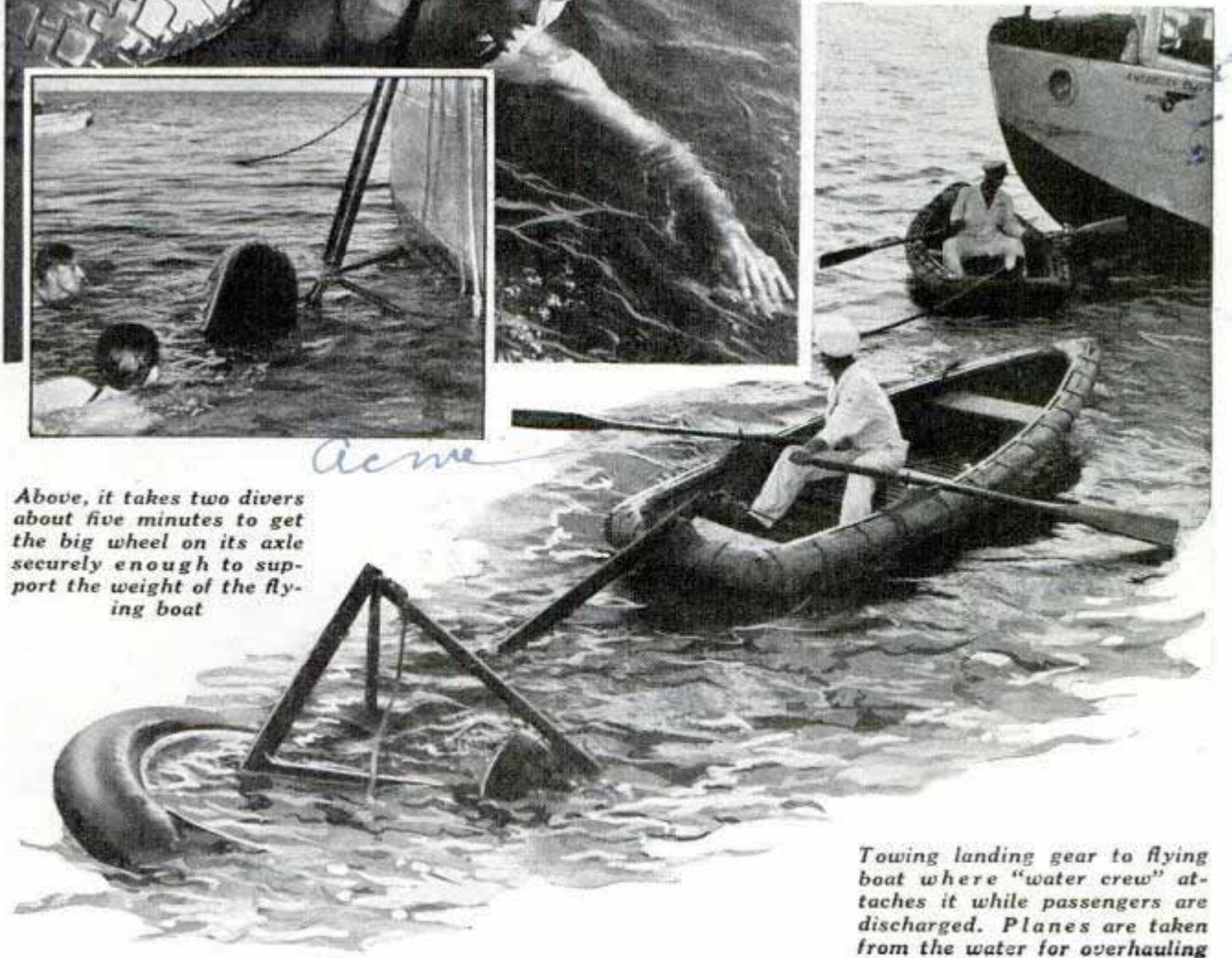
the Duay. Norris

Expert Divers Put Big Wheels on Flying Boats



135 E 42nd Street
 Before Pan-American Airways' flying boats can be rolled out of the water at Miami, Fla., expert swimmers and divers must attach big wheels and tires. Top, a flying boat lands. Left, swimmer towing huge tire to the plane.

Above, it takes two divers about five minutes to get the big wheel on its axle securely enough to support the weight of the flying boat



Towing landing gear to flying boat where "water crew" attaches it while passengers are discharged. Planes are taken from the water for overhauling

was before flying boat
 135 E 42nd Street
 was before flying boat

TAMING

HAVE you ever seen oil wells go on a rampage and catch fire? Here is how it happens:

A well is about to be brought in. The derrick stands on the open plain, steam boilers near by with smoke rising from their stacks. A few automobiles are drawn up near the rig. Men are working on the derrick floor. Suddenly someone shouts. A rumbling fills the air, drowns out the chuffing of the pumps. Men scurry from the derrick, running for their lives.

Behind them a gray column of gas and oil screams through the derrick with a bellow that can be heard for twenty miles. Timbers swish into the sky like toothpicks. In a few seconds a thundering detonation shakes the earth and the derrick is enveloped in rocketing flame

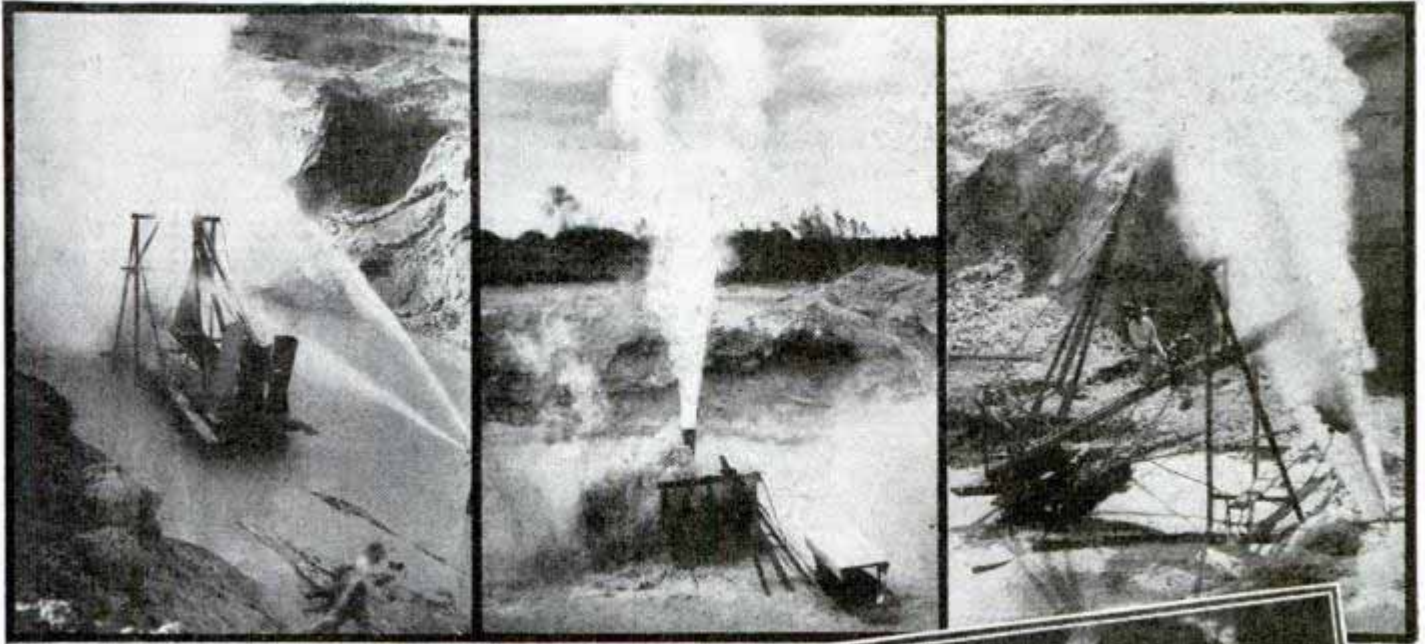
Reader says this was Haven's first wild well
at La Blanca, near Edinburg, Texas



Top, fire fighters inspect flaming oil well from behind tin shields. Bottom, left, dredge being sprayed with water as it digs away dirt from buried casing. Right, casing being pulled into position with cables. Note size of the crater. In this photo the fire has been extinguished, but stream of gas and oil rushing from casing is visible

721099
960121

WILD WELLS



that shoots 100 feet high.

If they have been lucky the men will stop running a quarter-mile away where the heat can be endured. If they have not been lucky one or two or three of them will be lying back in the red-hot wreckage, caught by the rush of gas or hurled to death by the explosion.

The men will stand looking at the inferno, watching huge chunks of earth going up with the flame. "She's beginning to crater," they'll say, and move still farther off as rocks and earth begin thudding down around them. The derrick, white hot, begins to sag, then disappears without adding a sound to the bellow of escaping gas.

Night comes, but not darkness. For fifteen miles around cherry-red light flickers from this source. Next morning you see nothing but flame leaping into the sky from



Top, left, Patton's capping machine in crater with manifold enveloped by flames. Center, men in tin-shielded boat on boiling lake. Right, dropping swedge into casing. Below, fire breaks out in new spot as swedge restricts flow in casing. Bottom, wheeling nitroglycerine into crater



their short exciting lives but put out such fires.

If there is a possibility that the fire can be extinguished and the well brought under control, they will come with heavy manifolds, high-pressure pumps, dredges, asbestos suits, boxes of nitroglycerine jelly and special well-capping equipment, and set about their task so calmly that you would never guess the chances are two to one some of them will be badly hurt or burned or blown to bits before the job is done.

Not long ago fire fighters were working on a wild well in south Texas. The morning after the well caught fire it was a forty-foot crater. Flame geysered

Top, nitroglycerine in place beside flaming well. Center, exploding the charge that snuffed out the fire. Bottom, measuring pipe with calipers preparatory to cutting it off. Noise here is terrific. This is another step toward capping well after fire has been extinguished

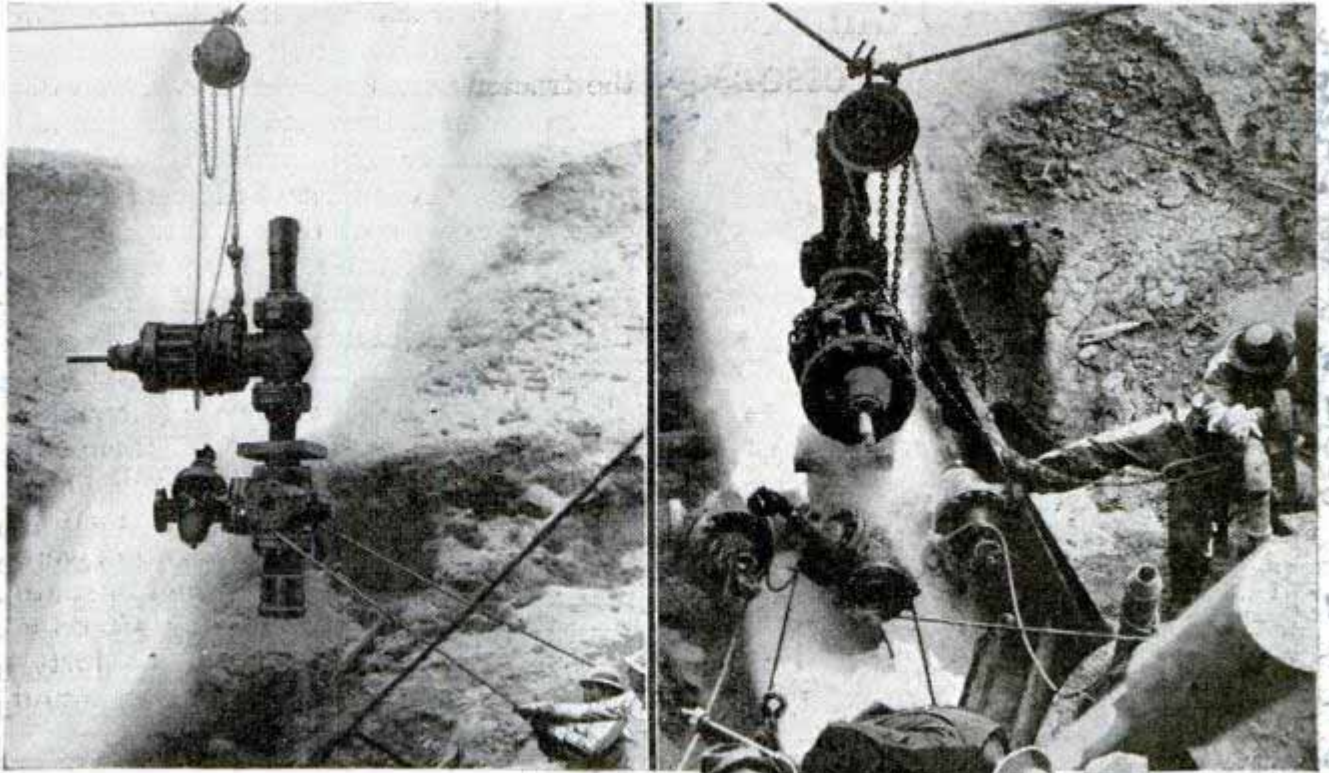
a crater city blocks across with a clean rim that shimmers under the sun because heat has turned the sand to glass.

A high-pressure well has gone wild. Can the owner do anything but cross off as a loss the thousands of dollars invested in it? Perhaps if the casing has given way or the crater is more than forty or fifty feet deep nothing can be done, and it will burn on for weeks or months or years until stones and debris shooting up the hole gradually wedge fast and the decreasing gas pressure is not strong enough to dislodge them. Or it may be possible to drill another well to tap the oil-bearing sand within a few feet of the bottom of the wild well and pump in mud or cement that will seal it.

But there is another way of saving a wild burning well if the casing is still intact. The owner calls in a company of wild-well fire fighters, men who do nothing during

three hundred feet into the sky from a stream of gas and oil.

The H. L. Patton Corp., of Houston, arrived with equipment two days after the blow-out. The fire fighters built tin shields with wooden hand-grips and walked up to the crater rim pushing the shields before them against heat that charred the wooden handles. They put on asbestos suits and stalked about at the bottom of the hole



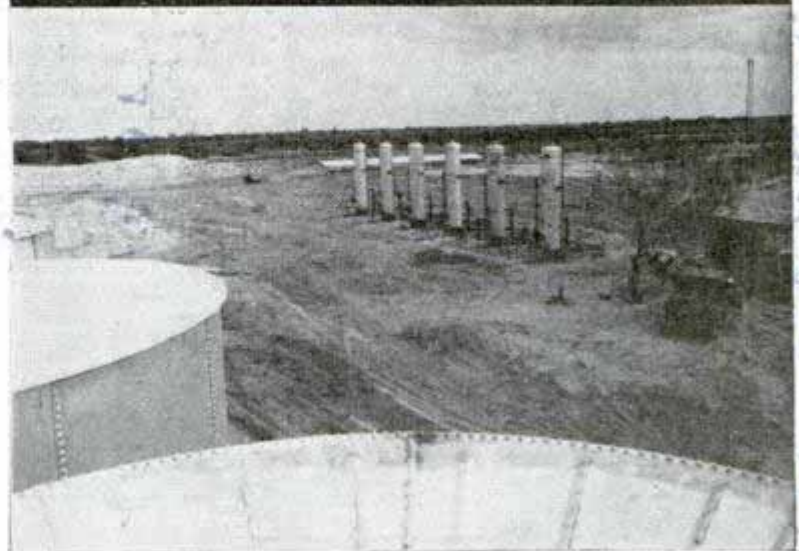
deciding where it would be necessary to dig in order to find the buried casing.

They laid water lines to the edge of the crater, brought in a dragline dredge to dig a ramp to the bottom of the hole. To keep the dredge boom from buckling in the intense heat a water line was strung to spray its entire length. Shields were attached to the dredge so that its operators would not be roasted alive, and men behind other shields on the crater rim directed streams of water against the machine's sizzling exterior.

After weeks of digging, the casing was uncovered in the bottom of the crater, lying in horizontal position spewing its seven-inch stream of gas. Asbestos-clad men went into the hole with cables, fastened them to the big pipe and with heavy block and tackle it was pulled upright.

For capping wild wells, H. L. Patton depends largely upon a capping manifold that is his own invention. It consists of a thirteen-inch, twenty-five-foot stack or manifold held in vertical po-

(Continued to page 122A)



Top, left and right, working manifold up to casing head. Center, looking into manifold after gas flow has been diverted. Bottom, the wild well after being tamed

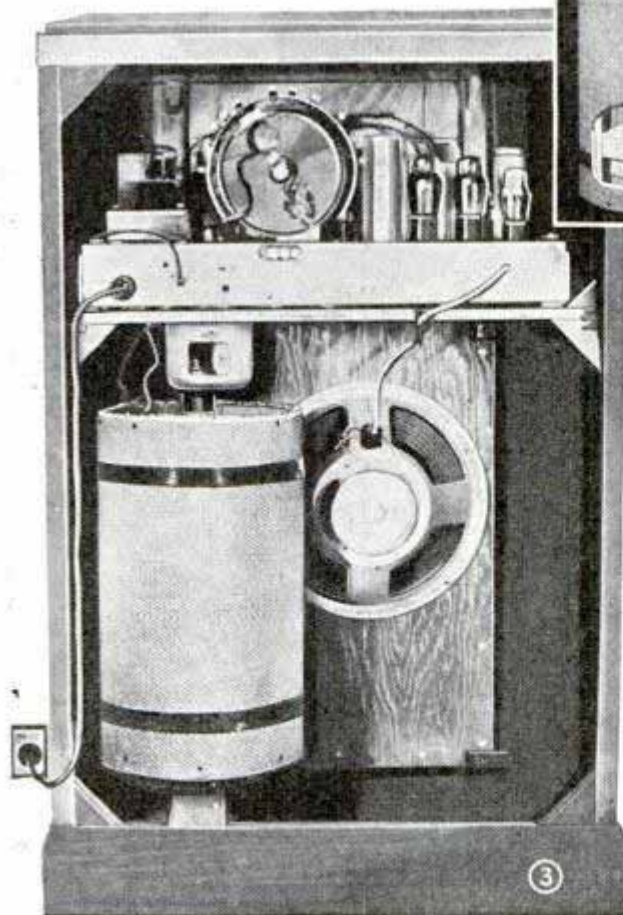
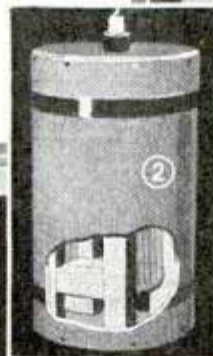
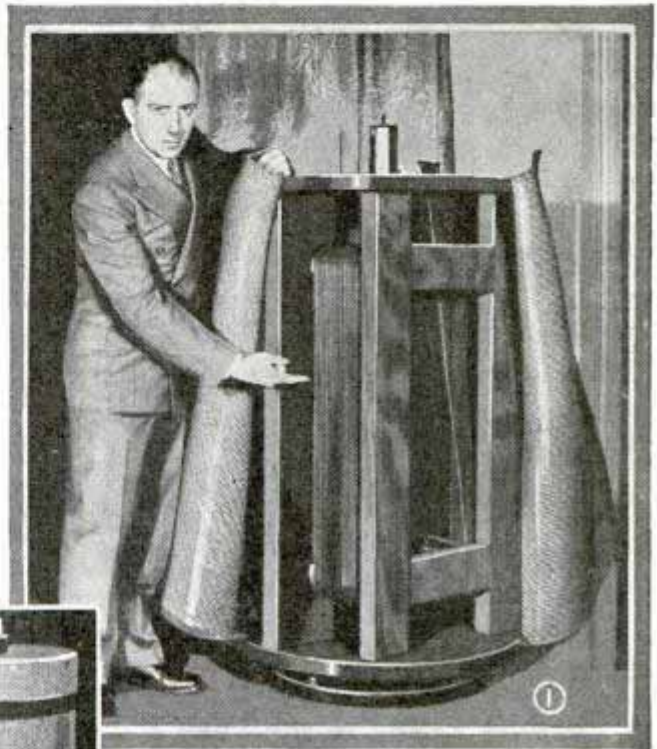
General Electric Co. 570 Atlantic Ter Englewood New York

R a d i o

ANTENNA *in Receiver Cabinet*

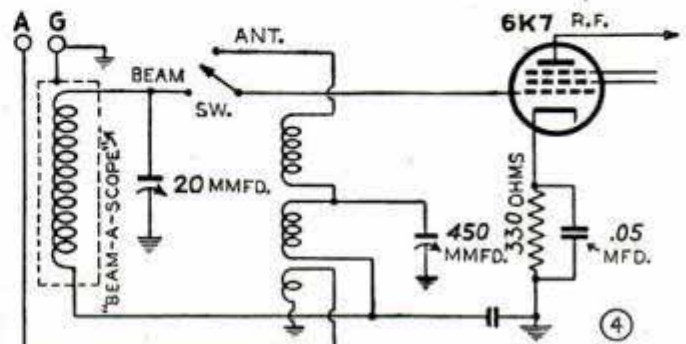
NO EXTERNAL antenna or ground leads need be used with this console receiver recently developed by the engineers of General Electric Co. A built-in shielded loop antenna is employed for the reception of local high-fidelity programs. The set may be moved about a room or home at will and plugged into a socket in the same manner as a floor lamp.

The loop is completely inclosed in a special shield of the Faraday type; this possesses the properties of excluding electrostatic fields,



permitting only electromagnetic fields to pass. Since most interference is of electrostatic nature it is greatly reduced. A large demonstration model of the loop is shown in photo Fig. 1; the receiver loop assembly appears in Fig. 2 and the complete receiver installation is shown in Fig. 3. The standard loop unit is about 12 in. wide by 24 in. long.

Ordinary antenna reception may be obtained by merely throwing the switch indicated in diagram Fig. 4.



PM ECONOMY NINE

By F. M. Lund

IN BUILDING the 9-tube superheterodyne receiver to be described, several objectives were kept in view. It had to be simple, inexpensive, easy to construct and adjust, yet it must have the best possible sensitivity and selectivity consistent with fine tone quality. Although designed for the broadcast band only, nothing has been overlooked in order to obtain maximum performance on this band.

A full-size chassis base avoids crowding of parts and simplifies construction. Either metal or glass-bulb octal-base tubes may be used in the 8-prong tube sockets. If metal tubes are employed, the tube shields are, of course, not required. Other outstanding features include, tuning eye, push-pull output, no audio transformers, no chokes, phase inverter, 10-watt output, one microvolt sensitivity and even channel selectivity; also full automatic volume control, variable tone control and phonograph pick-up jacks which enable the user to play records through the audio system and use the radio vol-

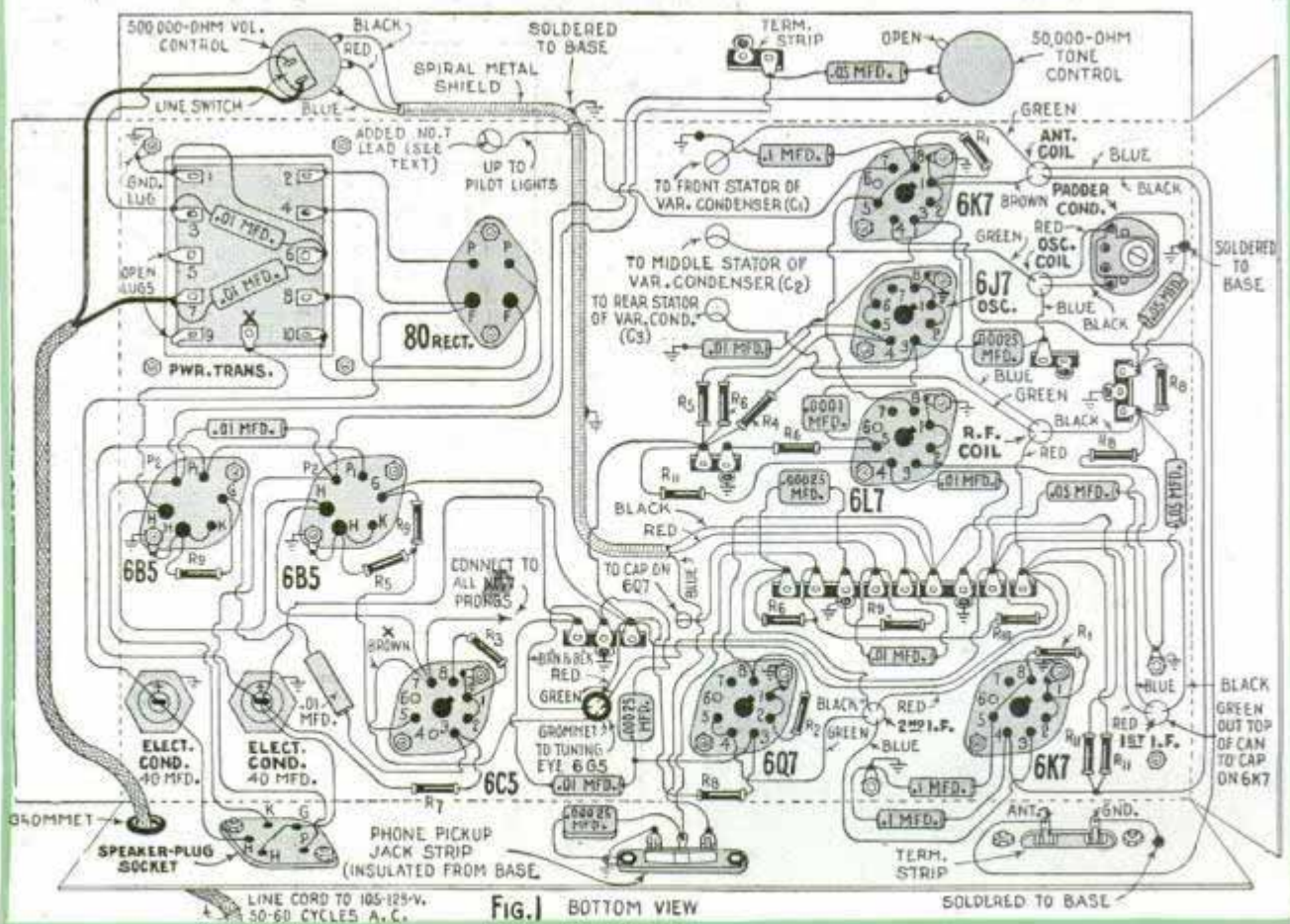
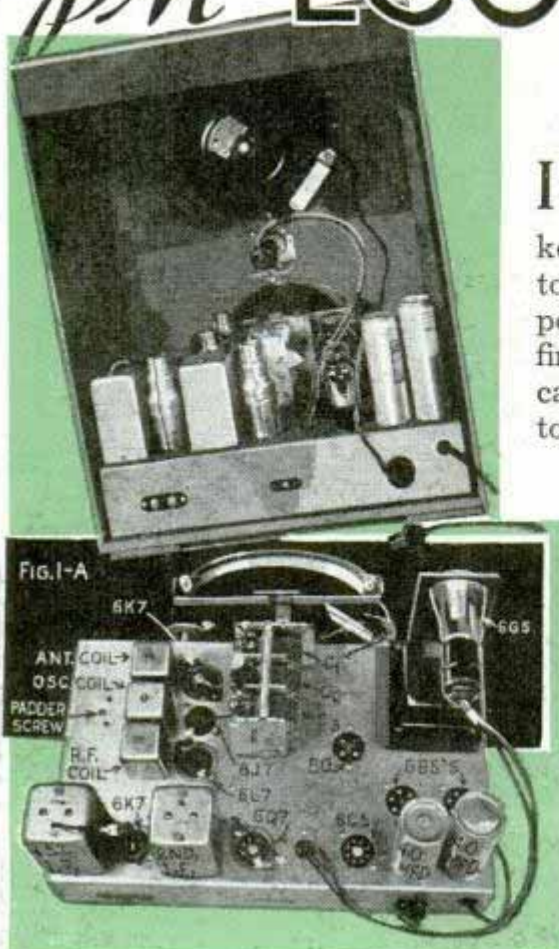


FIG. 1 BOTTOM VIEW

BROADCAST RECEIVER

ume control. Type-6B5 power-amplifier tubes in push-pull insure unusually fine tone quality if a good 8-in. dynamic speaker is employed.

A simplified wiring diagram appears in Fig. 1, and the 3-gang variable condenser connections are all clearly shown in Fig. 2. This ganged variable condenser should be mounted on soft rubber washers, the nuts on the mounting screws being left loose so that the unit is cushioned on the base. A strip of flexible woven-wire braid is used to make the ground connection to the metal base.

Complete base details are given in Fig. 3. This sheet metal should be of fairly heavy-gauge steel or similar metal that can be soldered easily. The schematic circuit diagram, Fig. 4, includes wiring details for the tuning-eye socket which is a standard Amphenol 5-wire assembly for a type 6G5 tube, and is altered to 4 leads. It may be mounted temporarily on a strip of Bakelite screwed to the chassis base as shown in photos Figs. 1-A and 1-B; photo Fig. 1-C is a bottom view of the completed set. Although the materials used

(Continued to page 138A)

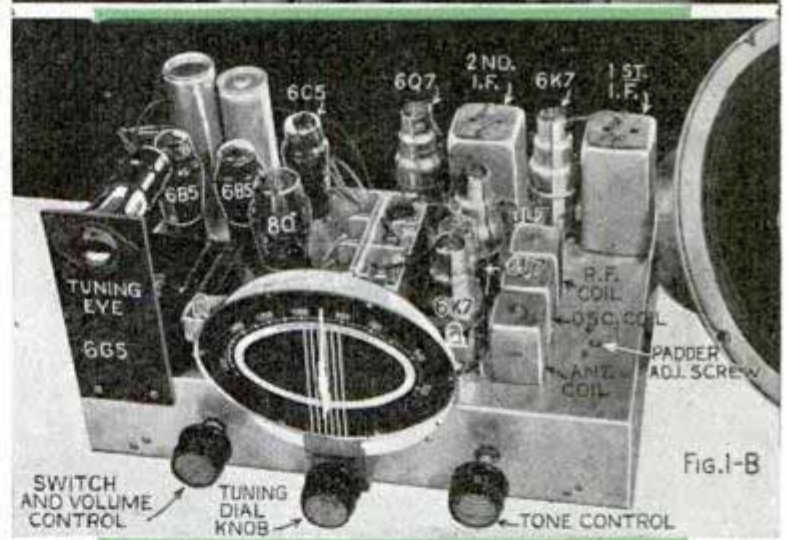


Fig. 1-B

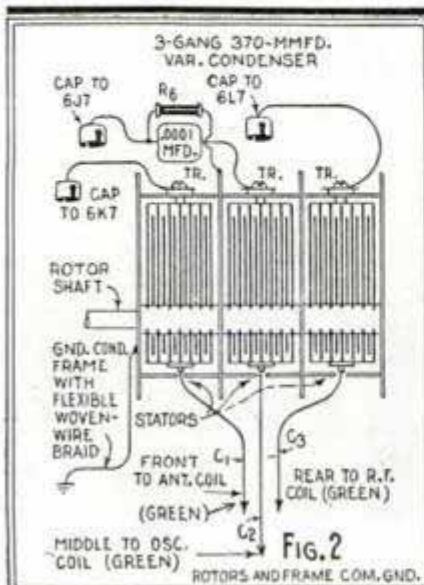


FIG. 2

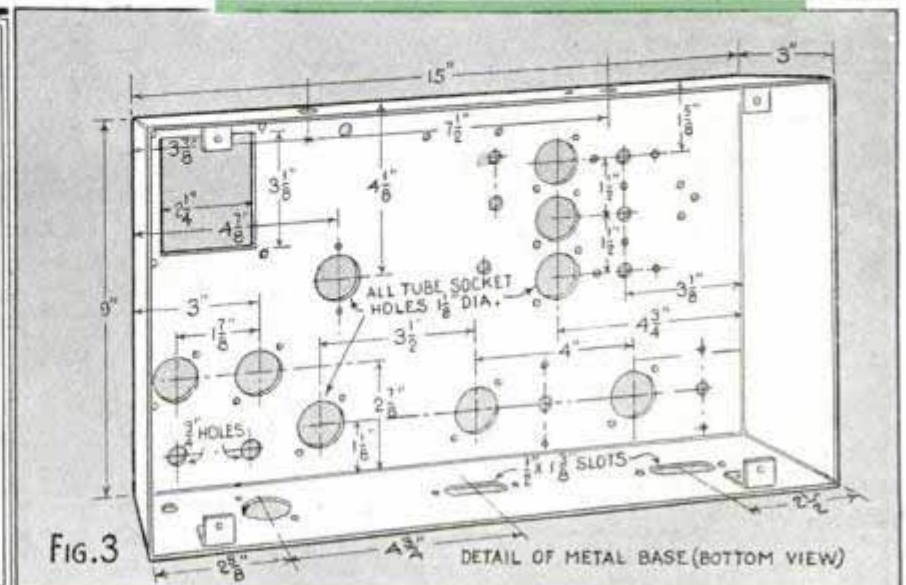
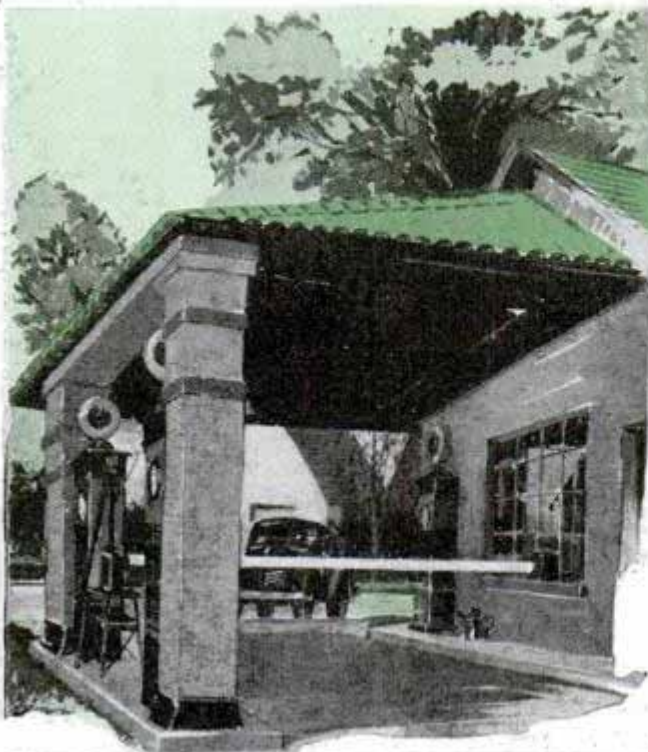


FIG. 3

DETAIL OF METAL BASE (BOTTOM VIEW)

How to Build an Inexpensive Photocell Relay

By M. N. Beitman



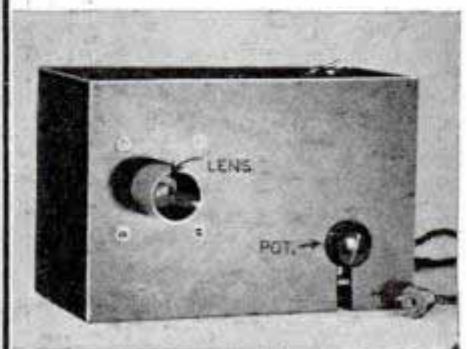
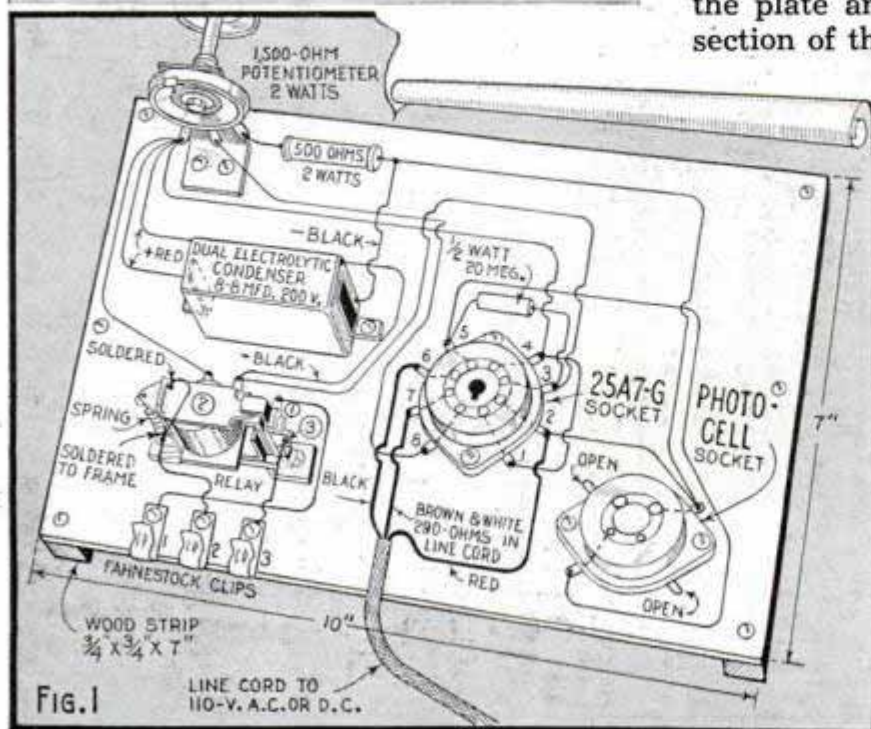
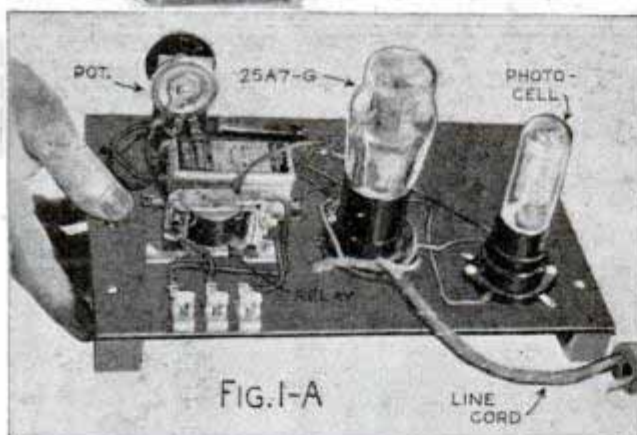
THIS simplified 110-volt a.c.-d.c. photocell unit will permit efficient control of lights, alarm bells, counters or other electrical equipment by means of changes in light intensity. In other words, this photocell "magic box" may be made to switch "on" or "off" associated electrical equipment with either an increase or decrease of light, handling loads up to 3 amps.

The photocell may be exposed directly to light, or it may be shielded and the control light source directed in a beam through a lens in the manner illustrated in the sketch at upper left. The car coming in to the gas station interrupts the light beam and the photocell relay closes an electric bell circuit to summon the attendant.

All parts are mounted on a $\frac{1}{8}$ by 7 by 10 in. pressed wood base and should be arranged just as shown in the simplified wiring diagram Fig. 1. A schematic circuit diagram is given in Fig. 2. Excellent stability and sensitivity are obtained by connecting the photocell in the control grid circuit of the dual-purpose 25A7-G tube. The 1,500-ohm, 2-watt potentiometer is easily adjusted for the light condition present so that changes in intensity of the light source will cause the plate current to change and the relay to operate. Condenser-filtered rectified current is placed on the plate and screen grid of the pentode section of the 25A7-G tube; chatter of the relay is prevented by the second 8-mfd. section of the dual electrolytic condenser unit.

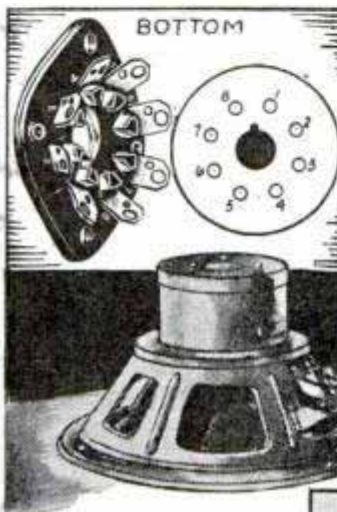
A photo of the completed relay is shown in Fig. 1-A; it may be operated in this

(Continued to page 134A)



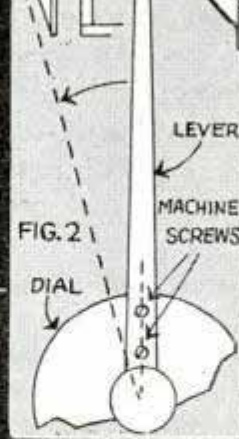
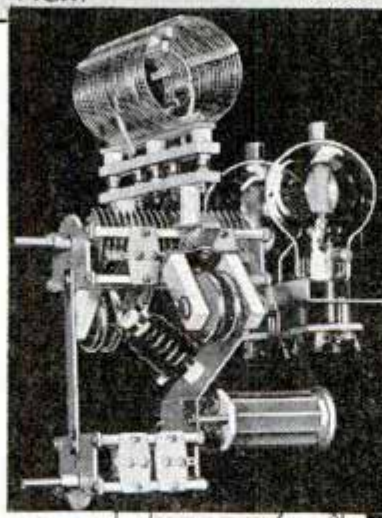
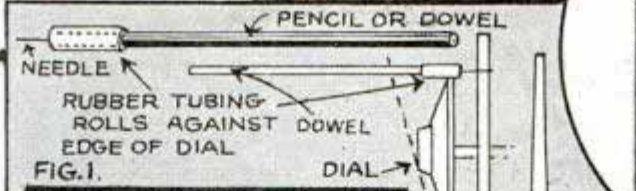
PRACTICAL RADIO SUGGESTIONS

Below, 8-prong wafer-type tubes socket for tubes having octal bases. Standard pin numbering is always clockwise from alining key in bottom view. Right, easily assembled cabinet for Peridynamic speaker; no baffles are necessary. Kit includes speaker and knocked-down inclosure

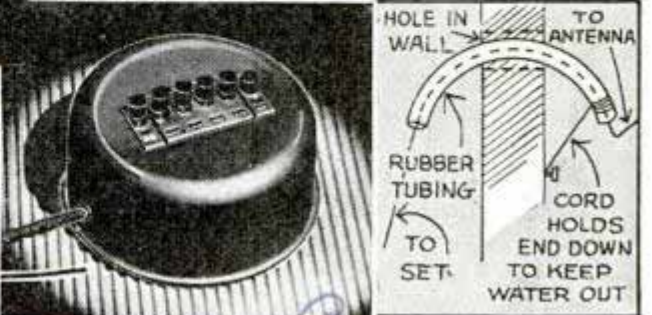
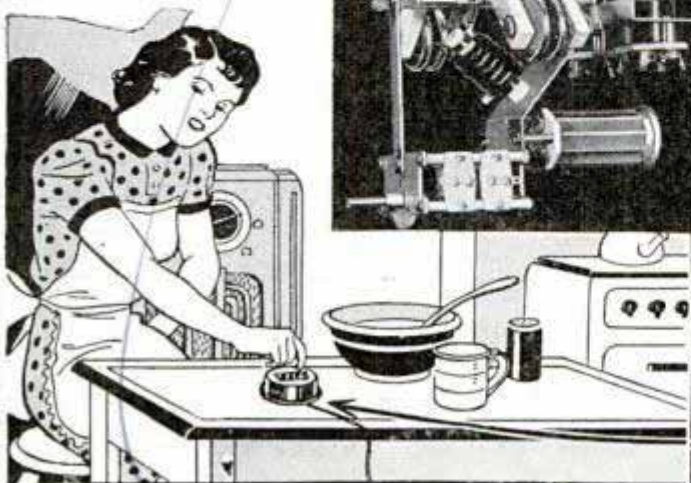


Right, Figs. 1 and 2 show simple methods for vernier tuning with an ordinary dial

Designed for amateur assembly, this compact self-supporting push-pull r.f. power amplifier unit, at right, is suitable for any of the popular triode tubes having ratings of from 100 to 300 watts output per pair



Below, rubber tubing provides temporary substitute for a porcelain-tube insulator to bring antenna lead-in into building. Lower left, easily portable automatic push-button device for remote tuning; may be attached to any a.c. radio receiver by means of a 25-ft. cord; buttons can be set for five favorite local stations

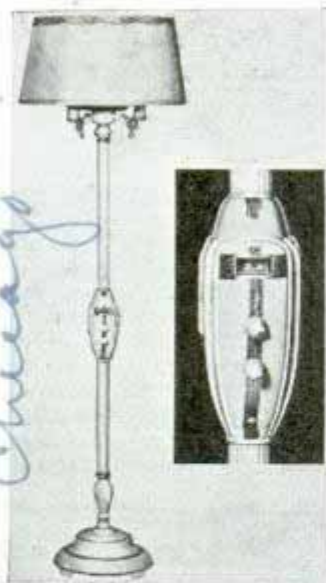


Battlefield Relics Found with Metal Locator



Twelve 6-in. shells and two pieces of bursted cannon were located and dug up on a civil war battlefield near Vicksburg, Miss., by Mr. James Nave in a single day. The above photo shows Mr. Nave with his trophies and the 5-tube radio metal locator, R-213, which he built from the construction article that appeared in the September, 1935, issue of Popular Mechanics Magazine. He has found about 750 pounds of battlefield relics and states that he has located more near the site of an old fort.

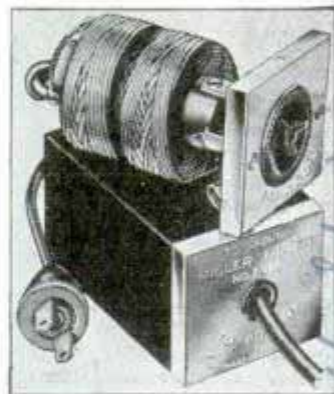
Radio Built into Floor Lamp



This combination lamp and receiver is a space saver in small apartments. A complete 4-tube set is built into the base; tuning controls and illuminated dial are located within easy reach of a chair for convenient operation and the speaker is in the top of the lamp.

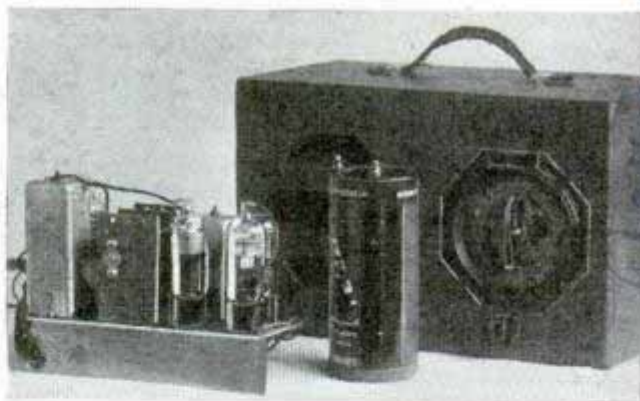
All-Wave Line Filter

Used in connection with the supply cord of a radio receiver, this filter is claimed to prevent unwanted signal pickup and direct-line noise interference from the house-wiring system. It employs double duo-lateral wound chokes and twin condensers. It is also suitable for use in eliminating interference from small electrical appliances such as fans and vacuum cleaners.



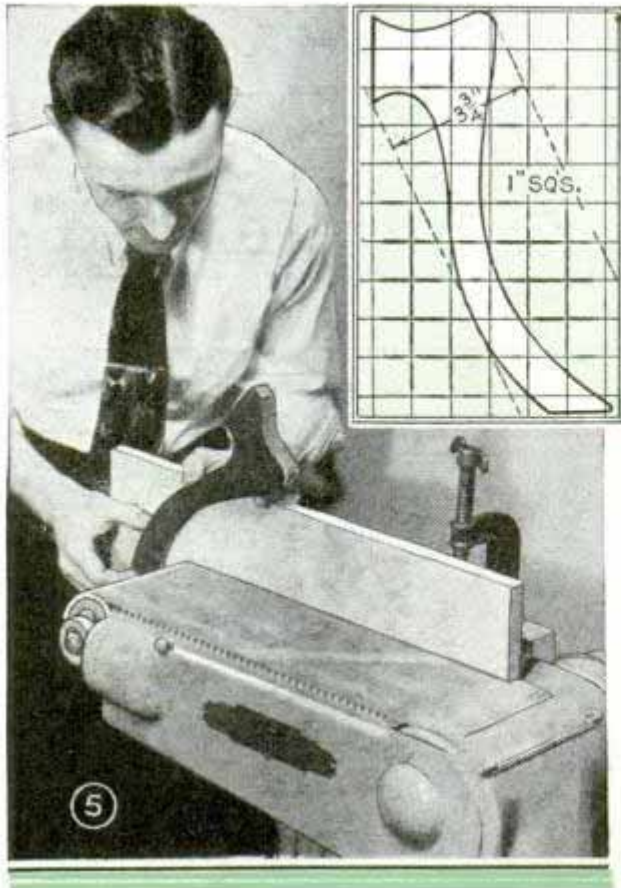
Portable Battery Receiver

Operating on a single No. 6 dry-cell A-battery, and two small B-batteries, this 4-tube super employs new low-drain tubes for economical operation. The A-battery drain is said to be less than $\frac{1}{4}$ amp. It is available complete in cabinet or as a wired chassis and separate speaker for installation in a cabinet of your own construction.



Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build a Radio Tube Tester. This simplified unit can be used to check over 120 different types of modern tubes. Operates on 105 to 120-volt, 50 to 60-cycle a.c. power line and is not critical in adjustment. Also—**An Inexpensive Low-Power CW Transmitter for Beginners**, complete with power supply.

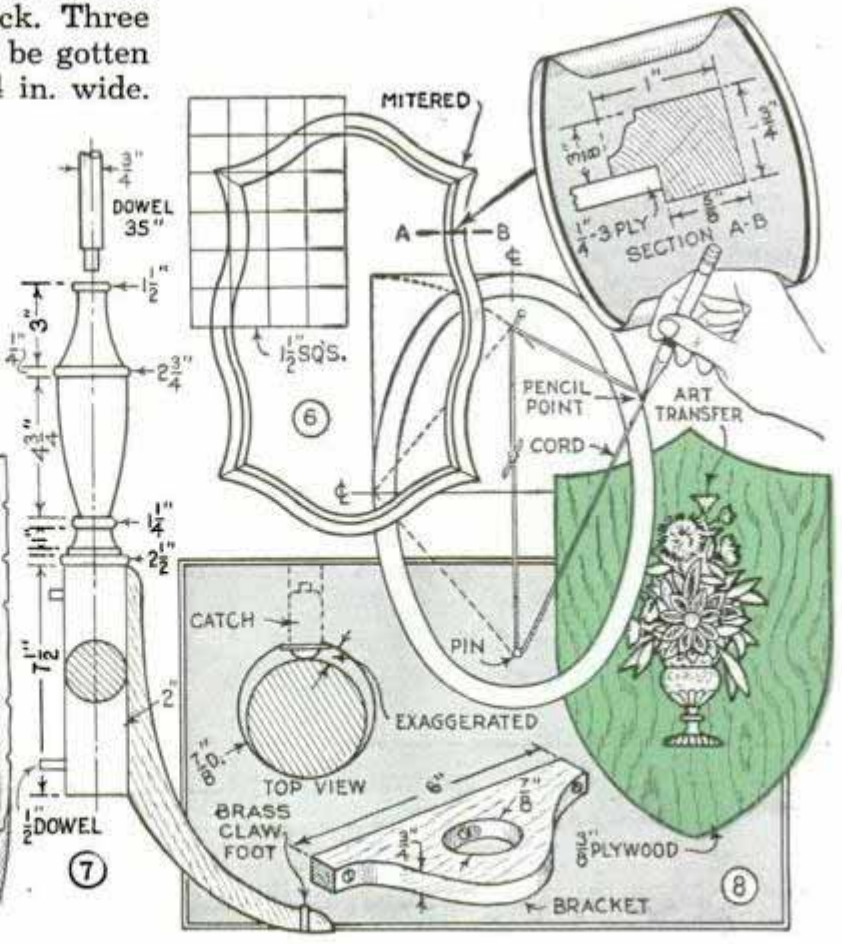
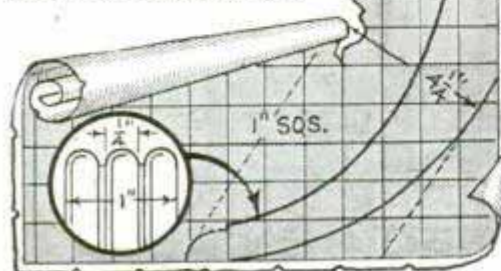
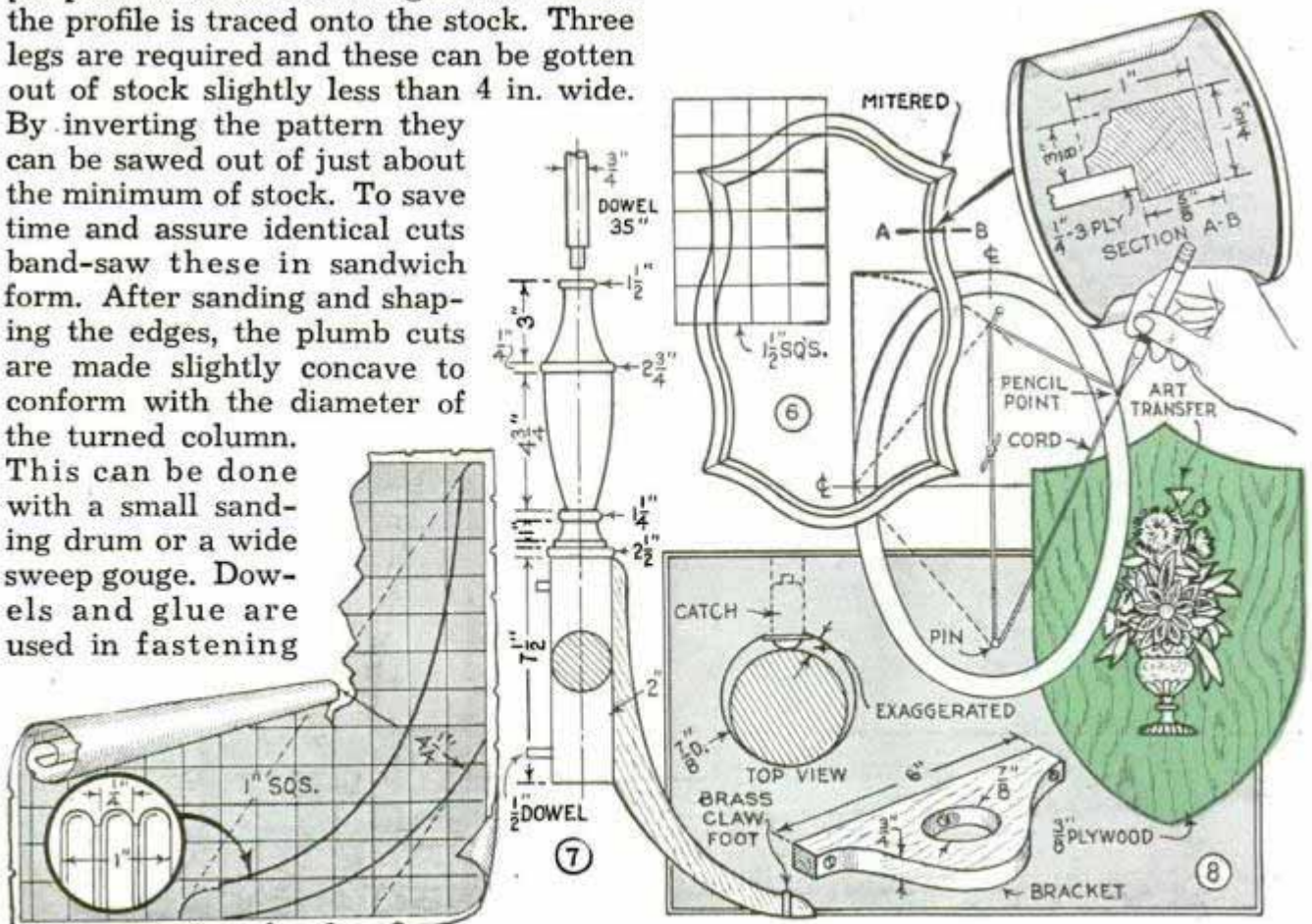


the legs to the column. The lathe index pulley can be used to good advantage in spacing them 120 degrees apart as in Fig. 1.

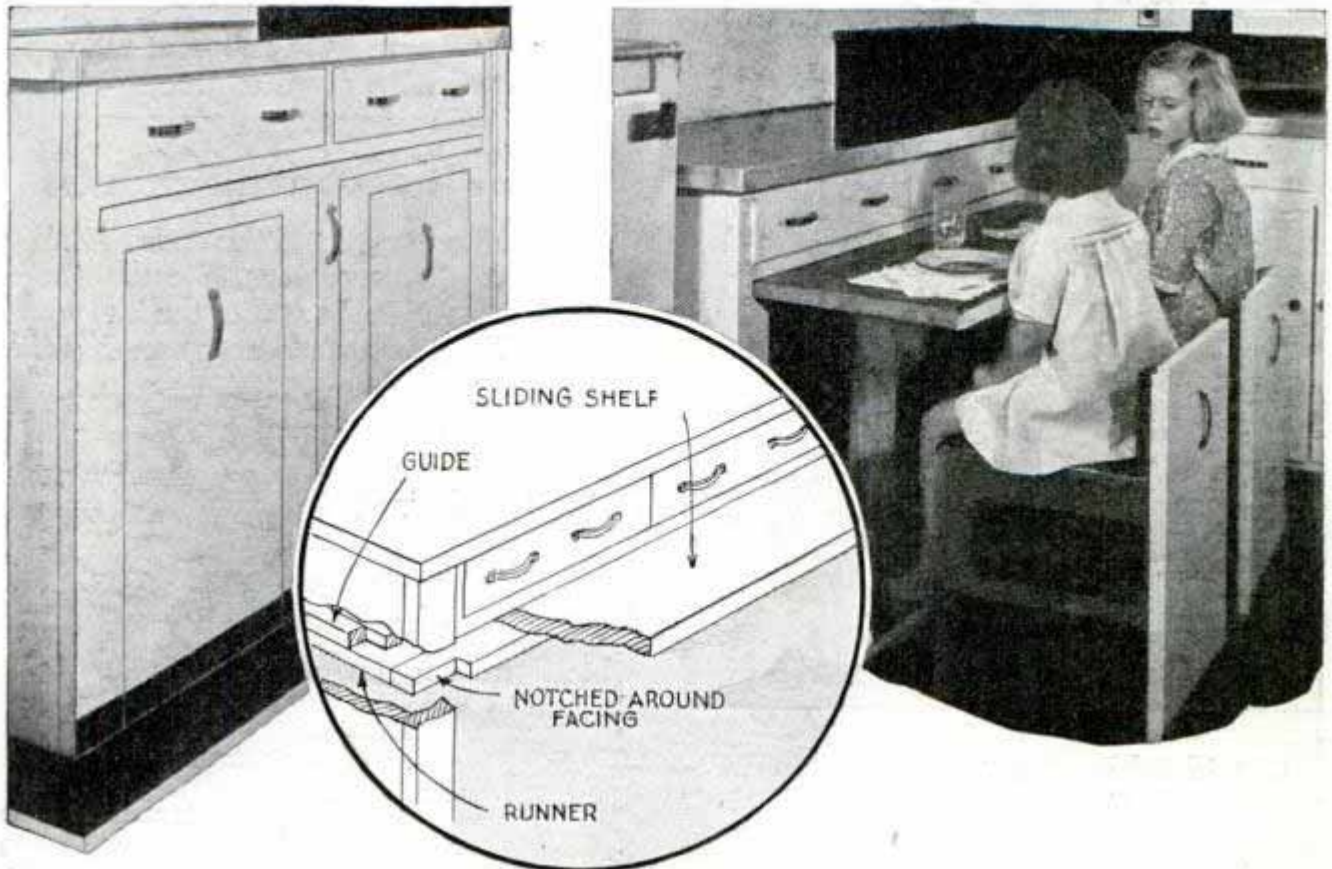
A similar procedure is used in working up the alternate design shown in Fig. 7. To simplify the turning, the upper shaft may be of a standard 3/4-in. dowel, stained to match the lower section. The beaded legs are likewise dowel fastened and capped with a standard claw foot. Aside from the rectangular screens, which can be mitered from standard stock picture molding, Figs. 6 and 8 give several irregular shapes which can be used. The scalloped and oval shapes shown are molded on the shaper while the shield is simply a veneer-faced plywood panel decorated with a decalcomania transfer. The screen is made adjustable on the upper section of the pedestal by means of a small 1/4-in. bullet catch fitted to a bracket which in turn is screwed to the back of the screen as in Fig. 8. The open-type frames are fitted with a 1/4-in. plywood panel over which a floral needle-point or tapestry is stretched before tacking with brads in the rabbeted edge. Care must be taken to space the brads equally to avoid wrinkles or uneven stretching of the tapestry panel.

of the plug is used in mounting the work between centers.

From the detail in Fig. 4, a full-size paper pattern should be enlarged from which the profile is traced onto the stock. Three legs are required and these can be gotten out of stock slightly less than 4 in. wide. By inverting the pattern they can be sawed out of just about the minimum of stock. To save time and assure identical cuts band-saw these in sandwich form. After sanding and shaping the edges, the plumb cuts are made slightly concave to conform with the diameter of the turned column. This can be done with a small sanding drum or a wide sweep gouge. Dowels and glue are used in fastening



'Breakfast Nook' Housed in Kitchen Cabinet



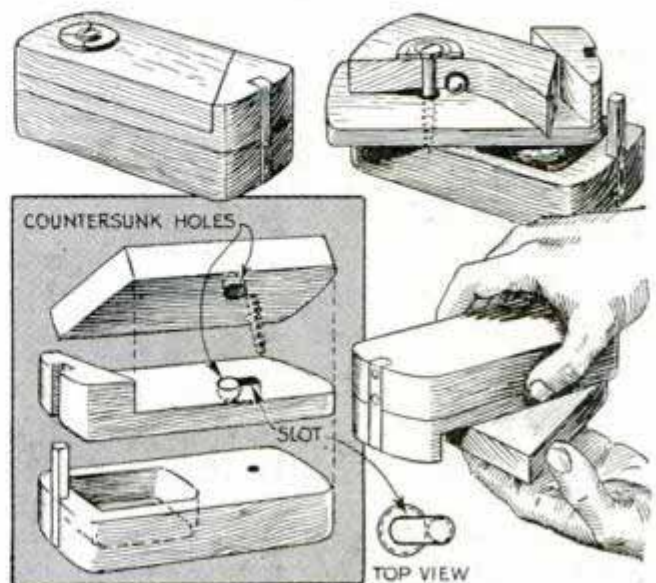
Here's a neat and useful space saver. It's simply an ordinary kitchen cabinet altered to house a table and two chairs as you see in the photos above. The detail in the circle shows how to alter a cabinet of the type having two drawers directly under the top and a shelf compartment below. Usually the compartment doors can be made to serve as chair backs, or, the latter

can be made of $\frac{3}{4}$ -in. plywood. The shelf or table top is supported on an extra rail-and-runner frame just like a drawer. The shelf should be provided with a center leg and a handle or drawer pull as in the upper-left view. To prevent the shelf sliding out too far, stop blocks are screwed to the back edge.

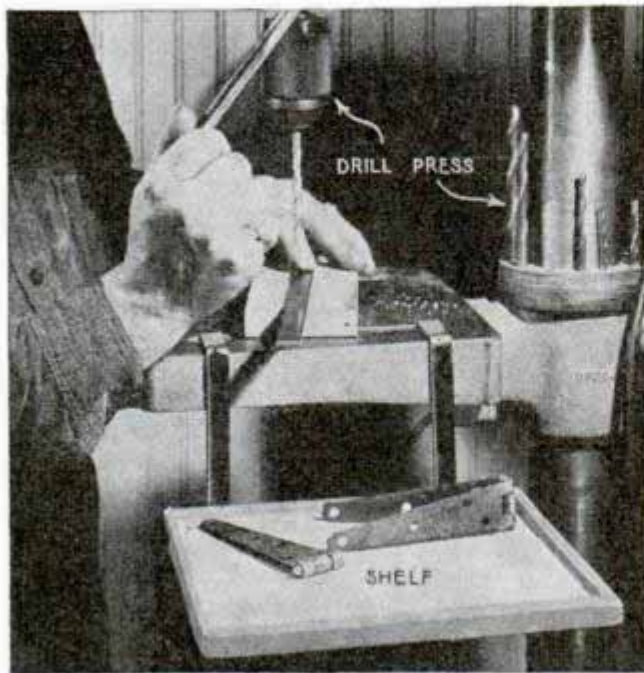
—Daniel R. Merrill, Montclair, N. J.

Gravity and Steel Ball Solve Puzzle to Open This Trick Box

To open this box, the two-piece lid must be slid away from the peg and swung around. But this is impossible when the box is closed and standing top side up, because a steel ball is then lodged in the slot next to the screw on which the lid parts pivot. To dislodge the ball from the slot and transfer it into a blind hole in the top part, turn the box upside down and swing the top part out. Then, holding the box normally, you slide the second part back. The blind hole may be located directly over the ball when the top part is closed, or at any other point the same distance from the screw, so the ball drops into the hole at a certain position of the top part.



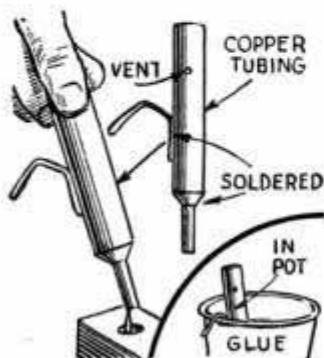
Hanging Shelf on Drill Press Holds Small Work



Considerable time can be saved in drill-press work if you provide a small shelf that can be attached to the table to hold small parts. The one shown here was made of $\frac{3}{8}$ -in. plywood cut to the same size as the drill-press table, and fitted with a narrow molding around the edge. Two lengths of flat iron, bent to form hooks, were screwed to the bottom. When the shelf is needed, the hooks are slipped into one of the table slots. The shelf is quickly removed for operations where the hooks would interfere.

Glue Dropper for Cabinet Work

Here's a dropper that will be found handy for applying glue in small dowel holes, blind mortises, etc. A short length



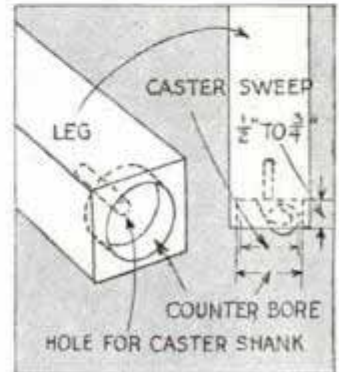
of copper tubing with one end closed has a spout soldered to the other end. A piece of wire soldered to the tube permits hanging it on the gluepot when not in use. A vent in the tube near the closed end permits

air to escape while filling, which happens each time the dropper is hung inside the

gluepot. When the dropper is removed, a finger is placed over the vent to keep the glue from running out where not wanted. Raising the finger from the vent momentarily allows a few drops of glue to escape.

Casters Recessed in Furniture

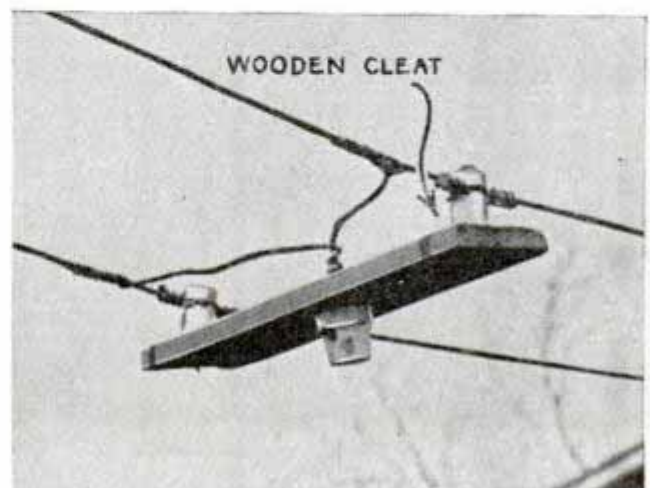
In mounting casters to the ends of bulky or massive furniture legs, a counterbore should be made in the end of the leg, when possible, large enough to accommodate the sweep of the caster. Furniture manufacturers often use a special recessing tool that makes a cut for the purpose at the same operation in which the leg is drilled to receive the caster shank. However, it is



quite possible to make a counterbore serve the same purpose, provided the leg is large enough to accommodate the caster sweep, and still leave a margin of wood standing all around.

Stringing Lamps in the Garden to Avoid Short Circuits

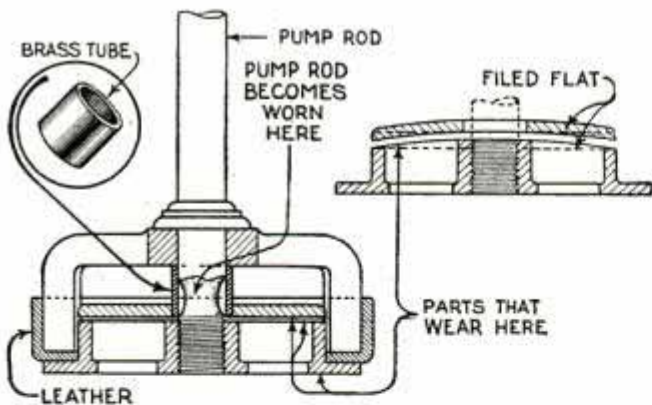
For illuminating lawns, gardens, parking spaces, etc., an improvement over the frequent method of stringing lamp cord around for the purpose, is to use two lengths of weatherproof, rubber-covered wire, which you can get from any dealer in electrical supplies. Wood spreaders serve the double purpose of spacing the



wires and carrying the lights. With this arrangement, constant movement of the wires cannot result in chafing and short-circuiting, which is one objection to using lamp cord. While the size of the wire is determined by the load, No. 12-gauge will be satisfactory usually. The spreaders are all cut to the same length and electrician's porcelain "knobs" are used to attach the wire. A cleat receptacle is screwed to the underside of the spreader and short lengths of the same wire are connected to the receptacle after which they are spliced, soldered and taped as indicated. The leads are connected to a fused branch circuit block so that the circuit will be independent of all others.

Repairing a Pitcher Pump

When new leathers in the cylinder fail to repair a pitcher pump, the trouble may be due to wear on the iron disk as it moves in the plunger head. The hole in the disk becomes enlarged and the pump rod wears smaller. This allows the disk to slip sideways so that it does not cover the openings in the bottom part, thus allowing water to leak back. The meeting surfaces of the



disk and bottom part also become worn, allowing more leakage. A simple repair for this condition is effected by slipping a short piece of thin brass tubing over the worn place on the pump rod and filing the disk and bottom part flat where they touch.

—David Jenkins, Xenia, Ohio.

Have you found an easier way to do some commonplace job around the home? If you have, send us a short description of how you did it, together with a snapshot or rough drawing. Popular Mechanics will mail you a check for all material accepted. Address Homecraft Editor.

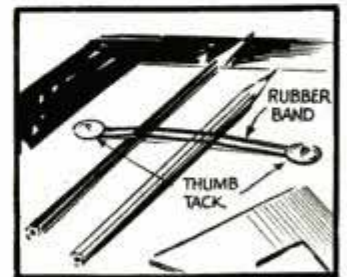
'Pantograph' Drawer Swings Out from Workbench



This drawer can be pulled out to its full length with less effort than the sliding type because its weight is carried on four pivoted legs instead of cleats on the underside of the bench top. The drawer should be built sturdily, and reinforced along the sides where the legs are attached. A chain fastened to the back of the bench and to the rear end of the drawer limits its forward movement. A block is nailed to the underside of the bench top to serve as a stop when the drawer is swung back. When the drawer is resting against the block, the legs should slant toward the back slightly so it will not fall forward.

Pencils Held on Drawing Board

Stretched across one corner of a drawing board and fastened at the ends with thumb tacks, an ordinary rubber band provides a good emergency pencil holder. Just slip the pencils under the rubber band which will keep them from rolling.



—Horace Taylor, Anderson, Ind.

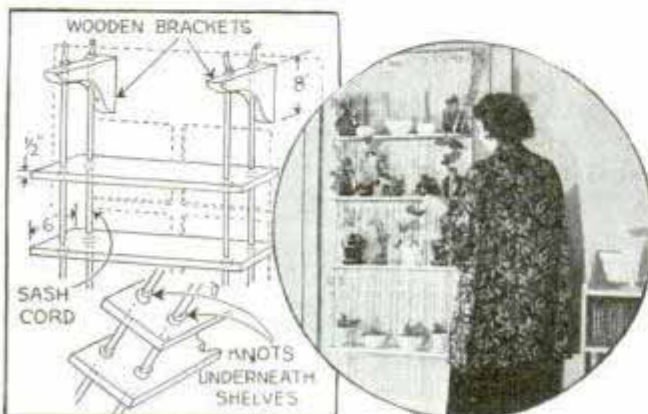
Wallpaper Knife Is Sharpened on Emery Cloth



Tacked to the pasting table near one corner, a piece of emery cloth is handy to keep a wallpaper trimming knife sharp. A few strokes of the knife across the abrasive surface of the paper at intervals will do the trick.

"Rope Ladder" Shelves for Door

Suggestive of rope ladders used on ships, these shelves look well on glass doors and give added space to the indoor gardener. They are useful for walls and windows, too. Ropes through holes near the corners of the shelves support the boards on knots tied just below the holes. The ropes are supported from brackets on the door so that the latter may be opened without dis-

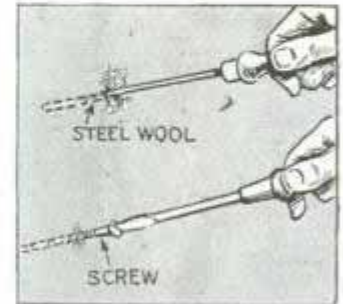


turbing the shelves. The holes in the shelves should be just a trifle larger than the rope used, but small enough so that a single knot will not pull through them.

—John G. Roberts, Chicago.

Screws Held in Plastered Wall with Steel Wool

The next time you want to drive a screw into plaster, make a small hole in the wall and tamp it tightly with steel wool. Then drive in your screw. Besides anchoring the screw, the wool prevents the plaster from crumbling and making an ugly hole.—Ralph Baker, Santa Ana, Calif.



Clothespins Hold Tree Lights

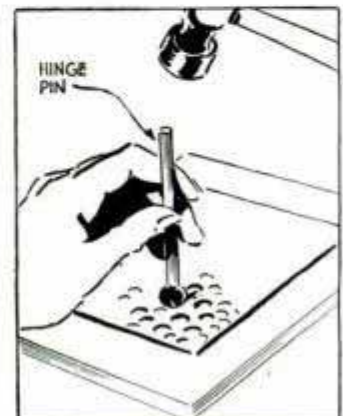


If Christmas-tree lights are fastened to spring-type clothespins by their socket and wires with rubber bands as shown, they can be clamped in a vertical position safely along the

tree branches instead of hanging downward loosely. The clothespins should be painted green to harmonize with the green needles of the tree.

Ball of Hinge Pin Makes Tool for Hammering Brass

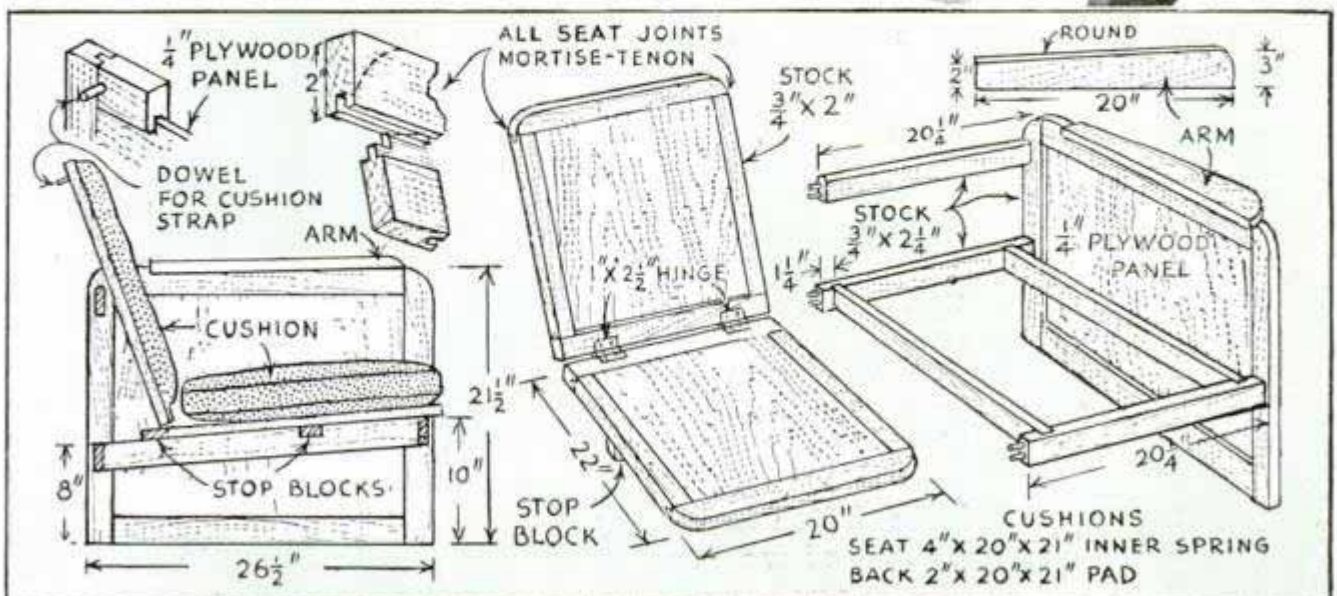
In the absence of a ball-peen hammer for decorating sheet brass, a good substitute can be improvised quickly by simply using the round end of a butt-hinge pin. One of these can be taken temporarily from a door.



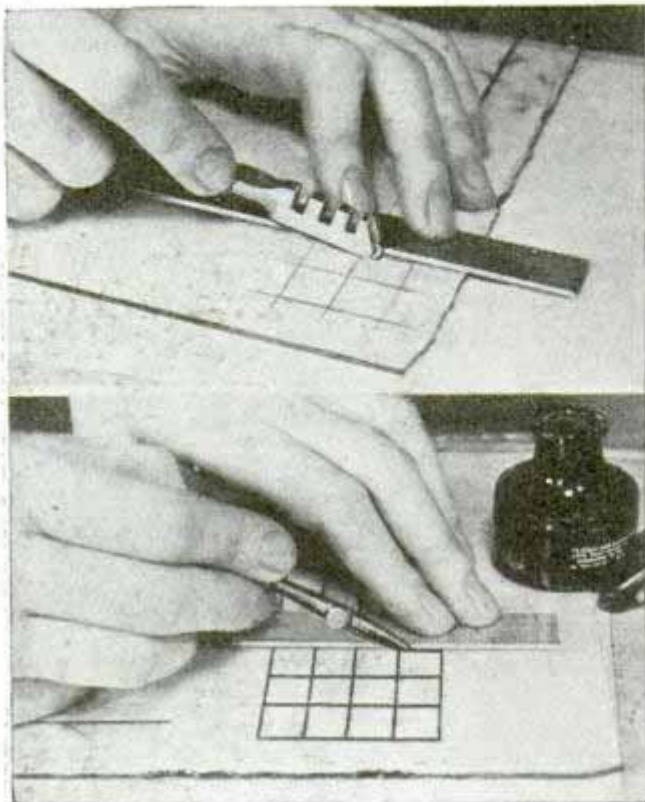
LOUNGE CHAIR

is adjustable

IDEAL for the porch, and nice enough for den or playroom, this comfortable lounge chair is inexpensive and has an adjustable seat and back. Construction consists largely of making four $\frac{1}{4}$ -in. plywood panels, two for the chair sides and two for the seat and back. All joints in the frame should be mortised and tenoned or doweled. The two seat frames are the same size, and are held together with two butt hinges. After paneled sides of the chair have been made, the two panels can be fitted together with the various cross members. The upper crosspiece at the back should be rounded on the top edge to permit the seat back to slide against it. The two slanted members on which the seat rides are dadoed into the cross members, the joints being secured with dowels. Stop blocks are nailed to the slanted members to stop the backward travel of the seat; a second set of blocks nailed to the underside of the seat stops the forward travel.

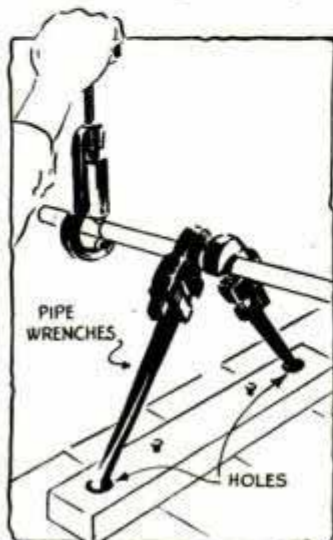


Simulating Casement Windows on Model Buildings



A good way to simulate windows on model buildings is to rule them on glass with India ink. Two methods may be used: The glass may be ruled with a glass cutter, the scored lines being filled later with the ink, or the lines may be made directly on the glass if its surface has been rubbed lightly with a piece of putty. After the ink has dried, the rest of the glass is carefully wiped clean. Then a coat of shellac is applied over the entire surface.

Improved Pipe Vise

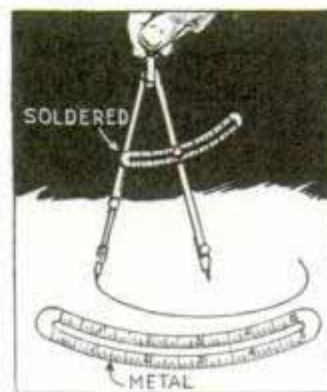


Home handy men who have no pipe vise, can improvise one from two pipe wrenches, which will serve well in an emergency. After adjusting the wrench jaws to grip the pipe securely, the handles are set in holes drilled in a piece of wood, which is nailed to

the bench top near one end. The end of the pipe extending beyond the bench can be cut or threaded then with little difficulty.—Opie Read, Jr., Chicago.

Calibrated Radius Arm on Dividers

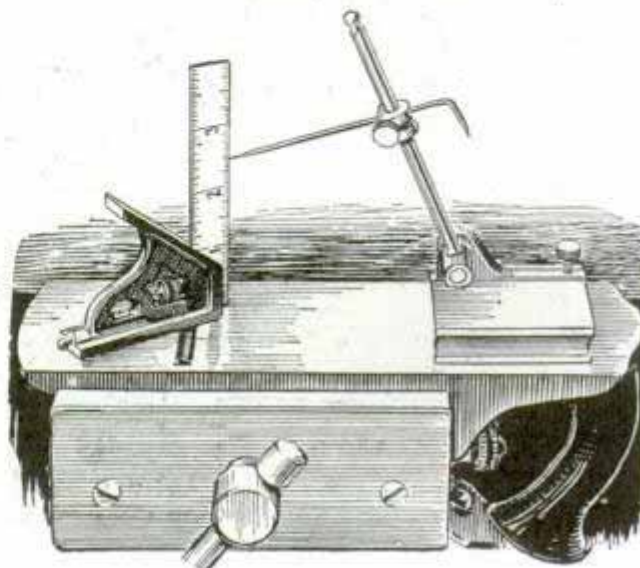
Here's a way to set a pair of dividers or a compass to any desired radius quickly with the aid of this calibrated arm. It is cut from a piece of sheet brass to the shape shown and is slotted in the center, after which it is soldered to one leg of the instrument. A hole is drilled and tapped in the other leg for a thumbscrew, which fits the slot of the arm and locks the legs at any desired adjustment. To calibrate the arm, set the legs exactly 1 in. apart at the points and scribe both the arm and the leg. Then calibrate the remaining part of the arm in the same way.



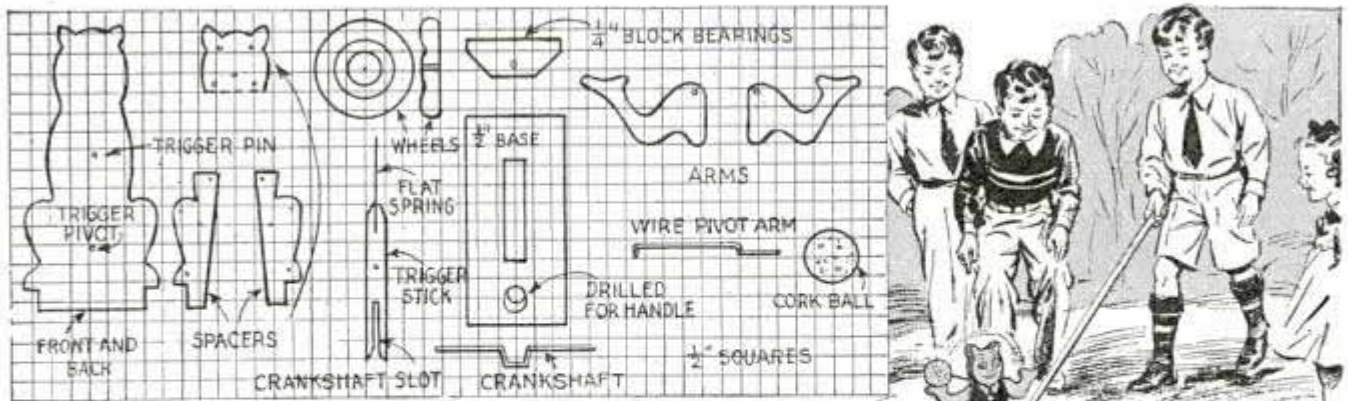
Plane Used as Surface Plate

As a substitute for a surface plate, a hand plane clamped upside down in a vise serves nicely. Of course, the cutter must be withdrawn and the sole wiped clean. In the illustration, a surface gauge is being set to a combination square.

—S. J. Gancher, Richmond Hill, N. Y.



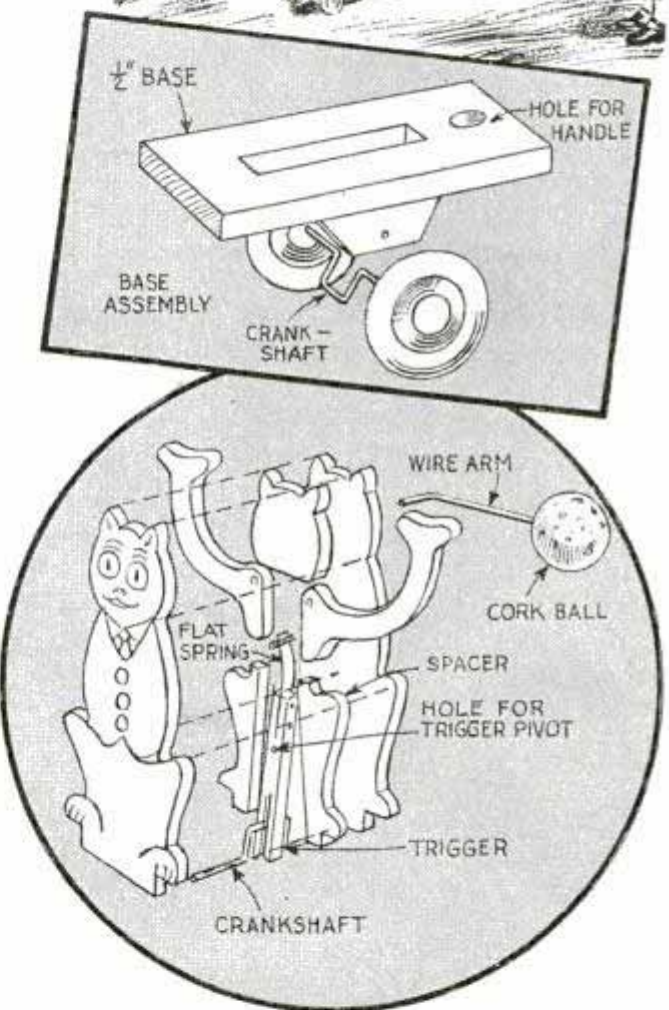
"Juggling Cat" Tosses Ball from Paw to Paw



Wheeled across a floor, this cat tosses a cork ball from one paw to the other and it will entertain a small child for hours. Simple construction permits the parts to be cut in duplicate so that you could assemble a number of toys and sell them at a profit. Thin stock is used for the body, which consists of two duplicate parts with spacing blocks between, which are bradded together, leaving sufficient space for the pendulum to swing. This is provided with a piece of clock spring. The pendulum, pivoted on a brad driven through the toy, rides the crankshaft axle and is moved back and forth as the axle turns, snapping the spring strip across the trigger pin. The force of the spring striking the pivoted arms alternately flips them upward in an arc, tossing the cork ball back and forth over the head of the figure. The ball is impaled upon a wire which pivots at the central point of the figure. If desired, you can make the toy to suit the season. A rabbit can be substituted for the cat, and the ball can be replaced with an "egg," to convert the toy into an Easter special.

A Wax Finish on Wood Plates, Spoons and Salad Bowls

Here is an excellent penetrating wax that will give a high luster to natural-finished wood plates, salad bowls, etc., and contains nothing that contaminates or imparts a flavor to the food. It is made by melting pure, white beeswax and stirring in an equal amount of olive oil as the wax cools. The mixture will solidify at room temperature. A lump of it will smooth out under the warmth of the bare hands as it is rubbed on the work with the fingers. Fur-



ther friction of polishing with a soft cloth makes a perfect spread of the right consistency. The finish is brightened easily without polish and is impervious to finger marks.—H. Thompson, Westfield, N. J.

☞ Gauze bandage material provides good facings for sheer wash frocks when the hem has been let down and there is no matching goods. It has the advantage of being pre-shrunk and therefore does not pucker when laundered.

A PENDLETON



Photo, courtesy Rhode Island School of Design

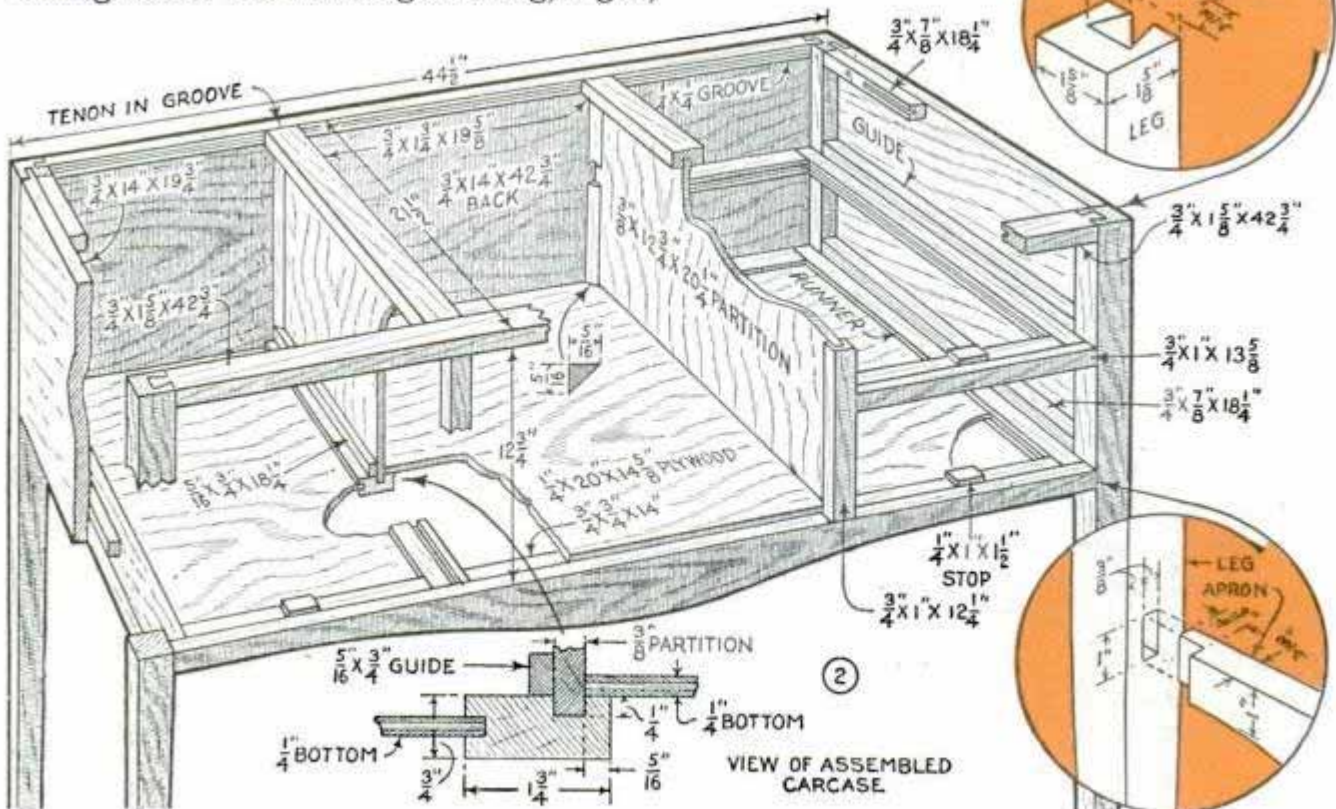
By R. O. BUCK

Lane Technical High School, Chicago

gives the general dimensions and also the location of the various decorative bands of holly inlay. The brass bail or pulls detailed are not exactly like the originals but resemble them so closely that they are suggested as a style that is available at a nominal cost.

The carcass: The cut-away drawing, Fig. 2, shows the method of framing the carcass. The ends and back panels are mortised into the legs with the outer faces flush with the faces of the legs. This type of construction requires very careful fitting so that no unsightly lines will be evident. It is advisable to set the panels in just a trifle when fitting so that a little may be planed from the leg later if necessary to make them perfectly flush. On the original, even the legs and rails are veneered. For your reproduction it is suggested that solid wood be substituted, and veneer, if used, confined to the larger areas such as the top, ends, drawer fronts, and doors. The compartment framing is un-

ONE of the choicest pieces in the famous Pendleton collection of American furniture of the Revolutionary era is the Pendleton sideboard shown in Fig. 1. The original is made of mahogany veneer, inlaid with fine lines of holly. The simplicity of the design gives the piece a distinction and individuality which makes it useful as a sideboard or serving table in most any dining room. The working drawing, Fig. 5,

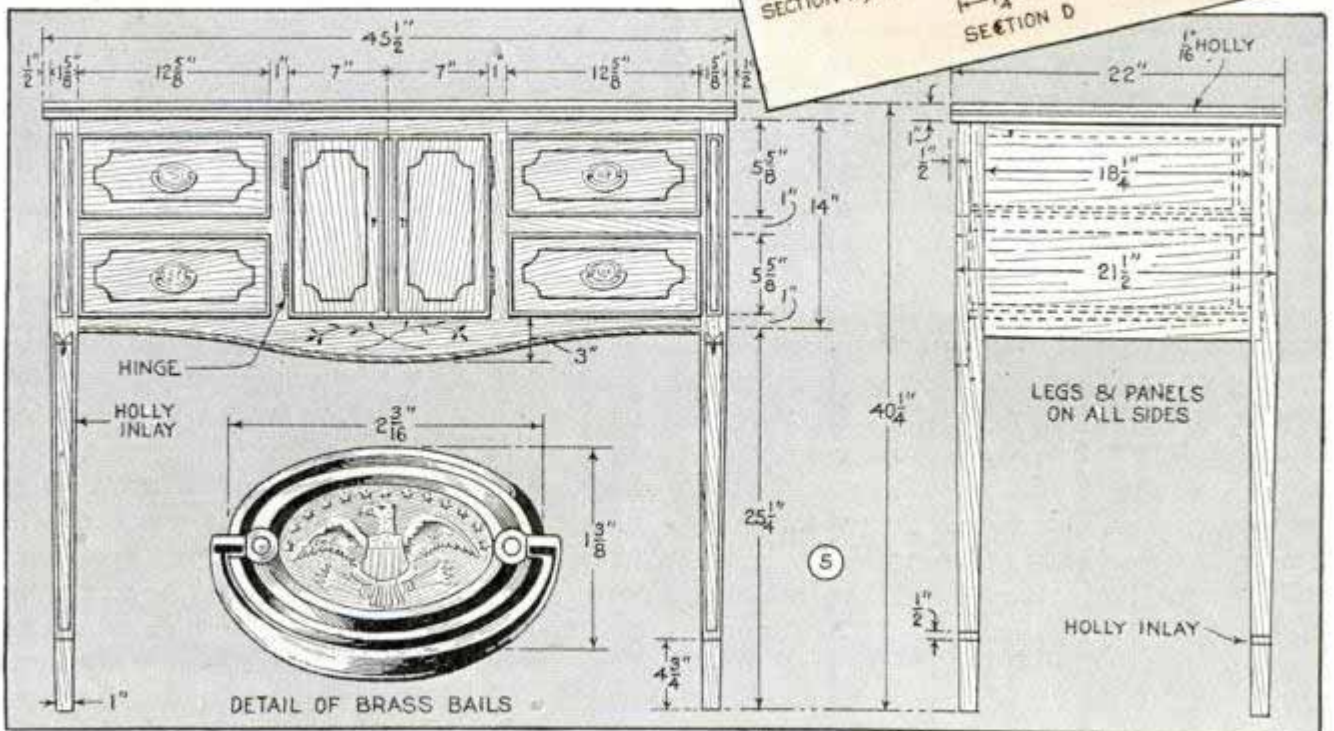
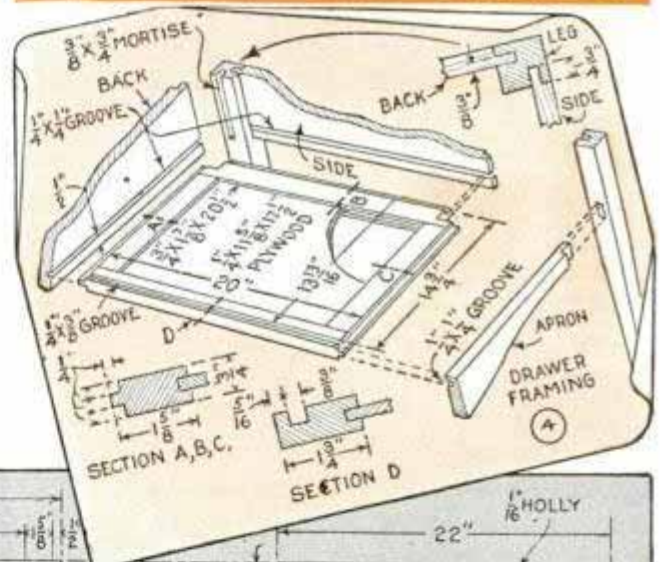


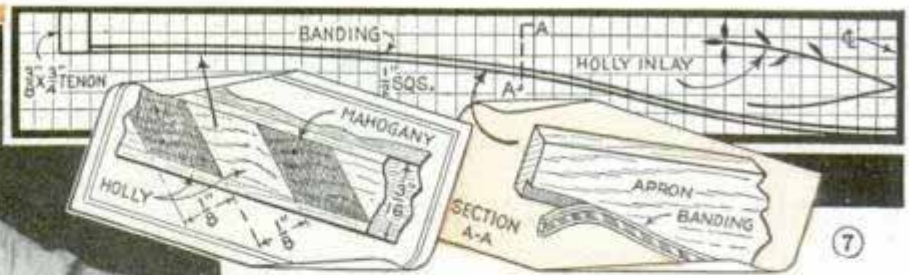
SIDEBOARD

Built in the true American tradition — an accurate copy of a famous original

usual, as shown in the detail of the partition cross rail. These pieces carry the partition, form a ledge for the compartment and a runner for the drawer. The partitions at the sides of the compartment are mortised into the top rail and apron, and the dividing rail for the drawers is mortised into the leg and vertical member in a similar manner. The partitions are secured at the back with triangular cleats, which are tacked and glued into place, but all other edges of the partitions are housed in grooves.

Framing for the drawer section is shown in Fig. 4. Note that these frames are set into grooves in the ends, back and apron, resulting in an unusually rigid construction. See sections A, B, C and D, Fig. 4. Plywood panels are set into the bottom frames to make the drawers dusttight. The frame for the upper, right-hand drawer is made in a similar manner, but is set in grooves on only three sides, and simply

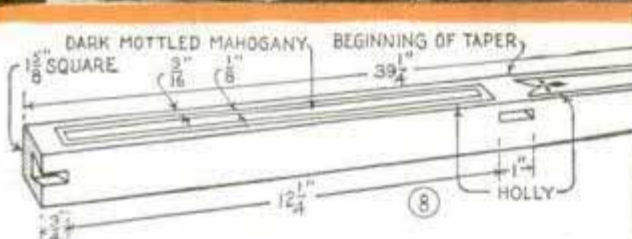




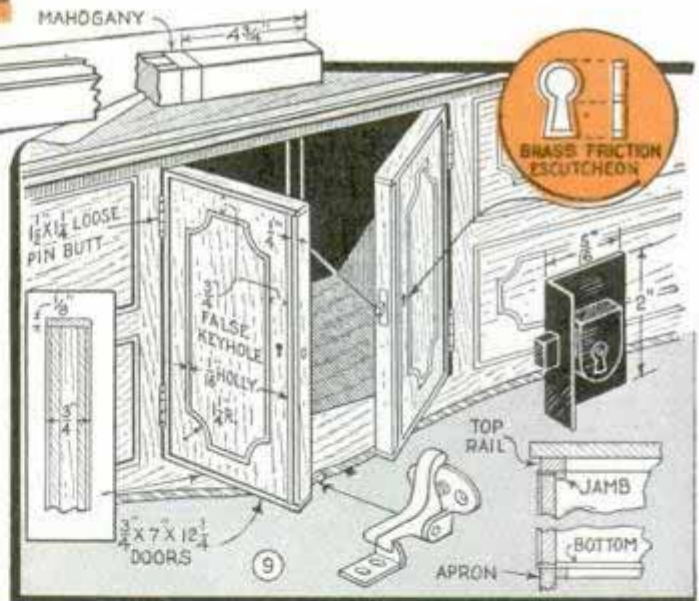
of the easiest methods for cutting the long panel mortises in the legs is shown in Fig. 3, using a routing bit and guide on a drill press.

The top: The top is made perfectly plain except for a single band of holly set into the edge. The groove for this inlay is cut by running the piece over a circular saw set to a depth of $\frac{1}{16}$ in. In order to allow for possible expansion or shrinkage the top is fastened in place with twelve hardwood clamp blocks, which are screwed to the top and engage grooves in the framing members as shown in Fig. 11.

Doors: The compartment doors are or-



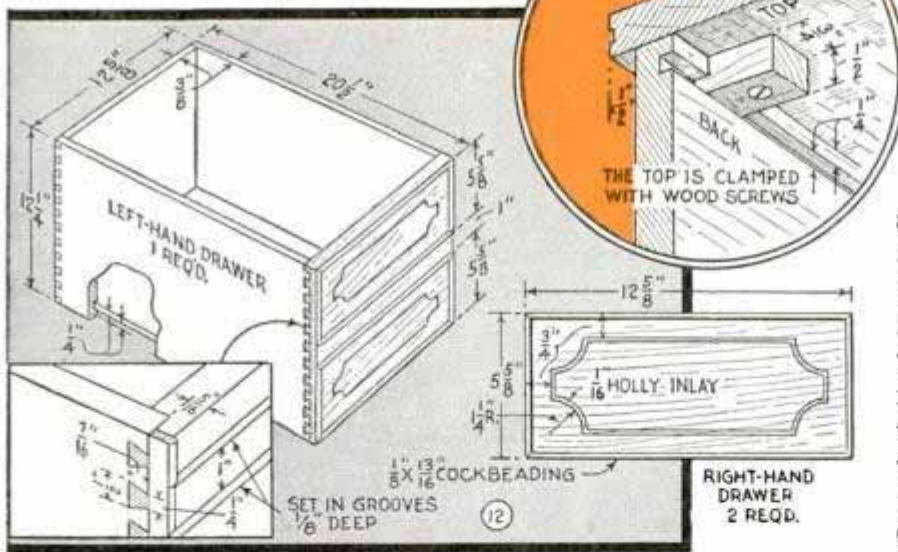
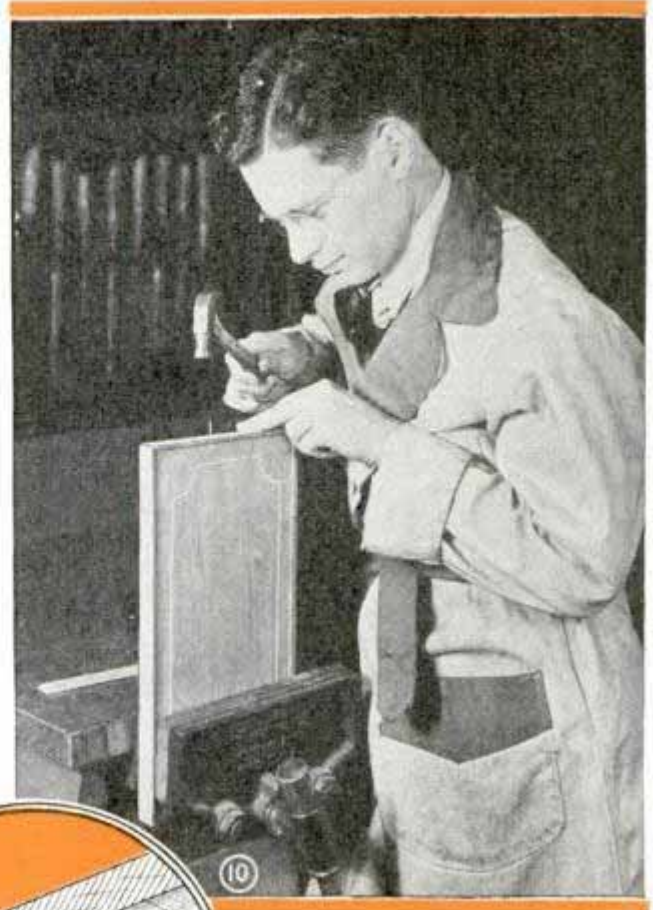
glued against the partition on the other. The plywood panel in this frame is optional. Dovetail joints used at the ends of the top rail are detailed in Fig. 2, also the single shoulder tenon used on the ends of the apron. The shape of the apron should be worked out from the squared pattern shown in Fig. 7, then band-sawed to shape. This piece is ornamented with an inlaid spray of holly and also a band of marquetry along the bottom edge. The spray is simply cut into the stock with a sharp knife. If veneered stock is used it is necessary to cut only through the first ply. For solid stock a depth of $\frac{1}{32}$ in. is sufficient. Marquetry banding is set into a shallow rabbet cut along the curved edge of the apron. As this banding can be purchased ready-made, at a nominal cost, it is not practical to make it. The method of applying the banding and inlays is described later. The tapered legs are detailed in Fig. 8. A dovetail mortise in the top of the front legs is laid out from the dimensions given in Fig. 2. One



namented with holly inlays as shown in Fig. 9. Grooves for the inlays can be cut with the grain by means of a special cutter which is readily made from a piece of hacksaw blade or clock spring, to the shape shown in Fig. 13. The cutter, after grinding to a keen edge, is inserted in an ordinary wood marking gauge in place of the usual point. Cuts across the grain are made with a straightedge and sharp knife or the router as in Fig. 14. The method shown in Fig. 15 for scoring the concave corners works well if the points of the dividers are sharp. The block clamped at the corner

prevents making an unsightly hole. After scoring the curved lines with the dividers, the wood is readily removed by following with the knife. The edges of the doors are covered with strips called "cockbeading." This feature serves the double purpose of covering the plywood joints and ornamenting the doors. The beading is applied by gluing and tacking, as shown in Fig. 10. Note that it is omitted at the meeting edge, Fig. 9.

The doors do not have a rabbeted joint as is customary in modern work, but are simply made to fit rather close. A rim lock is installed in the right-hand door, with a tongue mortise to correspond in the left. Both doors are fitted with an escutcheon of the type shown but the one to the left is false. The left door is held closed by means of an elbow catch. The doors swing on antique brass hinges, set $1\frac{1}{4}$ in. in from the top and bottom. The sectional view through the compartment shows the bottom, which forms a jamb, and the location of the top



jamb strip. See lower-right detail, Fig. 9.

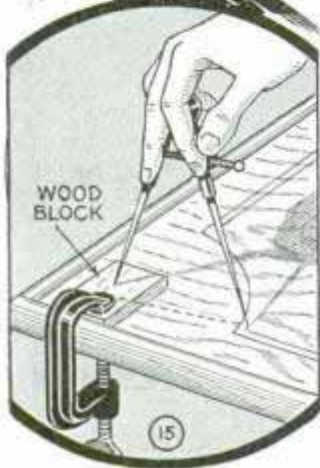
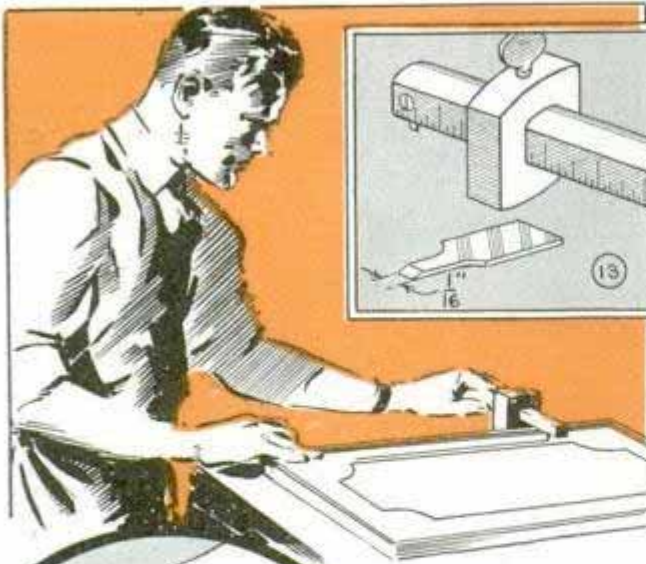
Drawers: One of the unusual features of the piece is the left-hand drawer, Fig. 12, which is made to simulate two drawers and thus give a symmetrical arrangement. This feature may be omitted if desired and four uniform size drawers provided by simply making the drawer framing identical on both sides of the compartment. The drawer fronts are ornamented with a cockbeading and holly inlays to match the doors. A recess is cut along the ends to house the cockbeading. This allows for cutting the dovetail joint into the end

grain without having to cut through the beading. The two strips which give the appearance of outlining the top of one drawer and the bottom of the other are set into shallow grooves as indicated. The dovetailing should be laid out and the pins cut on the side piece first, Fig. 12. This piece is then laid on the front and the sockets carefully scribed in the manner shown in Fig. 6. The blind dovetail in the front is cut with a bit and

chisel in the usual manner, before the narrow strip of cockbeading is tacked into the recess.

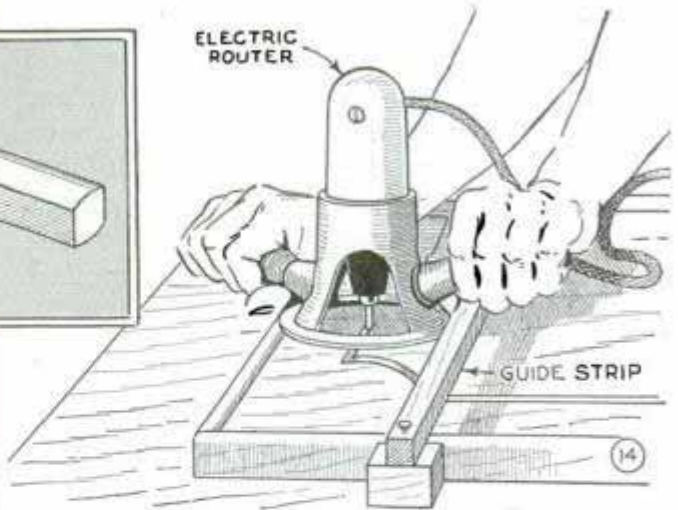
Open dovetailing is used at the back corners and the bottom is set in a groove in the usual way. Stop blocks, glued to the front rails, Fig. 2, prevent the drawer from being pushed in too far. The two drawers for the right-hand side are duplicates.

Inlaying: The inlaying, which should be done before the various members are assembled, is simple, but requires careful work. After the corners of the grooves have been squared up, strips of the band-



ing are cut to a rather snug fit and the corners mitered with a knife or razor blade. The strips should be large enough so that they extend slightly above the surface when they are in place. Thin glue is applied

sparingly to both the grooves and the strips, and the latter forced into place by tapping with a hammer over a block of wood. The piece is then covered with a strip of paper to absorb any glue which may ooze out and tend to stick the inlay to the gluing strip. The latter is simply a piece of scrap which is laid over the work to equalize the pressure and prevent the clamps from marring the surface. When



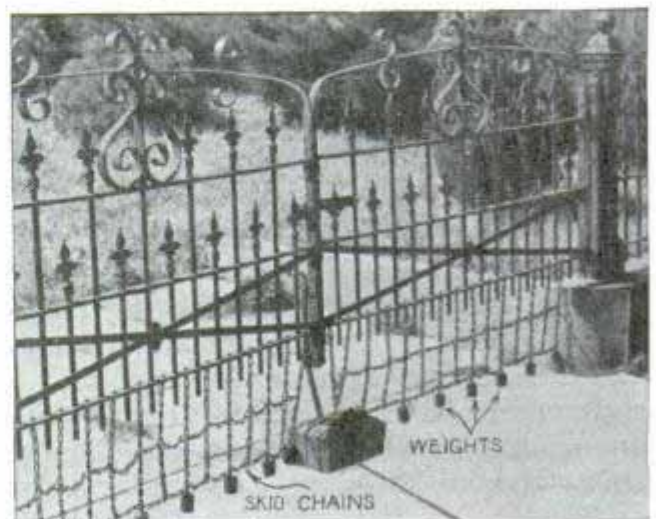
the glue is dry the banding is sanded down flush. The marquetry along the bottom of the apron is applied in a similar manner. Many craftsmen obtain good results by using plastic wood for inlays, and of course this process is much simpler, especially for the spray design in the apron. Care must be taken in using this material, however, that it is not spread over the surfaces around the grooves as it is likely to cause a discoloration in the finish later. The original sideboard is finished in a deep-red color and has a rich dull sheen that is exceedingly beautiful. This finish is achieved by the use of a red mahogany filler, followed by an oil stain of the same color, one coat of thin shellac and three of rubbing varnish. The shellac and varnish should be sanded lightly after each coat and at least three days allowed between applications. Pumice and water are used to rub the final coat to an egg-shell gloss.

Skid Chains on Driveway Gate Keep Out Cats and Dogs

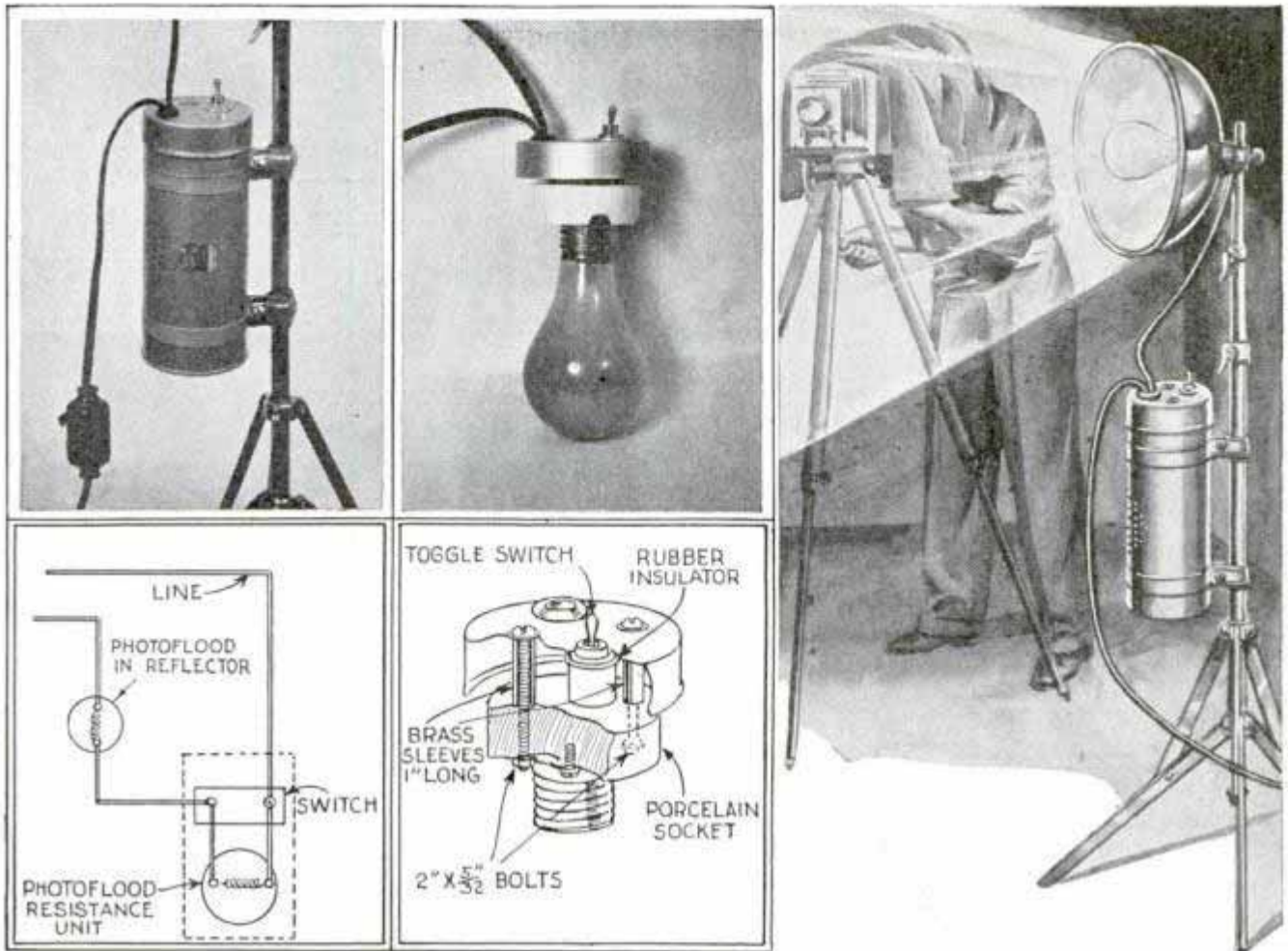
Old skid chains were fastened under a gate of a private driveway to fill the space between the bottom of the gate and the surface of the recessed driveway to keep out small animals. The chains were wired to the gate and lead weights were attached to the bottom of the chains.

—Dale R. Van Horn, Lincoln, Nebr.

☐ To avoid cutting a mimeograph stencil too deeply, place a piece of thin tissue paper, of the kind used for tracing, over the stencil to absorb some of the blow from the typewriter keys.



Photoflood Lamps Dimmed While Focusing

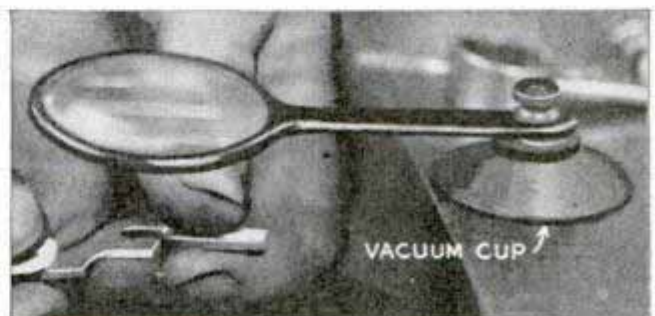


Dimming the photoflood lamps while preparing to make an exposure prolongs the life of the lamps considerably besides eliminating the discomfort to a person being photographed. To do this conveniently by just snapping a switch, one photographer designed a neat unit comprising a bicycle dry-cell case in which a second photoflood lamp, the same size as the one in the reflector, was mounted. After drilling holes in the case to assure adequate ventilation, a porcelain socket was fastened inside of the lid with machine screws and a

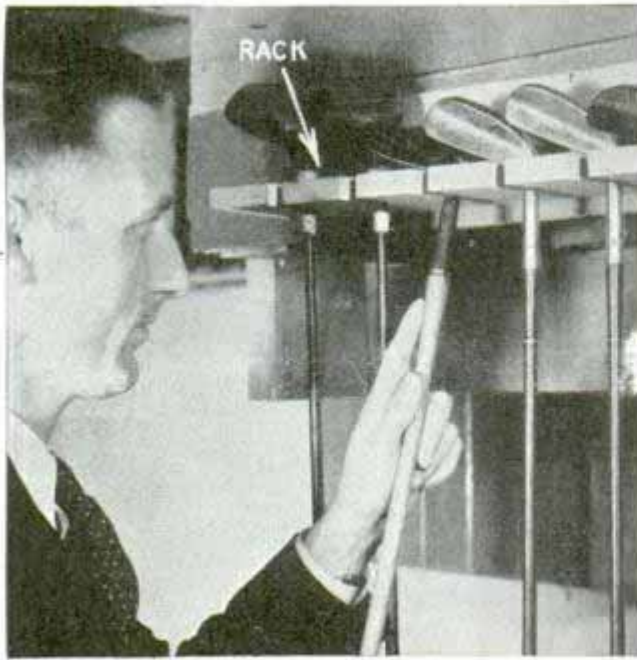
small toggle switch of the panel-mounting type designed for 110-volt operation, was located next to the socket as shown. Wiring was done according to the diagram at the left, using flexible rubber-covered cable. After the unit was assembled and wired, the case was clamped to the lamp stand. Pushing the switch toward one side caused both photofloods to light at much less brilliancy than normal, and pushing the switch the other way cuts out the lamp in the unit and allows the one in the reflector to burn at full brilliancy.

Magnifying Glass Held by Vacuum Cup Leaves Hands Free

Modelmakers and others who often have to examine small parts under a magnifying glass will like this method of anchoring it to leave both hands free. The handle of the glass is drilled to take the screw in a vacuum cup of the type used to fasten ash trays to car windshields. This permits the glass to be set on some smooth surface of the bench, wall, or any other place desired.



Wooden Rack Protects Golf Clubs Against Warping

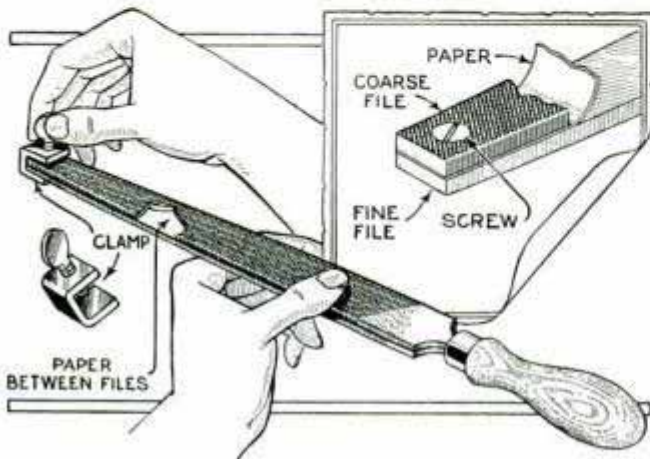


Before storing your golf clubs for the winter, assemble this simple little rack and hang them in it. It assures protection for the clubs so that they will not warp as they might if left standing in a corner. The rack is nothing more than a length of wood with slots cut in it to take the shank of the club handle close to the head.

—Joseph P. Driscoll, Buffalo, N. Y.

Fine and Coarse File Combined to Save Time

When you have a job in which you first outline the work roughly with a coarse file and finish it with a fine one, this combination file will save time. It consists of a fine and coarse file fastened together with a piece of paper between them to protect the teeth. A small improvised C-clamp can be



used to fasten them or the metal can be annealed back an inch or so from the end and drilled to take a small bolt, counter-sinking the head of the latter. When one side of each file has become worn, you can take them apart and change the faces.

—M. M. Warren, Monterrey, N. L., Mex.

Hold-Down on Power Scroll Saw Converted to Presser Foot

When cutting thin material in a scroll saw where the hold-down has to press against the work so tightly that the latter is hard to slide over the table, this presser foot, which is somewhat similar to one on a sewing machine, will solve the problem. Get a small collar that fits over the shaft of the hold-down after

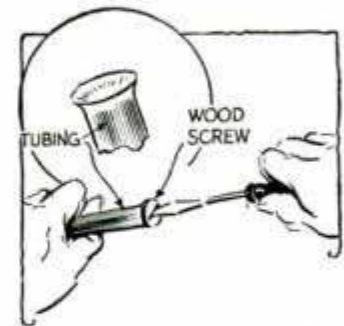


which you drill and tap the collar for a thumbscrew. Then slip a coil spring over the shaft and adjust the collar against the spring to give the required pressure on the work, leaving the adjustment screw on the hold-down loose so that the shaft is free to move up and down.

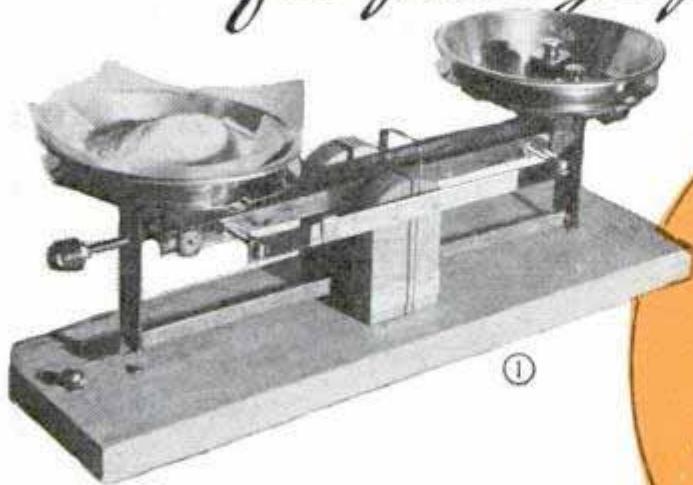
—A. H. Waychoff, Tempe, Ariz.

Wood Screw Flares Tubing

In an emergency, the end of a piece of copper tubing can be flared quite satisfactorily to take a compression fitting with an ordinary flat-head wood screw. Select a screw with a head somewhat larger in diameter than the inside diameter of the tubing. While holding the tubing with one hand rotate the screw with the screwdriver, pressing against it firmly. The bevel on the underside of the screw will tend to flare the end of the tubing.



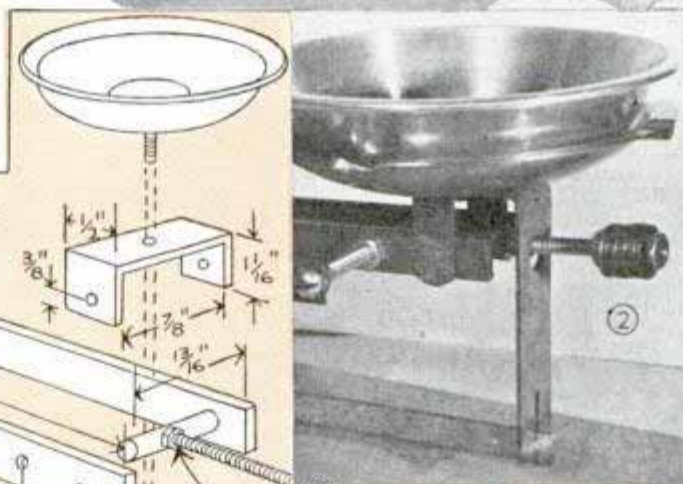
Sensitive BEAM SCALE for photographic chemicals



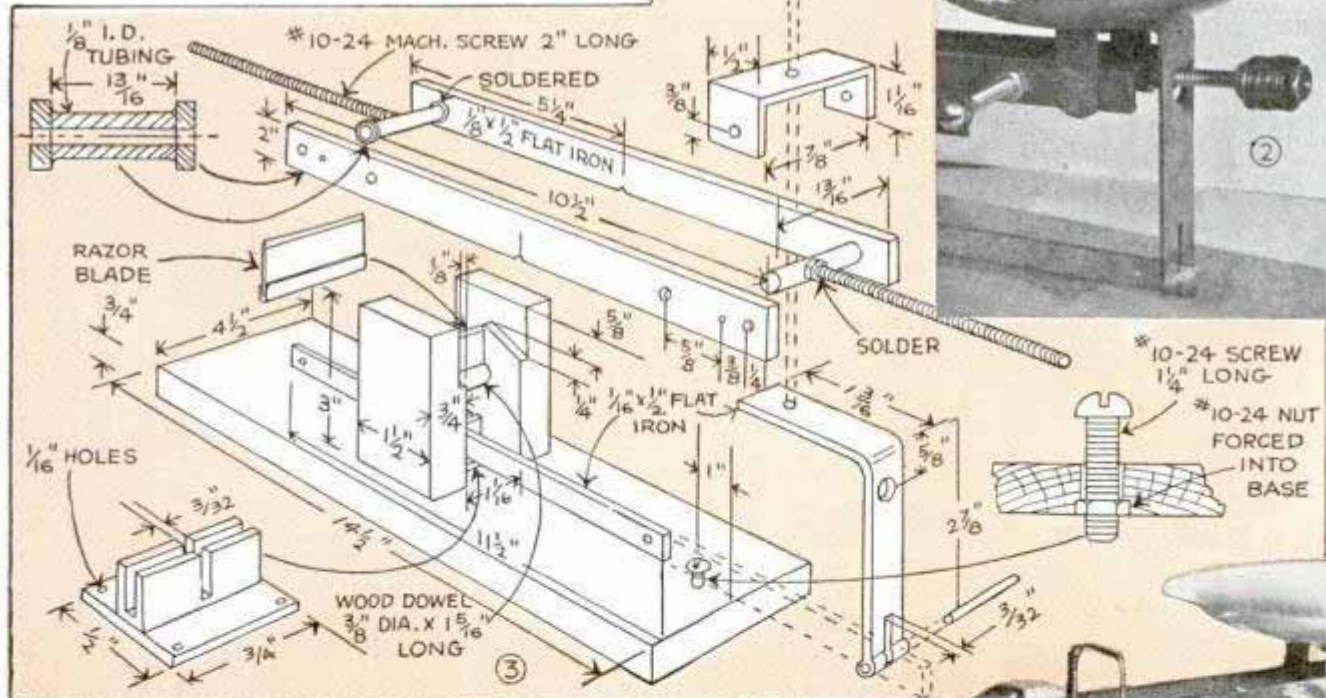
①



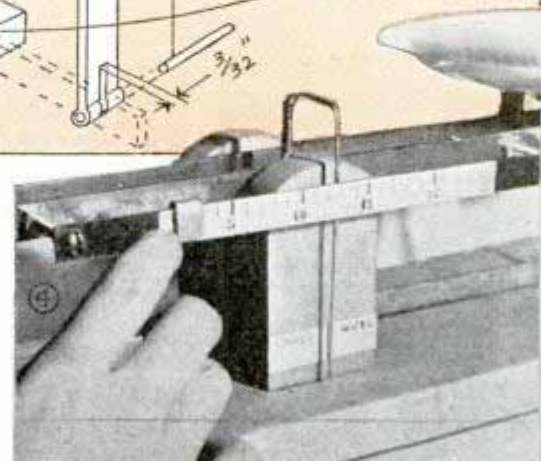
Ideally suited to the photographer who wants an inexpensive scale on which to weigh photo-developing chemicals, this one is accurate for most purposes, and can be assembled from odds and ends. Fig. 1 shows the completed scale, while Fig. 2 gives an end view showing one tray and the adjustable balancing weight. The base and two vertical supports are wood, and all metal parts are light flat iron



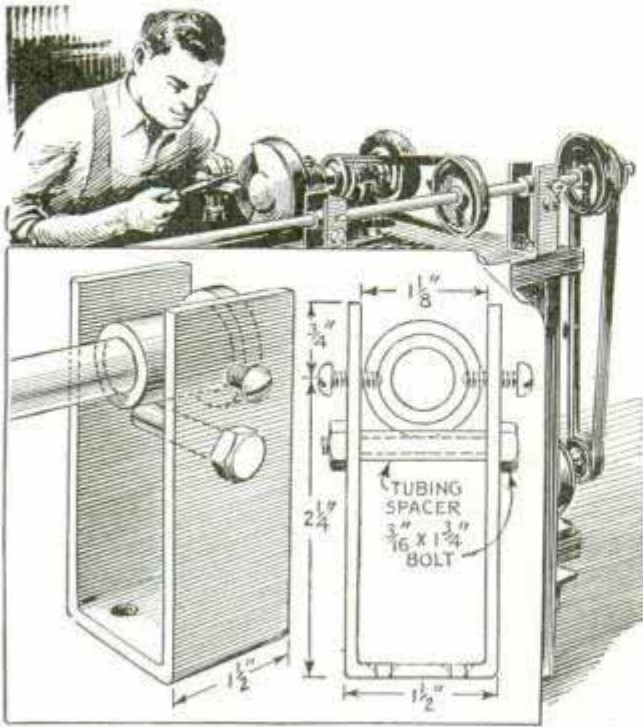
②



Method of assembly is indicated in Fig. 3. The beam is supported on a razor-blade fulcrum, which is set in a dowel pressed tightly between the vertical supports. The base rests on two rubber-headed tacks at one end and on an adjustable leveling screw at the other. This is a machine screw with the nut pressed tightly into the underside of the base. The beam is graduated as indicated in Fig. 4. A piece of adhesive tape may be stuck to the metal and the divisions marked on it. A steel wire bent to shape and soldered to the beam centrally between the ends serves as a pointer



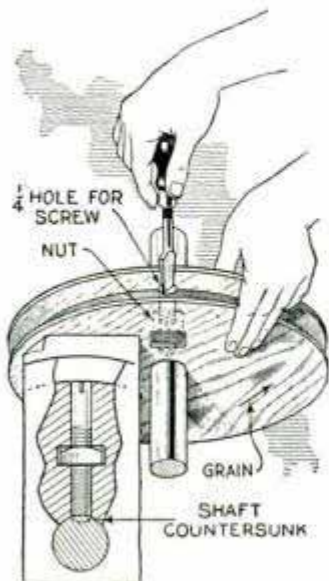
Self-Alining Shaft Hangers for Light Work



These hangers are suitable for running most light home workshop machines, and are made easily with hand tools. Soft steel for the frame should be bent to shape before drilling and tapping. Model-T Ford bronze spindle-bolt bushings are used for bearings. These will fit a 1/2-in. shaft with slight reaming. Hangers are self-aligning, and will take 4-in. pulleys.

—Walter Clark, Portsmouth, N. H.

Fastening Wood Pulley on Shaft



When a small pulley is needed, I turn it from a piece of 1-in. hardwood and fasten it to the shaft by the method indicated. After turning the pulley, drill a 1/4-in. hole across the grain from the top of the pulley to the shaft, and then make a slot about 3/8 in. from the shaft to take the nut of a stove bolt,

which serves as a set screw. After cutting off the head of the bolt, the end is slotted

for a screwdriver to tighten it. A shallow countersink in the shaft helps to keep the bolt from slipping when the pulley is under a stiff pull.

—Arthur Salzsieder, Oshkosh, Wis.

Taking Thin Cut on Board

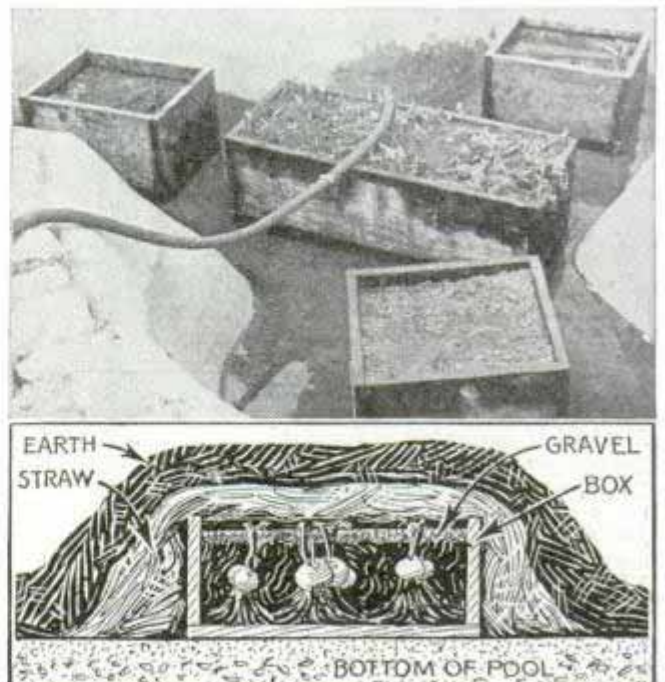
If you happen to cut a piece of work a trifle too long so that you have to remove a thin strip from one end, try the following method: Lay the work on a piece of scrap board as shown and saw through both pieces. The scrap piece tends to guide the saw so that it doesn't break off the thin strip that is being removed.



—Sigmund Segson, New Milford, N. J.

Protecting Plants in Fish Pool During Cold Weather

Here's a good way to protect plants in your fish pool during the winter. When they are set out in the spring place them in boxes of suitable depth and size. A layer of gravel is applied over the soil in the boxes. When fall comes, trim down the plants, drain off the water, tramp straw around the pots and then cover the straw with a 5 or 6-in. layer of earth.

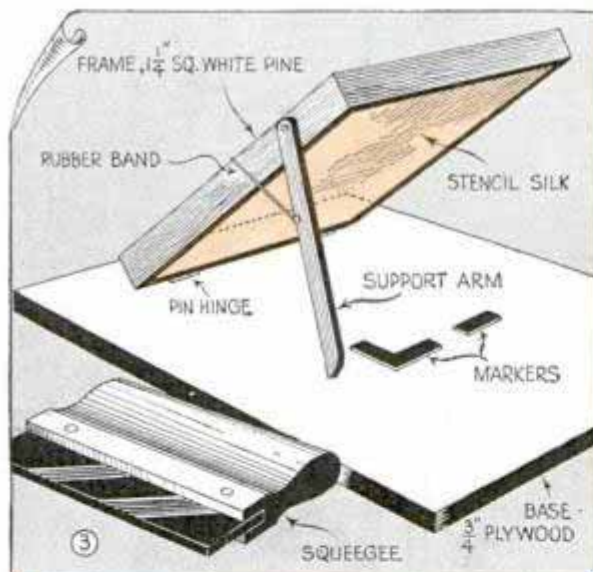
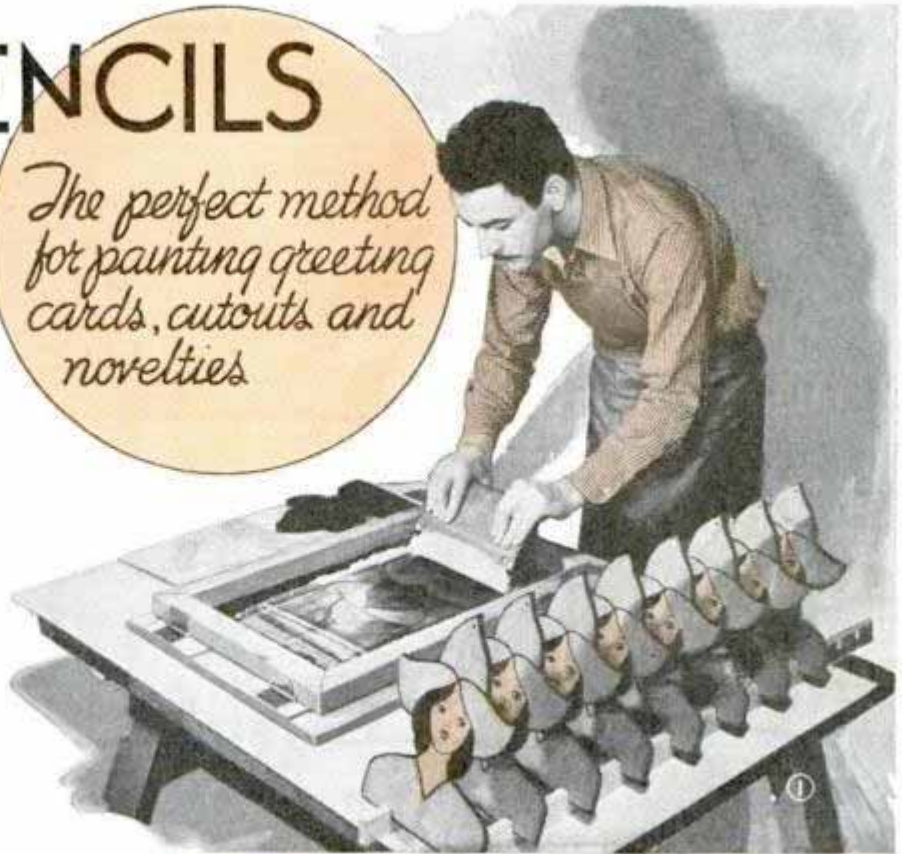


SILK STENCILS

SIMPLER than cutting linoleum blocks, silk-screen stencils offer the home craftsman one of the fastest and cleanest methods for painting greeting cards and cutouts. Painting can be done on any flat surface, and the design can be worked on wood, cardboard, cloth, or any other material. Photographic processes simplify the art work, so that intricate designs can be reproduced easily by the average worker.

The setup is simple. As shown in Fig. 3, there is a wooden frame on which is stretched a piece of stencil silk or organdy. The

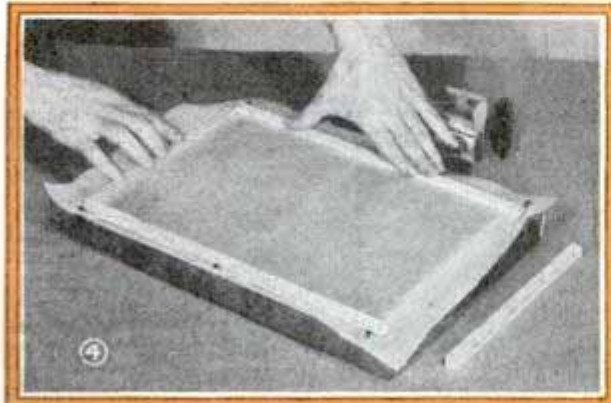
The perfect method for painting greeting cards, cutouts and novelties



frame is hinged to a base board with two pin hinges. The design is painted or blocked out on the silk screen and is reproduced by forcing paint through the open meshes of the screen, using a rubber squeegee.

In setting up for any job, the first thing required is the wooden frame. For average-size work, this is made from 1 1/4-in. square white pine. The frame should be about 2 in. wider than the design and about 6 in. longer, inside dimensions. Frame members are mitered and grooved, as shown in the detail, Fig. 2. The stencil silk is fitted to the frame by first tacking it loosely in place; then, 1/2-in. square cleat sticks are pushed into the grooves, as shown in Fig. 4, stretching the silk drum-tight.

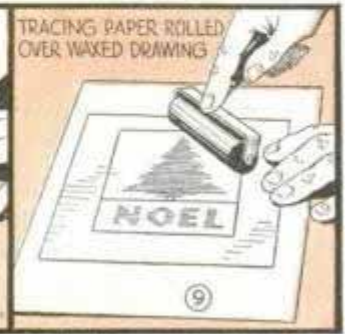
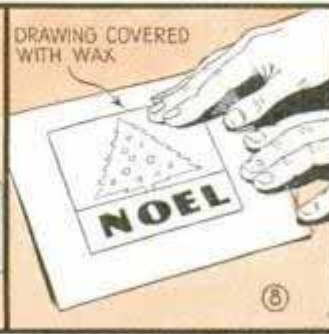
One of the simplest methods of getting the design onto the screen is the paper mask or knife-cut stencil, as shown in Figs. 5 to 13 inclusive. In the example, Fig. 6 is the copy, which is drawn full size. A sheet of tracing paper large enough to cover the screen is coated with shellac, as shown in Fig. 7. While this is drying, the copy is coated with wax, rubbing on a thin film with the fingers, as shown in Fig. 8. A good wax for this pur-



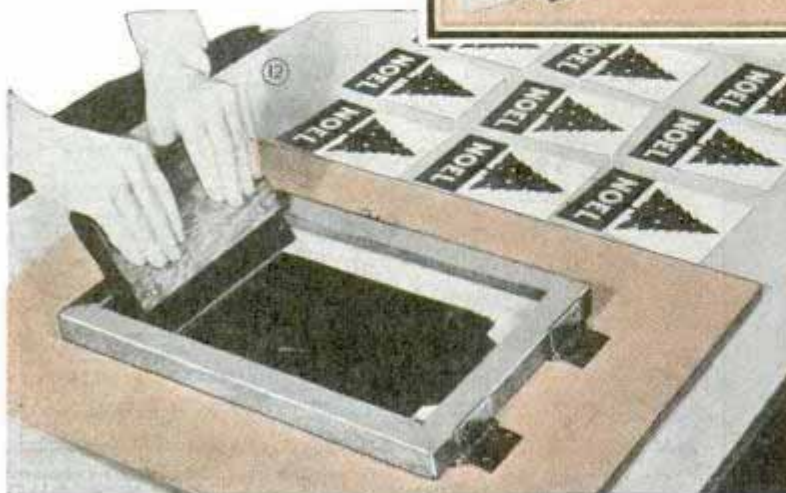
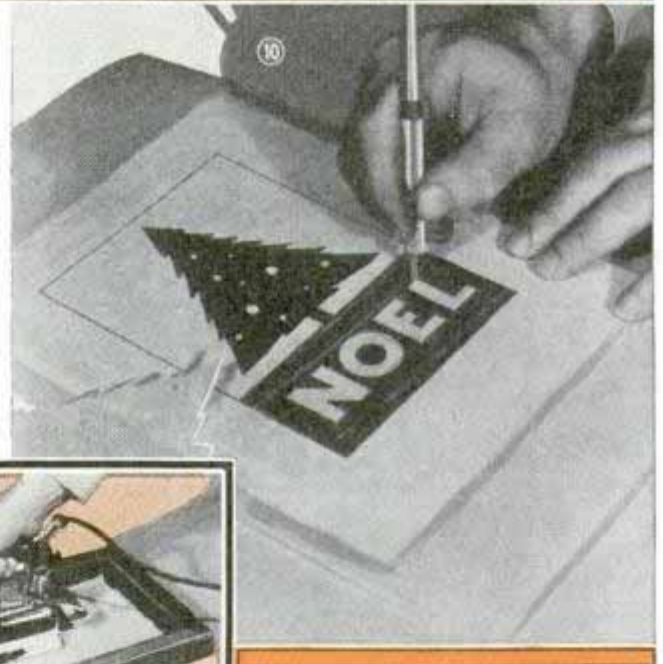


completely blocked off except for the design. Then you pour a quantity of paint onto the screen, and wipe it across the design with the squeegee, as shown in Fig. 12. Fig. 13 shows the screen in an up position, with the work in place, registered by two cardboard markers fastened to the base.

Another method of getting the design onto the screen is to block it out with a special lacquer filler. The Dutch-girl cut-

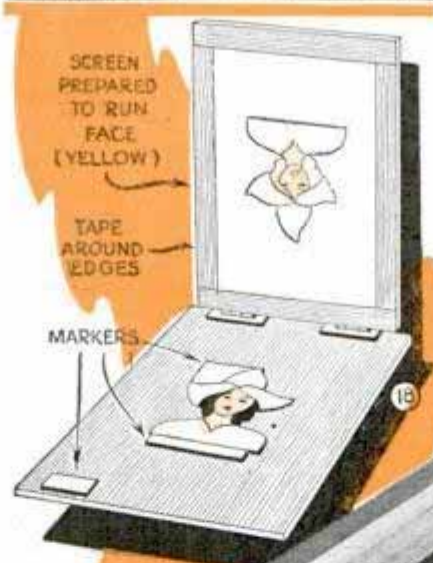
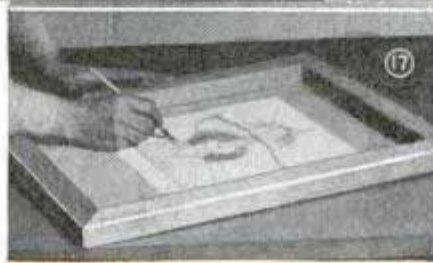


pose is made from equal parts of beeswax, kerosene and linseed oil. The tracing paper, shellacked side up, is then rolled over the waxed drawing, Fig. 9. All portions of the design which are to print are now cut out with a stencil knife or razor blade and stripped off, as shown in Fig. 10, the wax coating holding the design firmly in place. After the cutting is complete, the silk screen is placed over the design, and, using a thin, soft pressing cloth and a medium-hot iron, the design is adhered to the screen, as shown in Fig. 11. Finally, the inside edges of the screen are lined with masking tape, as shown in Fig. 5, to prevent paint from leaking through. The result is a screen





out for the top of a laundry bag, Fig. 14, is an example. Start, as before, by making a full-size copy of the design. Transfer the outline of the design to $\frac{1}{4}$ -in. plywood or wallboard and cut out the required number on the band saw or scroll saw. Stack the cutouts on edge and spray with black paint, as shown in Fig. 15, then, spray or paint the faces of the cutouts, as in Fig. 16. In the example, however, the first step is to secure an all-black cutout. The second is to make the screen, which is done by placing the screen over the copy, as in Fig. 17. The design, which is plainly visible through the silk, is then traced with a medium-hard pencil and painted with the lacquer filler. Since the cutout is already black, we will not want any of the black in the design to print. Hence, everything that is black on the copy is filled in with lacquer on the



screen, also, all the area outside the design is blocked off, as shown by the black in Fig. 18. This design is in two colors, yellow face and red hat and dress. The yellow is printed first, and, in order to protect the red, all the red areas are blocked out. This is done with a filler which is soluble in water. In Fig. 18, the gray portions of the design represent water filler. Thus, only the yellow face is left open, and this is painted on the black cutout, as shown in Fig. 19. After the

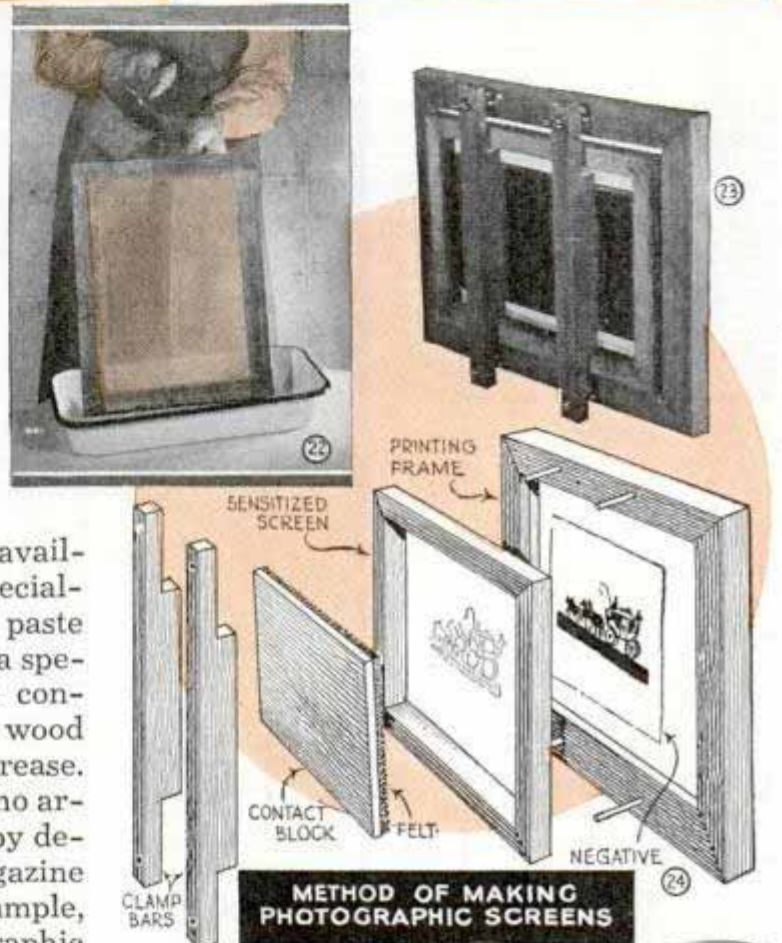


run in yellow is complete, the water filler is washed out, leaving the original lacquer-filled screen. The yellow face is then blocked off with water filler, leaving the red hat and dress open for painting, Fig. 1.

The stencil silk used for brush-filled screens is what is known as No. 16, running about 140 threads per inch. It is available in several grades. Knife-cut stencils of open design can be run on organdy. The paints used should be made especially for screen work. These are available in flat and gloss, also in a special-process lacquer, and are put up in paste form, being thinned as required with a special non-clogging varnish. Average consistency for painting on cardboard or wood should be slightly thinner than soft grease.

The photographic method requires no artistic ability, since the worker can copy designs directly from any book or magazine with the aid of a camera. In the example, Fig. 21 is the copy. As in any photographic process, a negative is required, that is, the copy must be transferred, in black, to a clear sheet of celluloid or tracing paper. If desired, the negative can be made by hand by placing a sheet of heavy tracing paper over the copy, as shown in Fig. 20, so that the design can be filled in with photographer's opaque or black ink. In the second method of making a negative, the copy can be made with a camera. This gives a negative which has white lines on a black ground. This first negative is then exposed to a second film, which results in a true copy of black lines on a clear ground.

So much for the negative. The next job is to sensitize the silk screen so that it can be printed just the same as a photographer prints a photograph. No. 16 stencil silk is used. The sensitizer can be purchased from any process supply house, and requires



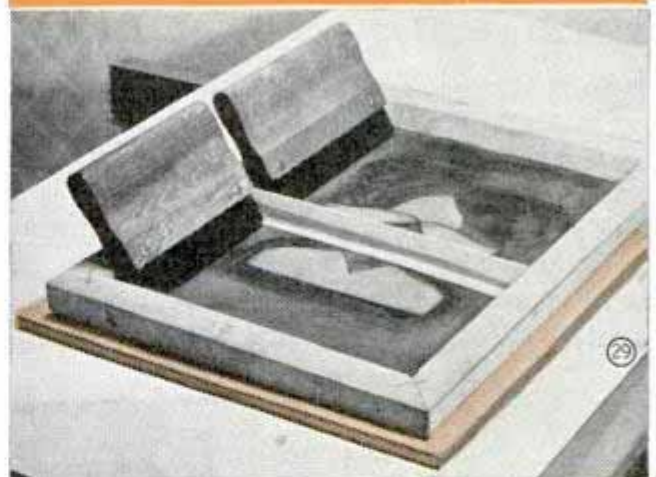


only mixing with water to make it ready. The solution is flowed on over the face of the screen, as shown in Fig. 22. All operations can be done in ordinary room light except the drying of the sensitized screen, requiring about 30 min., which should be in a darkened room. After the screen is dry, the print can be made. This is done just the same as printing a photograph, Fig. 24 showing the setup. The negative is placed face up (reading position) on the glass in the printing frame. The silk screen, face down, is then placed over the negative, followed by a contact block and clamps. Fig. 23 shows the frame ready for printing, while Fig. 25 shows the exposure being made, using a photoflood lamp. Exposure time is approximately 15 min., and has the effect of hardening the exposed portions of the screen. After printing, the screen is held under a stream of warm water, Fig. 27, which washes out the soft, protected parts of the design. Fig. 26 shows the finished photographic screen; Fig. 28 shows the job being run. While the example shows printing in one color only, as many colors as desired can be run by blocking out with water filler as previously described.

A useful dodge which can be used to advantage for certain types of two-color work is shown in Fig. 29. The copy is the Dutch girl previously shown, but in this case the hat is to be red and the dress blue. By fastening a cardboard bridge to the screen with masking tape and using two squeegees, both the red and the blue can be run at one time. Another method of multi-color printing is the elimination process. Using the Dutch girl again for an example, the first run would paint the hat, face and dress in red. The red hat and



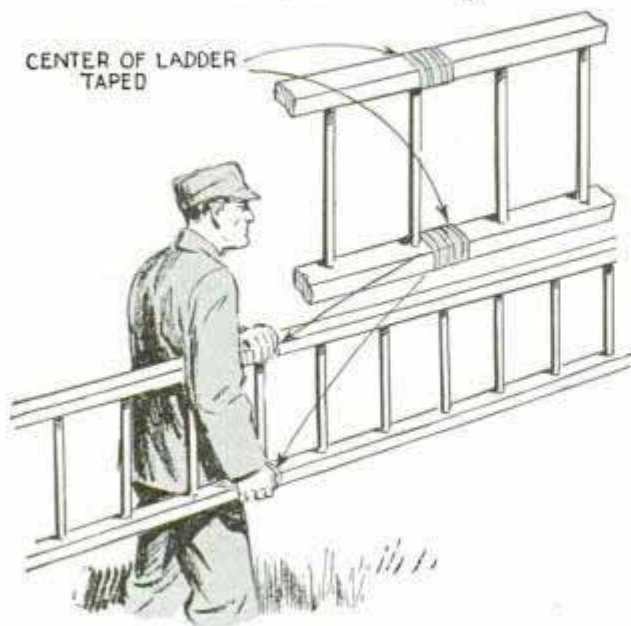
AFTER PRINTING, THE SCREEN IS HELD UNDER HOT WATER TO BRING OUT THE PICTURE-LEFT



dress would then be blocked out, leaving only the face which would be run in yellow. Then, if desired, the face could be blocked out, leaving only the eyes to print in blue.

☐ Dipping a rubber eraser in emery powder will make it suitable for cleaning rusted or corroded metal surfaces quickly.

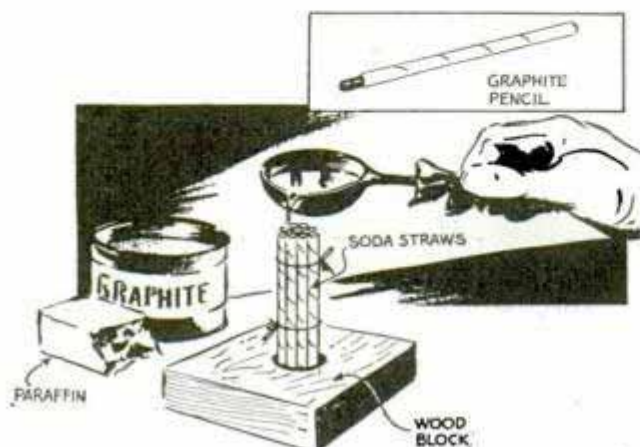
Balancing Point of Ladder Marked with Tape



Painters who are obliged to carry ladders from place to place are often annoyed and delayed by the necessity of "trying" the ladder for balance. If the center of balance is located and each standard of the ladder is given a wrapping of electricians' tape at those points, the tape will serve as an easy handgrip for carrying and the ladder will balance evenly when lifted from the ground and carried.

Making Up Graphite-Core Pencils

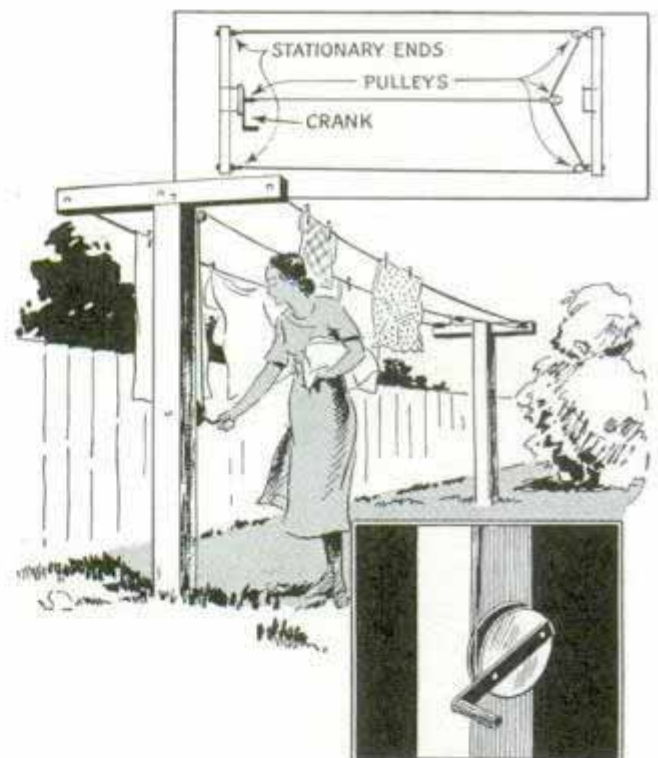
Soda straws filled with a lubricant made by mixing paraffin and graphite are handy to use on locks, hinges and other moving parts where graphite is preferred to oil. Get a dozen or so soda straws and tie them together. Then melt a small quantity of paraffin and while it is kept melted over heat, stir in graphite until the mixture is



the consistency of heavy syrup. Place the straws in a wood block, as shown, pour in the mixture and let it cool. In use the end of a straw is torn off and the pencil rubbed on the object to be lubricated.

Two-Wire Clothesline Tightened with a Crank

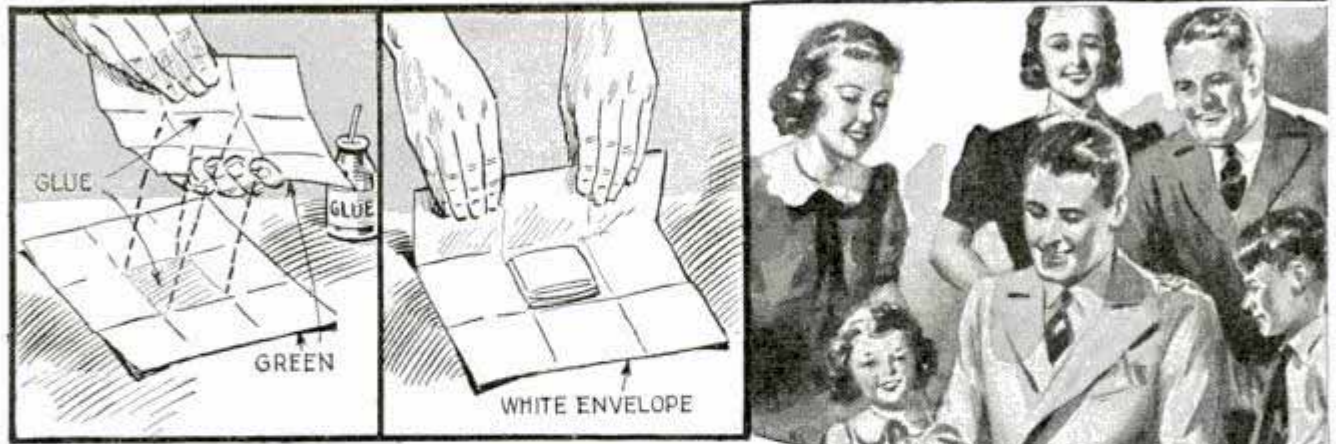
If you have this clothesline in your yard, you can throw away the line props because you just turn a crank to tighten the wires. Two support posts with crossarms are required. One arm carries two pulleys near the ends, and the other one carries two hooks near the ends and a pulley in the center. The pulleys on the arm should be of the type that have one side open so that the wires or ropes can be slipped into them easily. In use, one wire is fastened to one



of the hooks, then run over the pulleys and back to the other hook. The tightening wire has a closed-type pulley on the end to run over the first wire between the two pulleys on the arm as indicated. This wire is then run over the closed pulley between the two hooks to a crank mounted on the support post. The original crank was of the type used to shut off windmills. If this type is unavailable, you can make one easily, using a grooved wood disk with a crank attached to it.

—Conrad L. Lenstrom, Arcadia, Nebr.

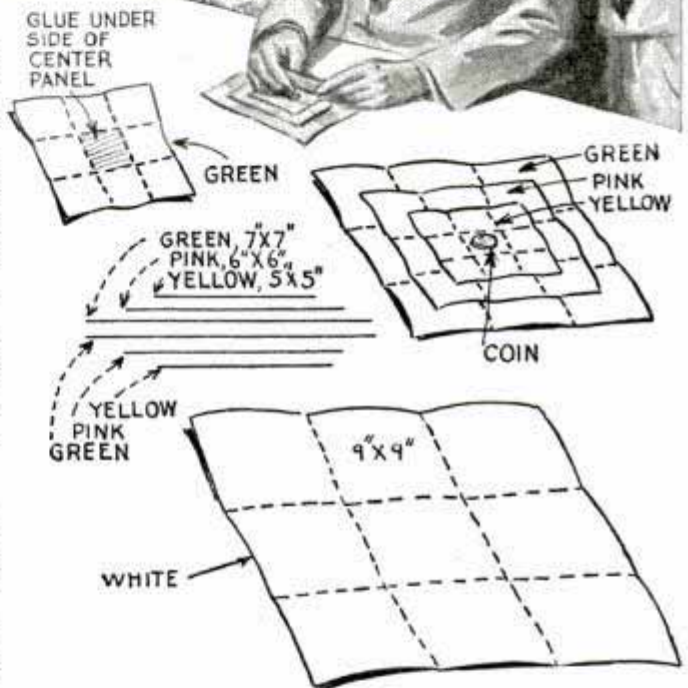
This Disappearing Coin Trick Is a Real Poser



Here's a little trick to remember for the next party. A coin is wrapped inside of three small sheets of paper, one over the other. Then, keeping the wrapped coin right before your eyes, the performer shows you how completely the coin is wrapped and even allows you to pinch the paper for assurance. Next, he lays the paper on the table, unwraps it carefully in full vision of spectators, who are amazed to discover that the coin has disappeared entirely, seemingly right through the paper without even leaving a hole.

And now to explain just how it's done. Cut seven squares of colored paper to the dimensions shown—two yellow, two pink and two green; the largest and last one being white paper. Crease the sheets to fold as indicated by the dotted lines, place the two green sheets back to back and stick the center panels together with glue. Place the green sheets on the table with one pink and one yellow sheet on top, and fold each envelope, starting with the yellow one which should be inclosed in the pink one, and so on. When the folds are completed, reverse the packet so that the unfolded green sheet is uppermost and repeat the process. You now have two packets of folded envelopes but the green ones are glued together through the center panels so that the assembly appears as one package. With this inclosed in the white envelope you are ready for the performance. Placing the packet on the table, you borrow a coin. Ask the donor to observe the date so that when you return it he will see it is the same coin.

Unwrapping the envelopes, and leaving them in the order shown, place the coin in



the center of the smallest envelope and re-fold them separately as before, but, before finishing by inclosing in the white envelope, give the green packet an extra turn which will bring the empty assembly of envelopes uppermost. This extra flip of the package will not be noticed by the spectators as your folding is accomplished by turning each envelope over in its turn. Now unfold the sheets. The last and yellow envelope will be found empty. To make the coin re-appear, simply re-fold the envelopes and repeat the turning of the packet after the green one is closed.

—G. E. Hendrickson, Argyle, Wis.

☐ A quickly vanishing red ink can be made by dissolving a small quantity of phenolphthalein in strong ammonia. Writing done with this ink disappears a short time after it has been exposed to the air.

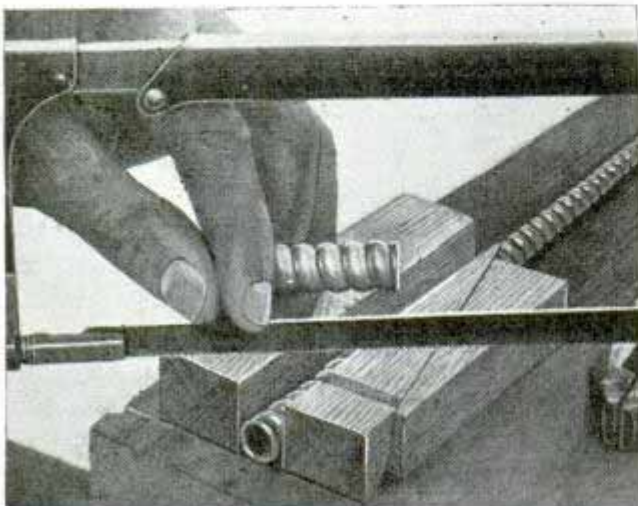
Auto Casings Hold Bricks on Roof for Chimney Work



It will not be necessary to build a stand or bench on the roof to hold bricks, when repairing a chimney, if a couple of discarded auto casings are tied together with a stout rope and placed over the roof, as indicated. The bricks are placed inside of the casings on each side of the roof.

Flexible Cable Cut Off Squarely When Held Between Blocks

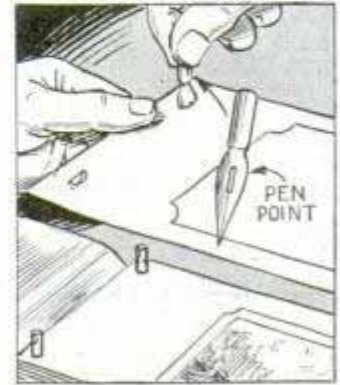
When working with flexible tubing or cable, you can cut it off squarely with a hack saw if it is held between blocks as shown in the photograph. One block of rectangular shape is fastened to the bench and another block of the same size and shape is cut diagonally across to form two wedges. One of these is nailed to the bench near the first one so that the other wedge-shaped piece can be driven in to grip the



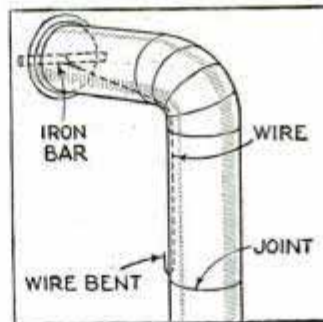
tubing tightly. If care is taken in locking the blocks, the wedge-shaped piece can be driven up flush with the end of the rectangular one so that the two ends will serve as a saw guide.

Notebook Sheets Perforated with a Pen Point

The next time you want to insert an unperforated sheet of paper in a loose-leaf notebook, punch the holes neatly with an ordinary pen point. The same method is also handy for perforating paper to take the corners of cards and photos as a substitute for gummed corner tabs.



Fastening Stovepipe in Chimney

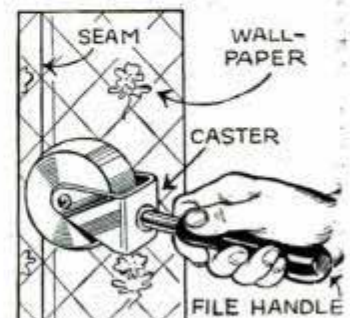


One home owner who had experienced considerable trouble by having his stovepipe slip out of the chimney opening, anchored it as indicated. A small iron bar was placed across the inside surface of the chimney opening. Then a wire was tied to this and run down inside the pipe where it was hooked over the edge of one section.

—Walter Fowler, Lawrence, Kans.

Wallpaper Seam Roller

In the absence of a regular roller for smoothing seams in wallpaper, you can improvise a serviceable one from a furniture caster of the wheel type. If desired, the stem of the caster can be fitted with a suitable handle for added convenience.





WALL MAGIC

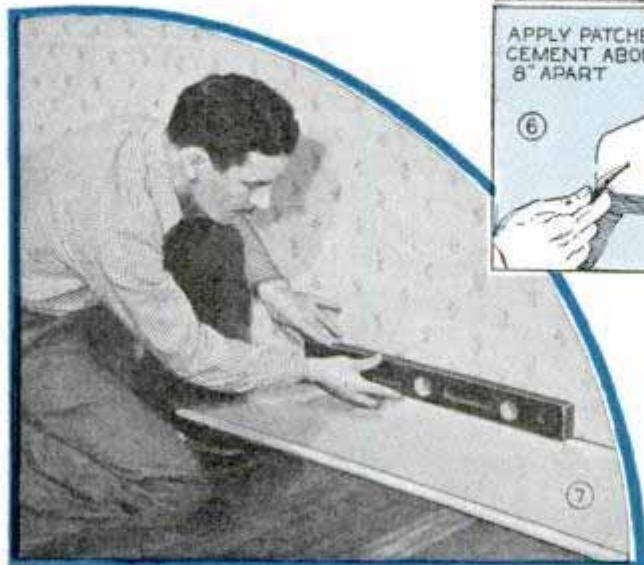
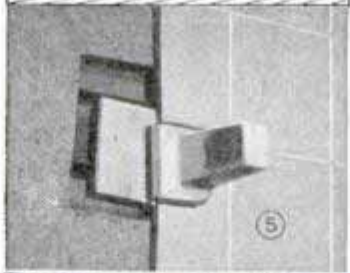
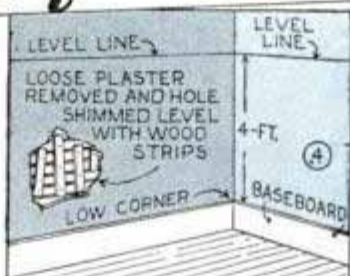
Smart Effects for Kitchen and Bath

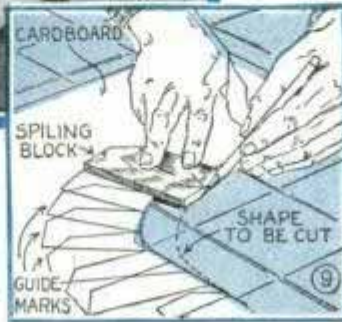
MODERNIZING those two ugly ducklings—the kitchen and bathroom—becomes a simple job with the variety of structural materials now available. Linoleum, tileboard, structural glass, metal tile, clay tile, asbestos, rubber, cork and oilcloth are the many materials now offered in colorful patterns.

One of the most popular

materials is tileboard. This is available in sheets 4 ft. wide by 6, 8, 10 and 12 ft. long, the surface of the board being ruled off into 4-in. square tiles. The board comes in various grades of hardness and thickness, the latter being usually $\frac{1}{8}$ to $\frac{3}{16}$ in. In installing tileboard, loose wall-paper should be removed. A straightedge is used to locate inequalities in the plaster surface, and these should be leveled off. Breaks in the plaster must be cut out and the hole shimmed with strips of wood, as shown in Fig. 4. Check with a level to determine if there is a definite low spot in the room, as shown in Fig. 7, and, if so, the height of the tileboard should be measured at

this point. Strike a level line around the room with a chalkline or straightedge. Cut through the plaster and fit wood blocks in place to take all screw-fastened fixtures, as shown in Fig. 5. Apply the tileboard by coating the wall with the special cement provided as in Fig. 6. Nailing, if required, should be done with $1\frac{1}{4}$ -in. No. 16 finish-





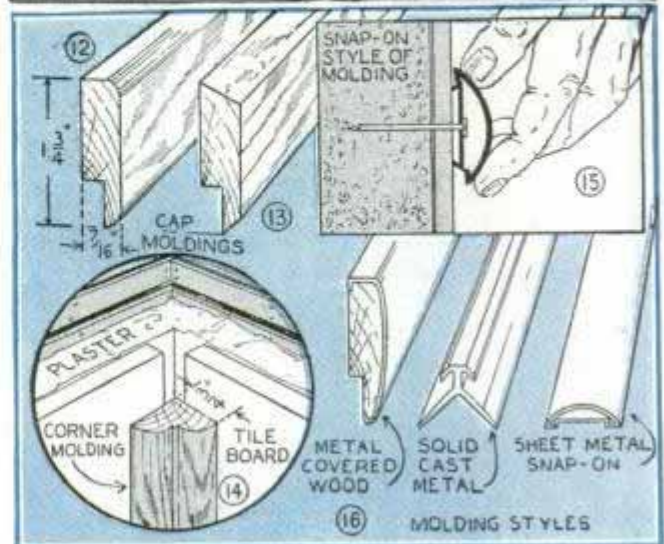
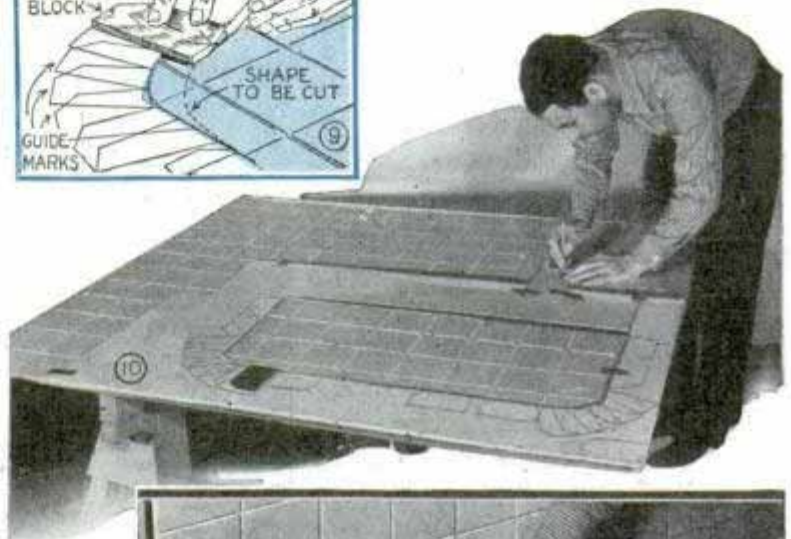
ing nails inserted through the tile scorings, as in Fig. 3. In most cases, plumbing fixtures can and should be removed. Where this is not practical, perfect fitting is done by spiling the shape on a piece of cardboard cut roughly to such size that it will fit around the fixture; then, with a small block of wood, as in Fig. 8, take off the contour. When the cardboard is removed and placed over the tile-board, as in Figs. 9 and 10, the relocation of the guide marks will give an exact cutting line. When cutting at the baseboard, a small block of wood with a hole drilled through it to take a pencil, can be used to advantage. The tileboard is tacked an inch or so higher than its actual position. Then, with the wood block riding the top of the baseboard, the pencil will mark the exact cutting line, as shown in Fig. 11. The same method is useful in determining the cutting line for corners.

The simplest styles of wood moldings can be made readily in the home workshop to the patterns shown in Figs. 12, 13 and 14. Among ready-made moldings, chromium trim is the most popular. Prices include cap moldings, inside and outside corners, division strips, edging strips, and a number of others. In the simplest kind of job, only the cap molding is required, as shown at the left in Fig. 16. In the center of the same illustration is shown a solid metal outside-corner molding, while Fig. 15 shows the popular snap-on style.

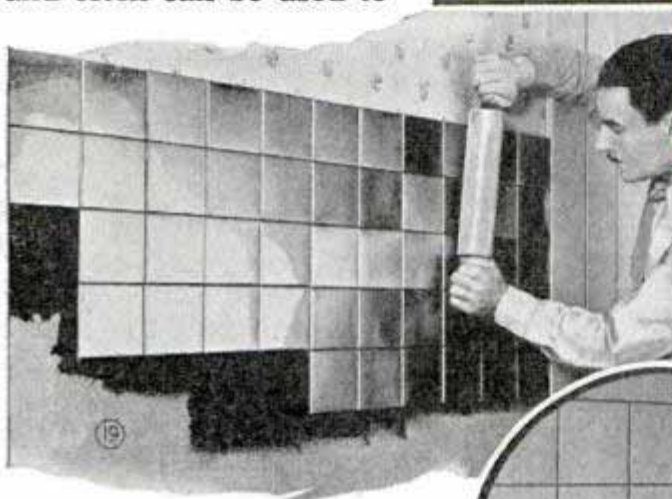
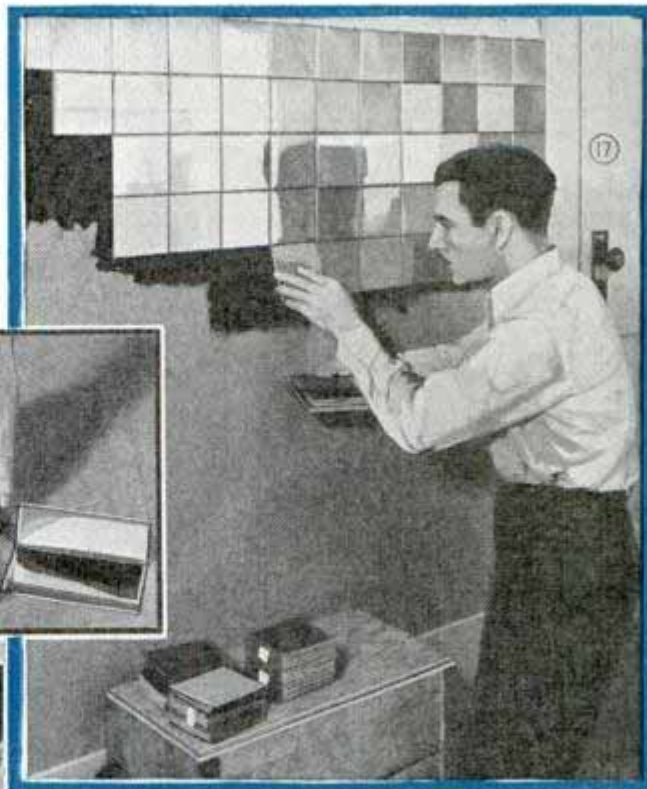
Stainless-steel tiles make an attractive wall surface. These are 4-in. square and are applied by mounting to the wall with cement, as in Fig. 17. Inside and outside corners are worked by scoring the fiber backing of the tile, as in Fig. 18, after which it can be bent over a straightedge. The tiles and other materials fastened with cement should be rolled thoroughly after application, as shown in Fig. 19.

Now, in figuring the cost of installation, the probable life of the material also should be considered. Oilcloth, for example,

Indulge in steel tiles. - W. Alverley.

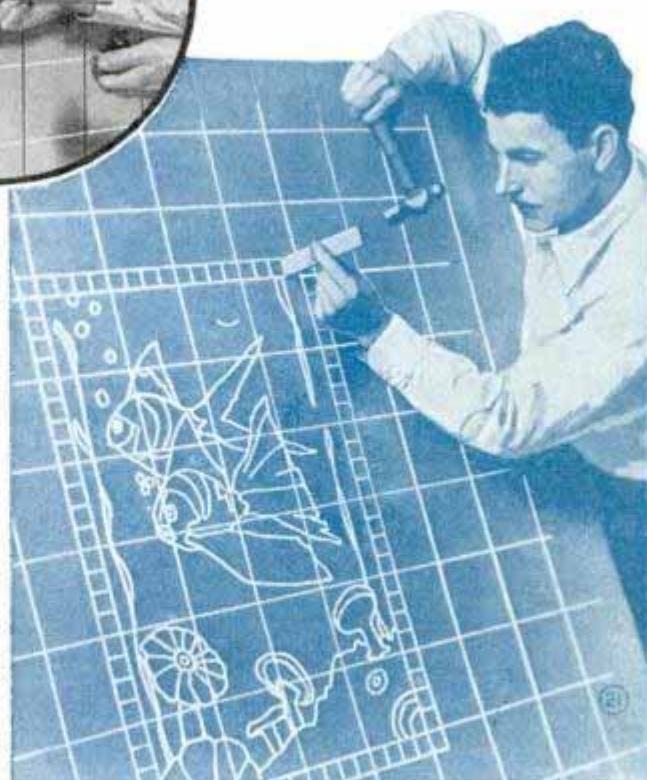
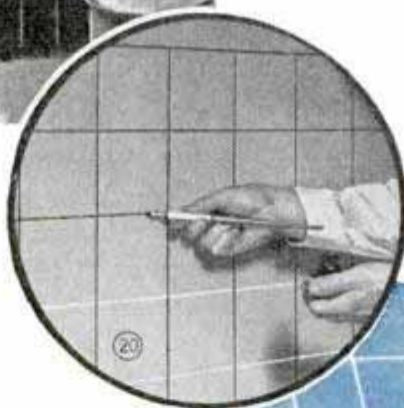


makes an attractive wall, but of course does not last as long as some of the more expensive materials. Linoleum is a good material to use when the entire wall is to be covered. Although the initial cost is fairly high, colored glass in various structural shapes undoubtedly makes the smartest and most durable wall surface. But, barring accidental breakage, such beautiful wall surfaces will practically last a lifetime, always retaining their original luster. Monel-metal tiles or prefabricated metal panels are particularly useful in some rooms and often can be used to

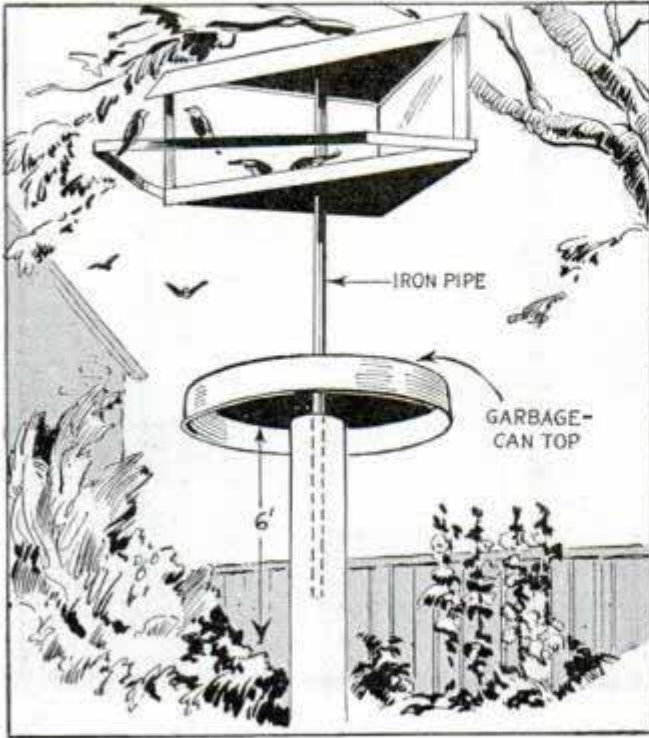


surface of the board. Freehand work can be done with an ice pick with the point rounded over, while straight tile marks can be impressed with a strip of metal, as in Fig. 21. After painting, the tile scorings can be run in with a ball-type lettering pen, Fig. 20, using black, white or colored waterproof ink.

advantage in combination with less expensive coverings. Sheet plastic compressed into asbestos or plywood panels makes sparkling walls. The least expensive way of using any of these products is to cover the lower portion of the wall only, treating the upper portion with paint or wallpaper. However, the various wallboards are so inexpensive that all-over treatment is usually not prohibitive. Excellent effects can be obtained by using a tiled board for the lower portion of the room and a plain board, with finish already applied, for the upper portion. Currently popular is the horizontal style of treatment as shown in Figs. 1 and 2 where the upper wall is done in plain wallboard with narrow division strips of chromium. Panel effects in any of the softer tileboards can be obtained easily by working any suitable picture directly on the



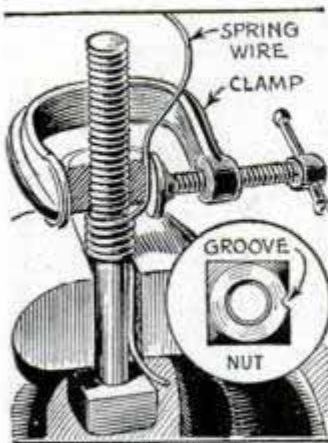
Bird Feeder Is Made Cat Proof by Can Lid on Standard



Finding that squirrels were robbing a bird feeder set up in his backyard, one home owner stopped the trouble by mounting a garbage-can lid on the standard of the feeder as shown. The lid is also effective in preventing cats from climbing the post and catching the birds.

Winding Small Coil Springs

The next time you have to wind a small coil spring, get a bolt of the proper diameter and file a small V-groove in one side of the nut. Then clamp the bolt in a vise,



placing the end of the wire from which the spring is to be wound between one side of the bolt and one of the vise jaws so that the assembly will be clamped tightly. Run the wire in the groove of the nut and put a C-clamp over it as indicated. Then using the C-clamp as a handle, turn the nut. This will cause the wire to be wound tightly on the threads. The groove in the

nut should be shallow enough to allow the screw of the C-clamp to press against it slightly, causing a slight tension on the wire while winding it.

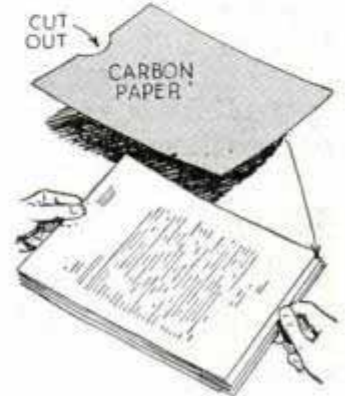
—Roy Mahal, Chicago.

Carbon Paper Removed Easily from Typewritten Copies

The usually difficult job of removing several sheets of carbon paper from a number of typewritten copies, is simplified

by cutting out a portion of the carbon sheets at the top. Select carbon paper that is a trifle longer than the typewriter paper so that the carbon sheets project a little at the bottom. To separate the carbons from the typewritten

copies grip the latter over the cut-out portion of the carbons, and pull the sheets apart.—John E. Bautsch, Denver, Colo.



Portholes for Model Boats

When constructing your next model boat try this simple method of making realistic portholes: Get a narrow strip of "Cellophane" of the desired shade, coat one side with shellac and apply to model so it covers the spots where the portholes are to be located. Using a belt punch, which you can get at any hardware store, press it through the Cellophane by hand and at the same time recess the wood slightly. Then strip off the excess stock.

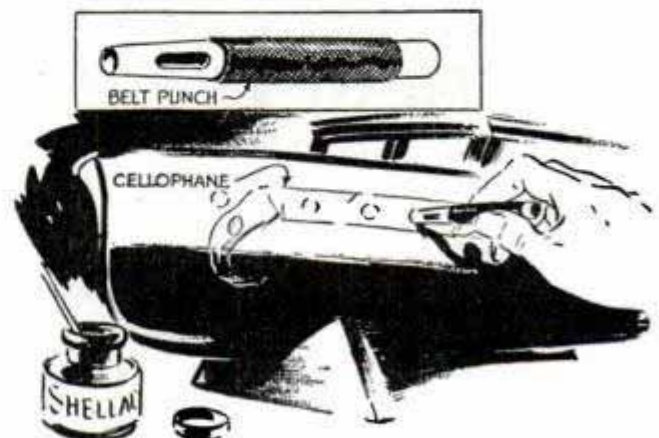
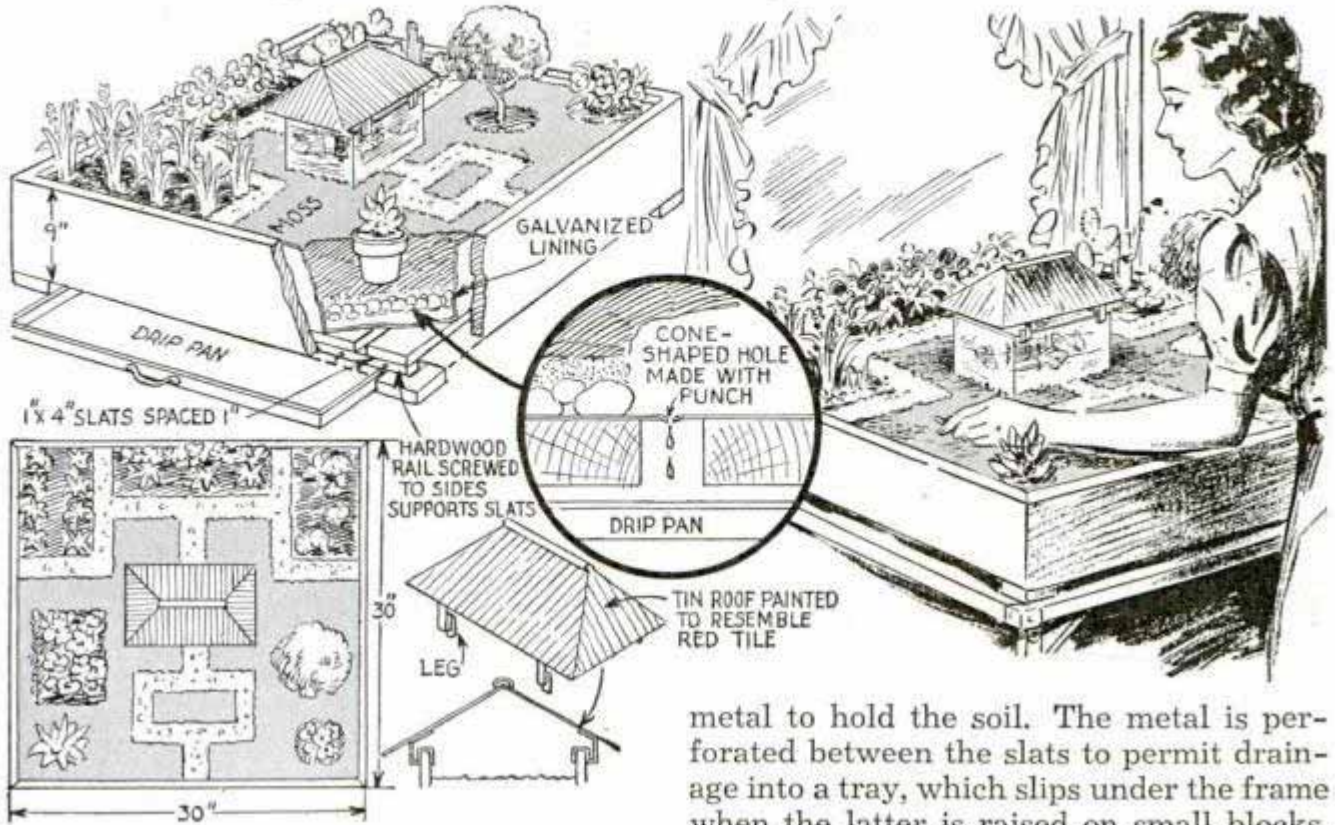


Table-Top Garden for Apartment Dwellers



Even with limited space, city dwellers can enjoy plants and flowers indoors with this miniature table-top garden. It can be laid out in formal plan with geometric walks and beds, or it can be developed into an old-fashioned type. The garden comprises a mitered frame with a slatted bottom. The slats and inside surfaces of the frame are coated with tar, after which the frame and bottom are lined with sheet

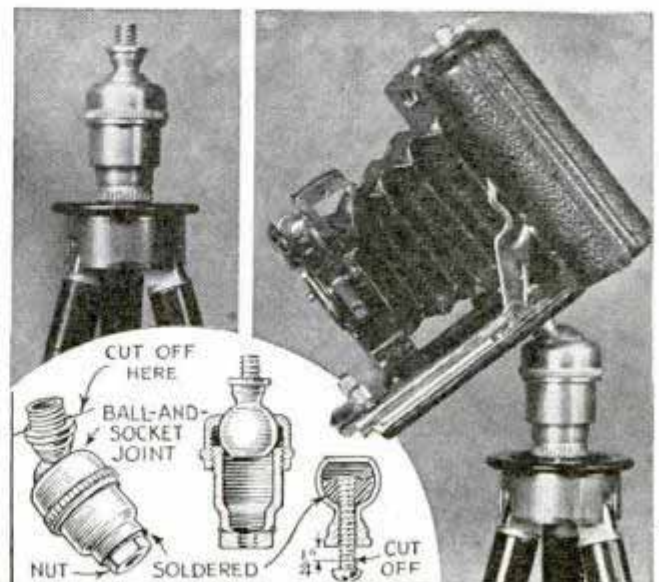
metal to hold the soil. The metal is perforated between the slats to permit drainage into a tray, which slips under the frame when the latter is raised on small blocks. To prepare the garden, spread small stones over the bottom, then cover with cinders or sand. Potted plants are used, and rich soil is packed around them. Lay out the walks with clean fine-mesh gravel, and plant grass or Helexine moss in spaces between the pots. An aquarium makes an attractive center piece, and if rectangular in shape, it can be made to resemble a glass house by providing a tin hip roof. Paint the roof to resemble red tile.

Tilting Tripod Head for Camera from Electrical Fixture

From a ball-and-socket electrical fitting, obtainable at many dime stores, I assembled a tilting tripod head to take small cameras. First saw off the threaded end of the socket, and insert a screw to take the camera. Fill the socket with solder to anchor the screw. Then solder a nut over the large end of the socket to take the tripod screw. The head can be tilted to hold the camera at any angle.

—Arthur Trauffer, Davenport, Ia.

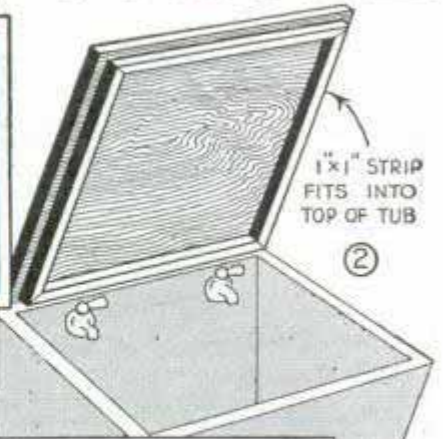
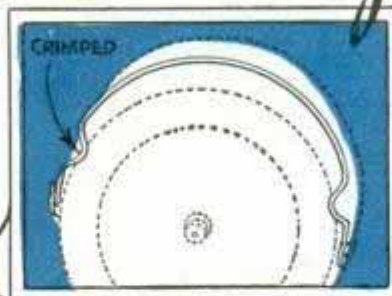
☐ A back rest for bed patients who wish to sit up is quickly improvised by inserting a washboard between the back of the pillow and the pillow case



Solving HOME



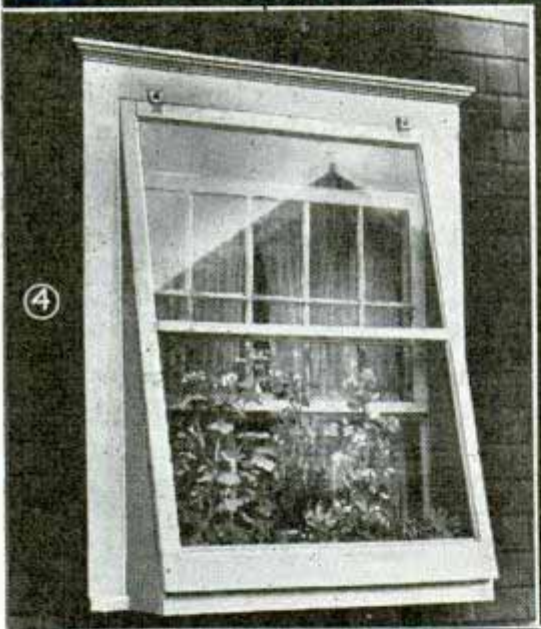
①



1"x1" STRIP
FITS INTO
TOP OF TUB

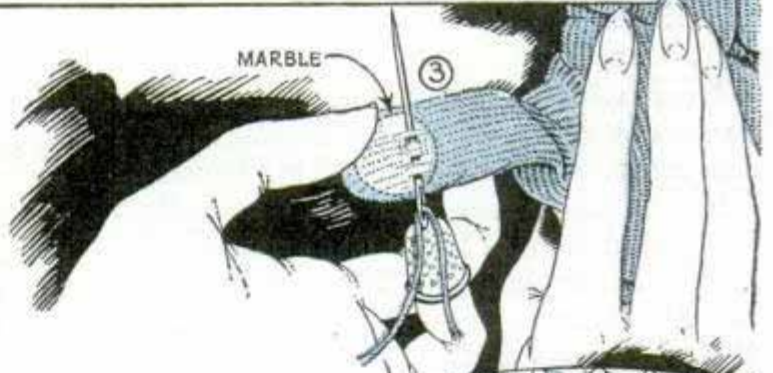
②

The lid of a stewing kettle is not likely to drop off and burn your hands if you crimp the bail to engage the lid as in 1. One side of a double laundry tub provides a good shelf while the other side is in use, when the wood lid in 2 is used. Next time you have a glove to darn, slip a marble into the end of the finger as in 3. It's a dandy emergency darning ball.



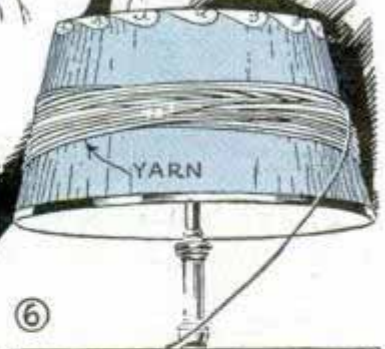
④

You can have a miniature greenhouse by tilting a storm sash and blocking behind it as in 4. Be sure that it's airtight



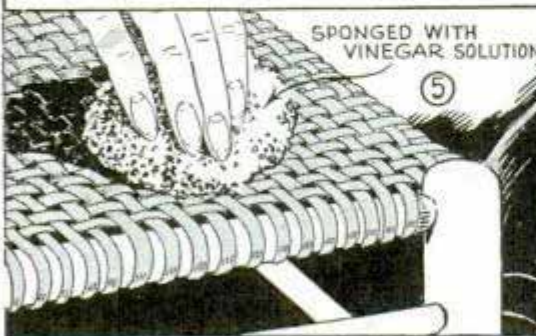
MARBLE

③



⑥

When you want to wind a skein of yarn into a ball, a lampshade provides a good substitute for a reel as in 6. Just drop the skein over the shade, loosen the ornament so that the latter will turn freely and wind the ball



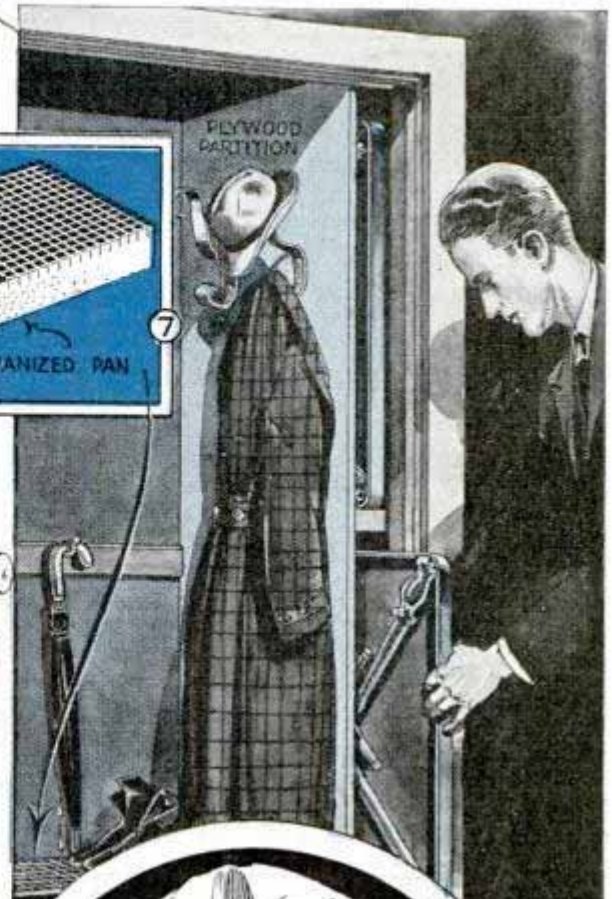
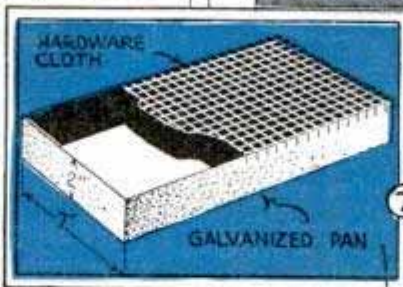
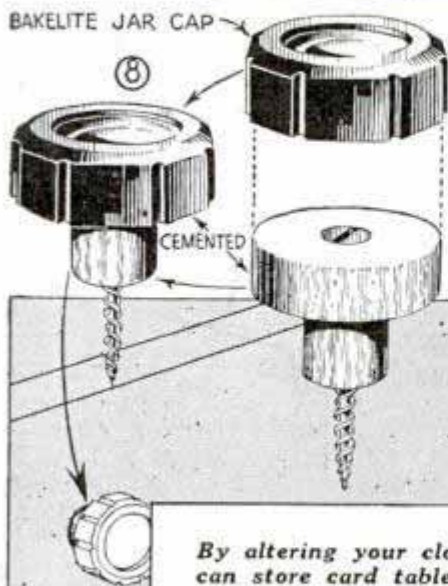
SPONGED WITH
VINEGAR SOLUTION

⑤

A cane chair seat that sags can be shrunk taut by sponging it top and bottom with a hot solution of vinegar and water, 5. Let it dry in the sun

PROBLEMS

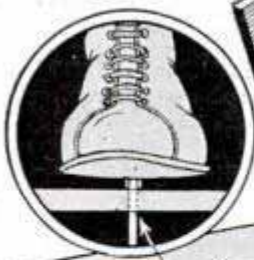
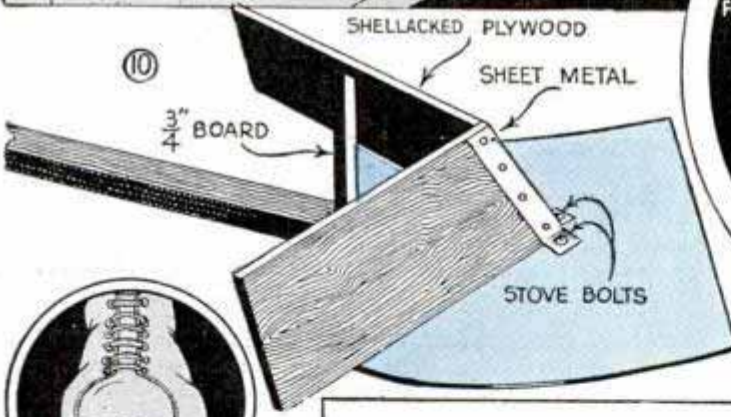
BAKELITE JAR CAP



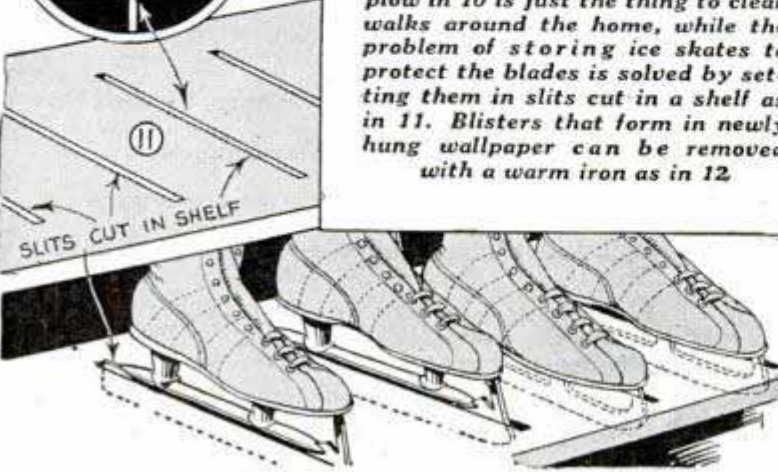
By altering your closet as in 7, you can store card tables, wet umbrellas and galoshes easily besides other clothing. Any tinsmith can make the drip pan, and you can easily shape the hat hangers from flat iron. Bakelite and plastic tops from empty jars of cosmetics provide attractive drawer pulls when cemented to a shouldered hardware cloth as in 8. A wood screw or stove bolt inserted into the turned plug prior to cementing permits attaching the cap in the usual manner



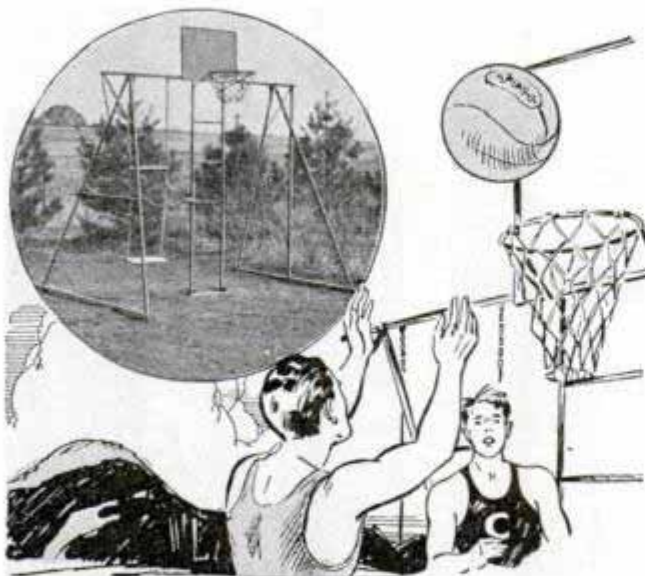
Your wet paintbrushes won't dry out if you put them in a can of turpentine and slip a silk food cover over the top of the can as in 9



The combination snow shovel and plow in 10 is just the thing to clean walks around the home, while the problem of storing ice skates is solved by setting them in slits cut in a shelf as in 11. Blisters that form in newly hung wallpaper can be removed with a warm iron as in 12



Three Units in Outdoor Gym on Single Frame

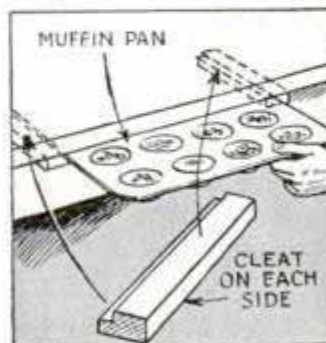


Located in the back yard of a private home in Lincoln, Nebr., the gym unit shown in the photo not only contains the usual swing, trapeze bars, etc., but also has

a basket and backstop for practicing basketball. The unit is assembled from iron pipe at small cost, and the various parts are arranged so that any one of them can be used without interfering with the others.

Muffin Pan Provides Drawer for Small Parts

When you want a bench drawer with a number of small partitions to hold screws, washers, nails and other small parts, why not save time and work by using a muffin pan?



It can be mounted under a bench top by means of two cleats, as indicated, which are rabbeted to take the edge of the tray.

—Lawrence B. Johnson, Spokane, Wash.

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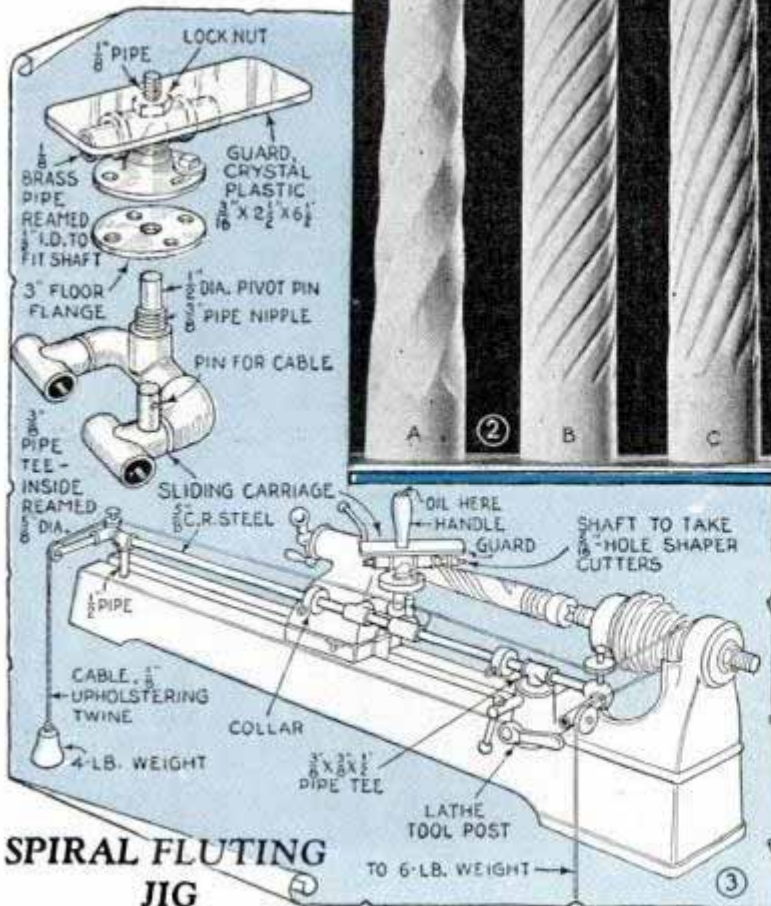
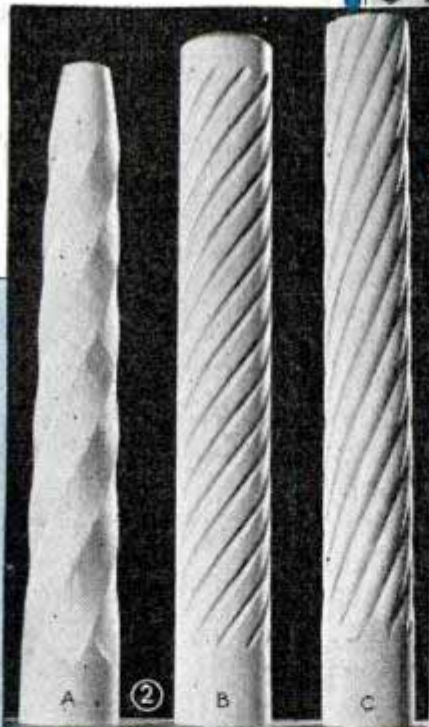
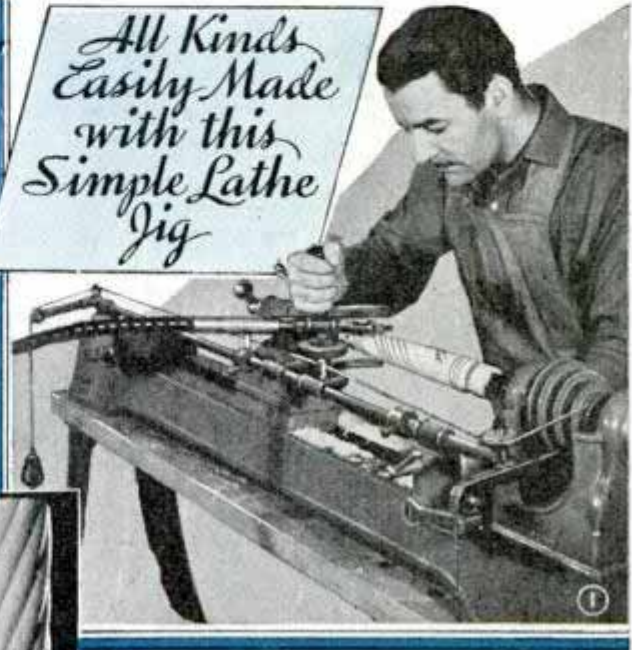


SHOP NOTES

SPIRALS

SPIRAL twists and rope moldings of all kinds, as well as straight fluting and reeding, can be done with this lathe jig. The unit, Fig. 1, is assembled from standard pipe fittings and consists of a track mounted behind the lathe to support a sliding carriage which carries a shaft, the latter being machined to fit $\frac{5}{16}$ -in. hole shaper cutters. A cable attached to the sliding carriage works over the lathe pulley to furnish the spiral feed, the work being rotated by the cable as the

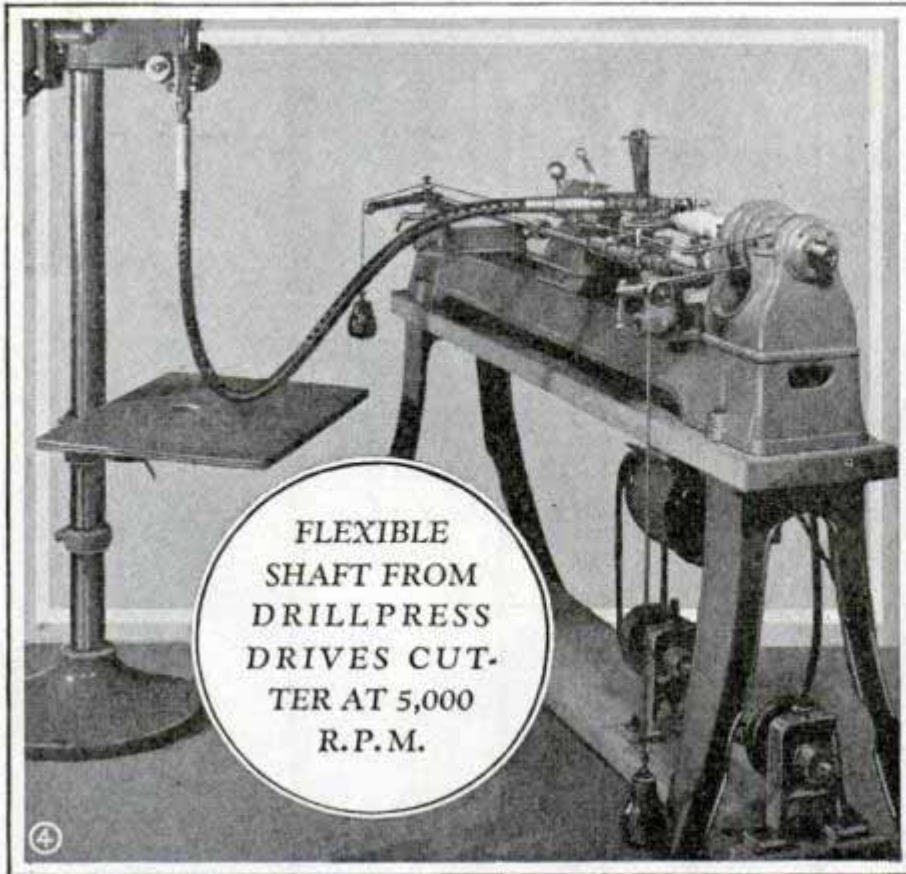
*All Kinds
Easily Made
with this
Simple Lathe
Jig*



**SPIRAL FLUTING
JIG**

carriage is pulled along the track.

Fig. 3 shows the essential points in construction. The track is $\frac{5}{8}$ -in. diameter cold-rolled steel, which is fitted into two pipe tees. These are provided with short lengths of $\frac{1}{2}$ -in. pipe to fit inside two regular lathe tool posts. The track is adjusted in or out, and up and down as required, in this manner. The sliding carriage is made from flangeless pipe fittings, held together with short nipples. Two 3-in. floor flanges are machined to make the turntable, the upper one of these being fitted to a $\frac{3}{8}$ -in. pipe tee which supports the shaft bearing. The shaft is machined to $\frac{1}{2}$ -in. diameter to fit the bearing and to make connections with a flexible shaft. The latter can be driven with a motor or from your drill press as indicated in Fig. 4. The working end of the shaft is machined and threaded to take standard shaper cutters. Spirals of various pitches can be obtained



FLEXIBLE
SHAFT FROM
DRILL PRESS
DRIVES CUT-
TER AT 5,000
R.P.M.

by working the cable over any of the four steps of the lathe pulley, the lead of the spiral being equal to the circumference of the pulley over which the cable is run. Various shaper cutters can be used to obtain different effects. In Fig. 2, example A is cut with a straight cutter; B with a round-nose cutter, and C is made with a concave shaped cutter. Combining B and C would give the familiar spiral twist. A depth collar is used to control the depth of cut. Straight fluting and reeding can be done by turning the shaft at right angles to the work and disengaging the cable.

Wheeled Pot Speeds Job of Filling Cracks in Pavement

Perfected by a California highway maintenance foreman, this wheeled pot for applying hot asphaltum to cracks and expansion joints in concrete pavements saves time, allows the workman to stand upright and relieves back strain, besides saving considerable time in application. As the weight of the pot is carried on the wheel, the workman can guide it accurately above the crack as he moves forward. A small wheel is attached to the spout end of the pot by means of a flat-iron bracket, the latter being bent to one side so that the wheel is offset about $1\frac{1}{2}$ in. from the center of the spout. This allows the wheel to run at one side of the crack, yet have the spout end directly over it.

—W. W. Wheatly, Lakeside, Calif.

"Cellophane" Used as Shim Stock

I have substituted Cellophane, which is about .001 in. thick, for metal shims where clearances are not critical. It is tough, durable and convenient to handle. I have used it in setting up dies, production machines, tool-room jobs, etc.

—Jack McClintock, Cleveland, Ohio.



Thickness Gauge in Key Case



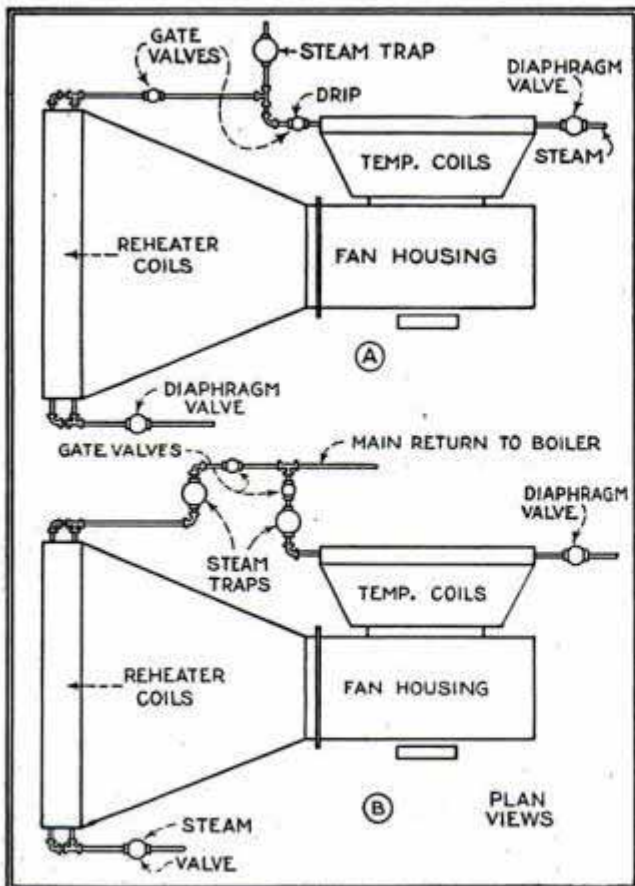
If you carry a thickness gauge in a leather key case, it can be kept oiled so that it will not rust, and the leather covering tends to protect the thin plates. A few drops of fine

oil are applied occasionally to the leather which contacts both sides of the gauge.

Steam Traps Prevent Hammer in Air-Conditioning Unit

It sometimes happens that in certain air-conditioning installations, a single steam trap, detail A, fails to carry off condensation fast enough to permit the necessary rapid action of the automatic valves in delivering new supplies of steam. In some instances this deficiency will cause severe hammering. The remedy is to install a second trap as shown in detail B. This arrangement practically doubles the capacity for returning condensation to the boiler.

—L. H. Georger, Buffalo, N. Y.



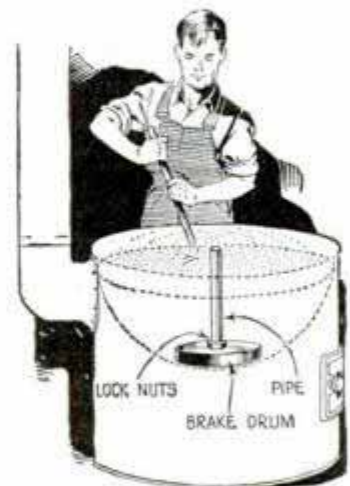
Mouth of Grain Sack Kept Open by Spring Holder



The task of holding a grain sack open while an assistant shovels grain into it from a scoop may be simplified with this holder. It consists of a length of steel rod, which is bent as shown to provide two handles and an open loop. The loop portion is inserted in the sack by compressing the handles, which are then spread apart.

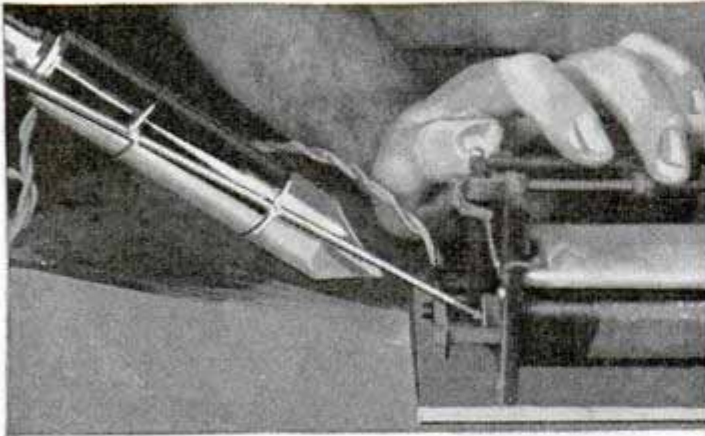
Percolator to Cook Stock Feed

All you need for an inexpensive percolator to quickly cook feed for poultry and livestock is a length of pipe and an old auto brake drum. One end of the pipe is threaded and is locked in the opening of the drum by means of a nut on each side.



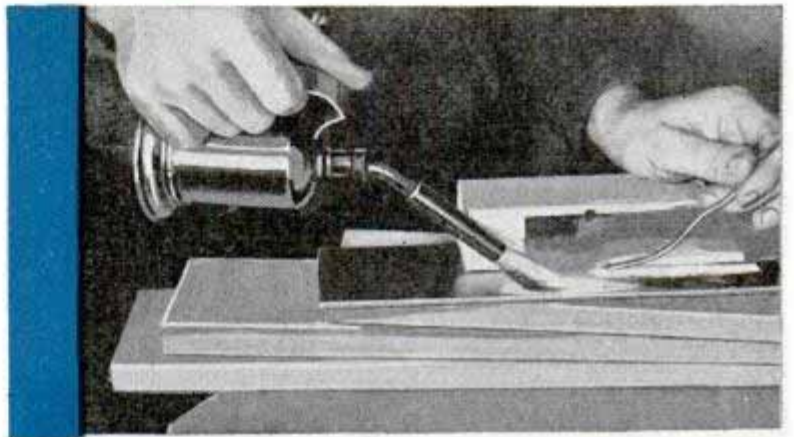
Because the boiling liquid contacts the top of the feed, as well as the bottom, cooking time is reduced and less stirring required.

Tricks that help you



Where you have only a large 175-watt soldering iron and you are likely to have trouble joining small, intricate work, the problem can be solved often by the method shown at the left. Simply wire a short length of copper rod to the iron, file the end to a diamond point and tin it. Heat from the iron will travel down the rod to the work.

Here two pieces of sheet brass are being soldered together at right angles. The vertical member is attached to a square block of wood with brads. This makes it possible to hold the part exactly at 90 degrees and at the same time, place it in just the position necessary to make a neat, strong joint.



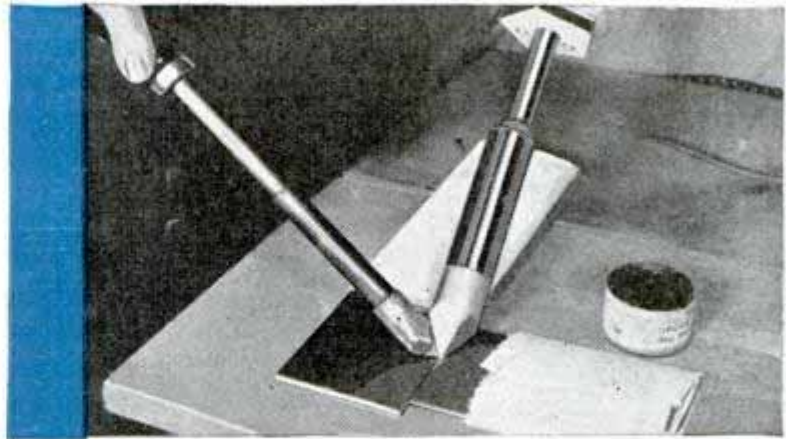
When you have to tin the bared ends of a number of wires, try the setup shown. Just clamp the soldering iron in the vise at an angle, set a small can cover on one of the facets of the iron and drop several small pieces of solder into it. When these have melted, dip the bared ends of the wire into the molten solder.

Suppose you wish to solder small parts that have been enameled and do it without charring the enamel. That's easy. Just suspend the parts with wire in a glass of water as shown at the right, leaving exposed only the joint that is to be soldered. The water absorbs and dissipates the heat, protecting the enamel from charring.



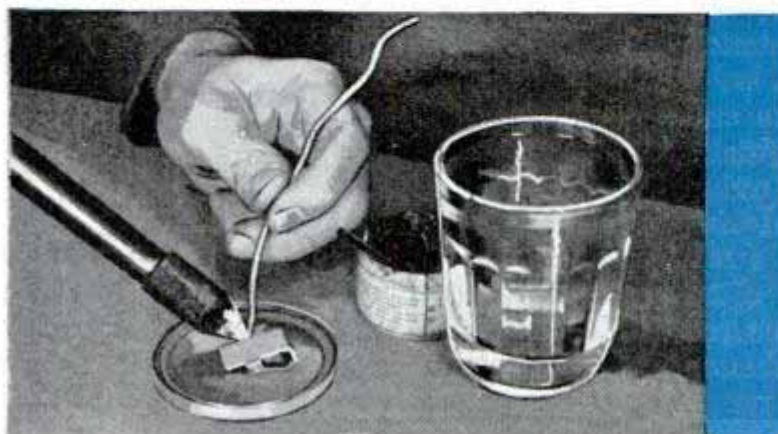
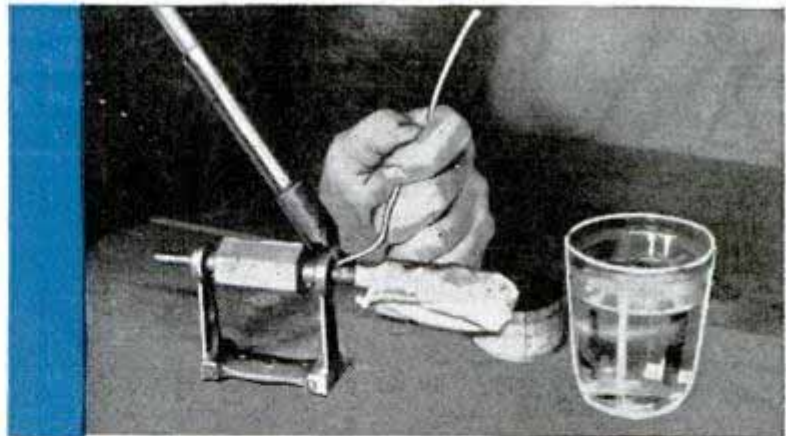
when SOLDIERING

Good soldering may be done only when plenty of heat is applied to the surfaces to be joined. The solder must penetrate the surface of the metal and should not crystallize too soon when cooling. So, when necessary to join pieces of sheet metal with large radiating surfaces, you can prevent heat loss by wrapping the parts in asbestos paper and using two irons.



There really is no such thing as a universal flux. Hence, if you have a variety of work to do, you should have a kit containing tallow or rosin for soldering lead, hydrochloric acid for galvanized steel, zinc chloride for gold or silver, Gallipoli oil for pewter, ammonium chloride for gun metal and a can of ordinary commercial paste flux for electrical work.

It often happens that a small part must be soldered which is adjacent to other parts already soldered in place. If the heat is not controlled the parts previously joined will be loosened and perhaps fall off. To prevent this, wrap the work in rags soaked in cold water, leaving only the joint exposed. This prevents flow of the heat to parts already soldered.



Another handy method of restricting the flow of heat is shown at the left. Here two small parts have been soldered in place and a third piece is to be joined. To prevent softening solder already applied, the work is immersed in water in a shallow container such as a can lid. Only the surface that is to join the third piece is left exposed. In this way the heat will be confined to the joint being soldered.

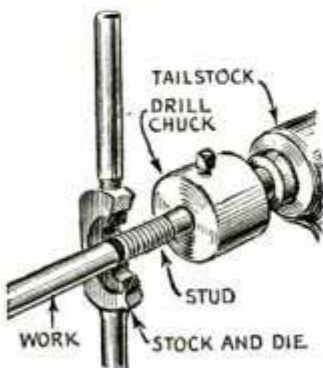
*A. Langley & Co.
159th St. New York
Chicago*

Slot Locates Gauge Positions in Holder



Ordinarily, plug gauges must be examined when they are returned to the case to make sure of the size so that they can be placed in the correct groove. A quicker and better method is as follows: Fasten a piece of sheet metal having a tapered slot to the back of the wood holder. The width of the taper over each groove in the case must be exactly equal to the size of the gauge fitting that groove, from the largest to the smallest. When a gauge is slid along in the slot until it stops, it will be directly over the groove in which it belongs.

Starting Stocks and Dies



Small-diameter work can be threaded to standard size in a lathe with stocks and dies, much quicker than with a single-pointed tool. But many such threads are often spoiled because

the die is not started squarely, or because the pressure by the tailstock is too much or too little. To avoid this trouble, a stud

or screw of the same size as the work to be threaded is gripped securely in a drill chuck. The die is run on the stud first, nearly to its full depth, and then the tailstock spindle is advanced until the die touches the end of the work. When the stock is turned the die runs off the stud and onto the work correctly.

Improving Spiked Calf Weaner

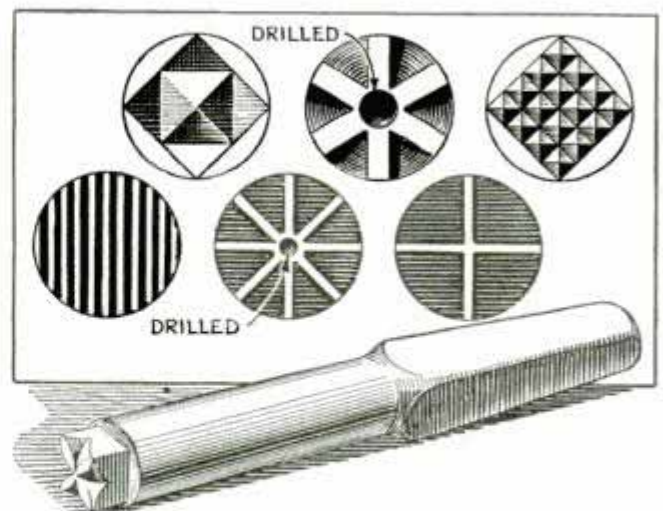
As calf weaners of the spike type are sometimes responsible for injuries to other animals confined to the same enclosure, one farmer follows this simple method to minimize such trouble:



He impales ordinary fuller balls on the spikes so that only a short portion of the points project, which does not defeat the purpose of the weaner.

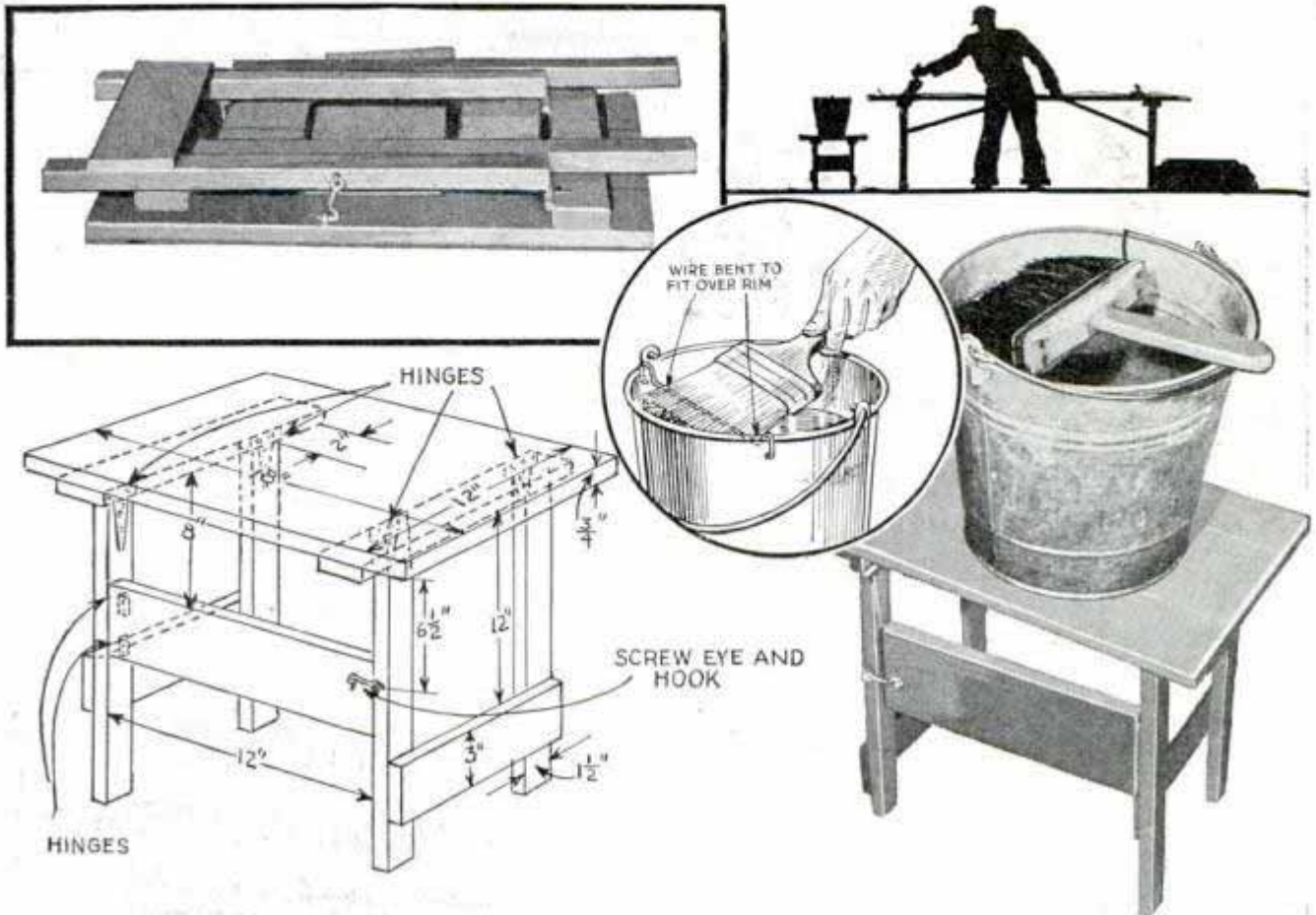
Background Stamps

Steel used in auger bits is well suited for making background stamps for wood carving, leather and even copper work. The square shank permits easy handling and prevents rolling when laid on the



bench. First cut the bit in two with a hacksaw and then square the end on the side of a grindstone. As an aid in laying out a design in the face, coat it with a copper-sulphate solution. You will find that this steel can be filed very easily.

Paperhanger's Portable Paste-Bucket Stand



This folding stand for the paperhanger's paste bucket takes very little space when transported from job to job. The top is plywood, and the legs are hinged to it in pairs, one pair being offset so that they will fold over the other pair. The legs are

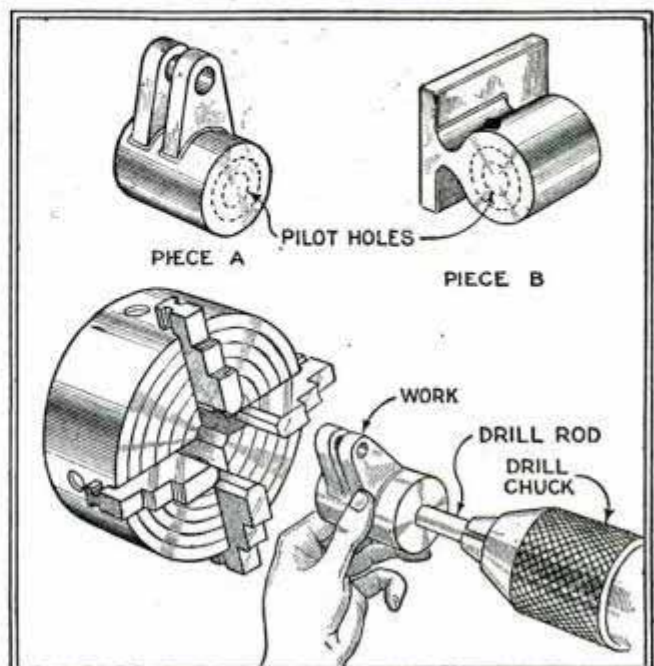
braced with a crosspiece, which is hinged to one leg, and folds flat when the table is closed. Another labor saver is a wire across the mouth of the paste bucket to support the brush as shown in the circular detail.—Loyal R. Jones, Lansing, Mich.

Irregular Lathe Work Supported on Center While Chucking

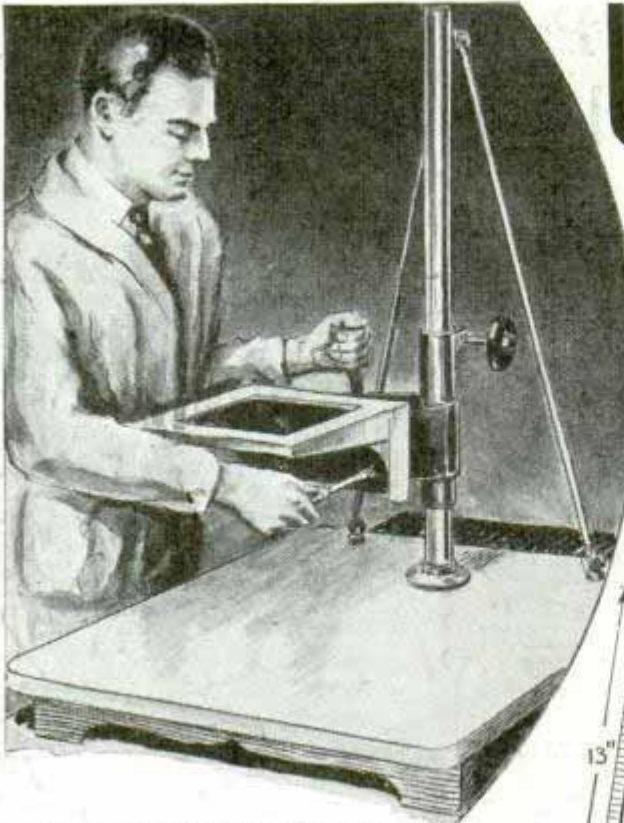
It's a simple job to chuck small irregular-shaped work in a lathe to face or bore it, if the nature of the work permits a pilot hole to be drilled as indicated by pieces A and B. Using a short piece of drill rod held in a drill chuck as a pilot, slip the work over the rod, and move it between the opened jaws of the lathe chuck. While the jaws are being tightened on the work, special care must be taken not to spring the rod out of line.

—Milo Shutt, Homeworth, Ohio.

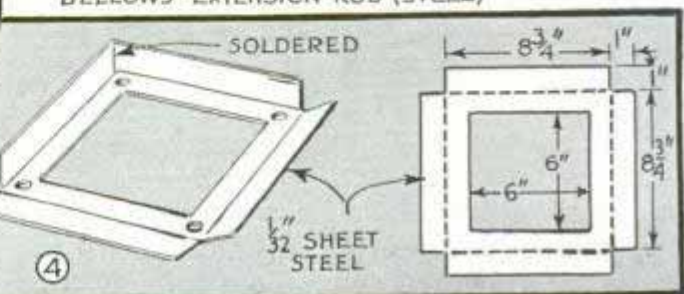
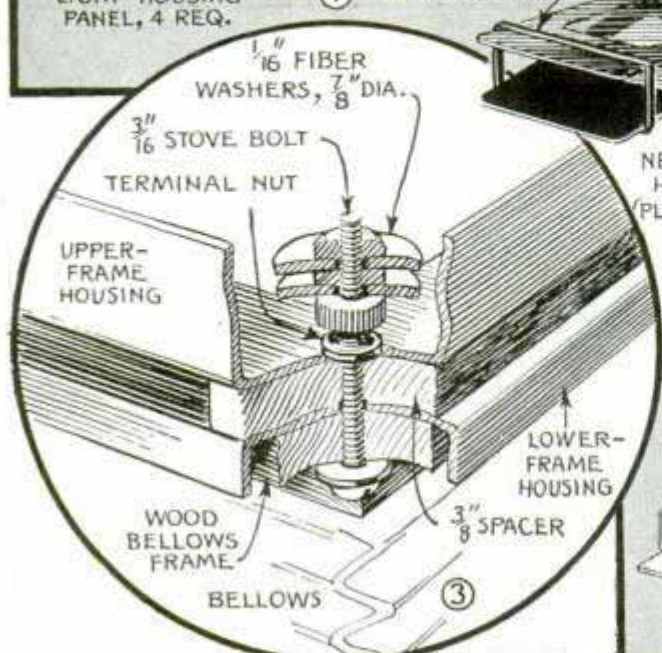
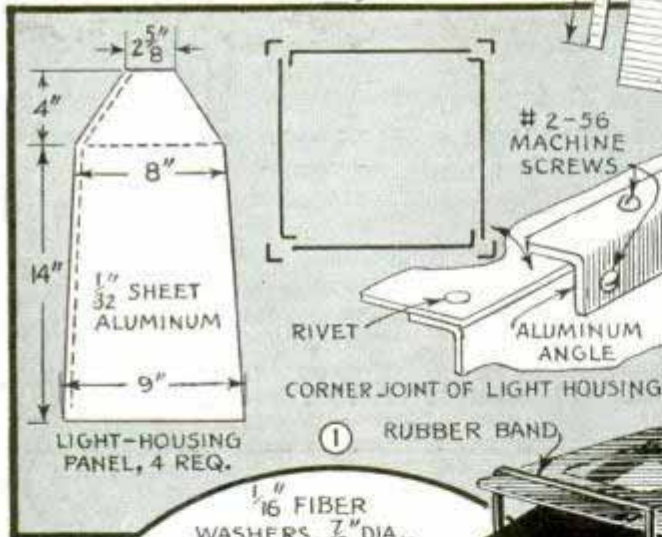
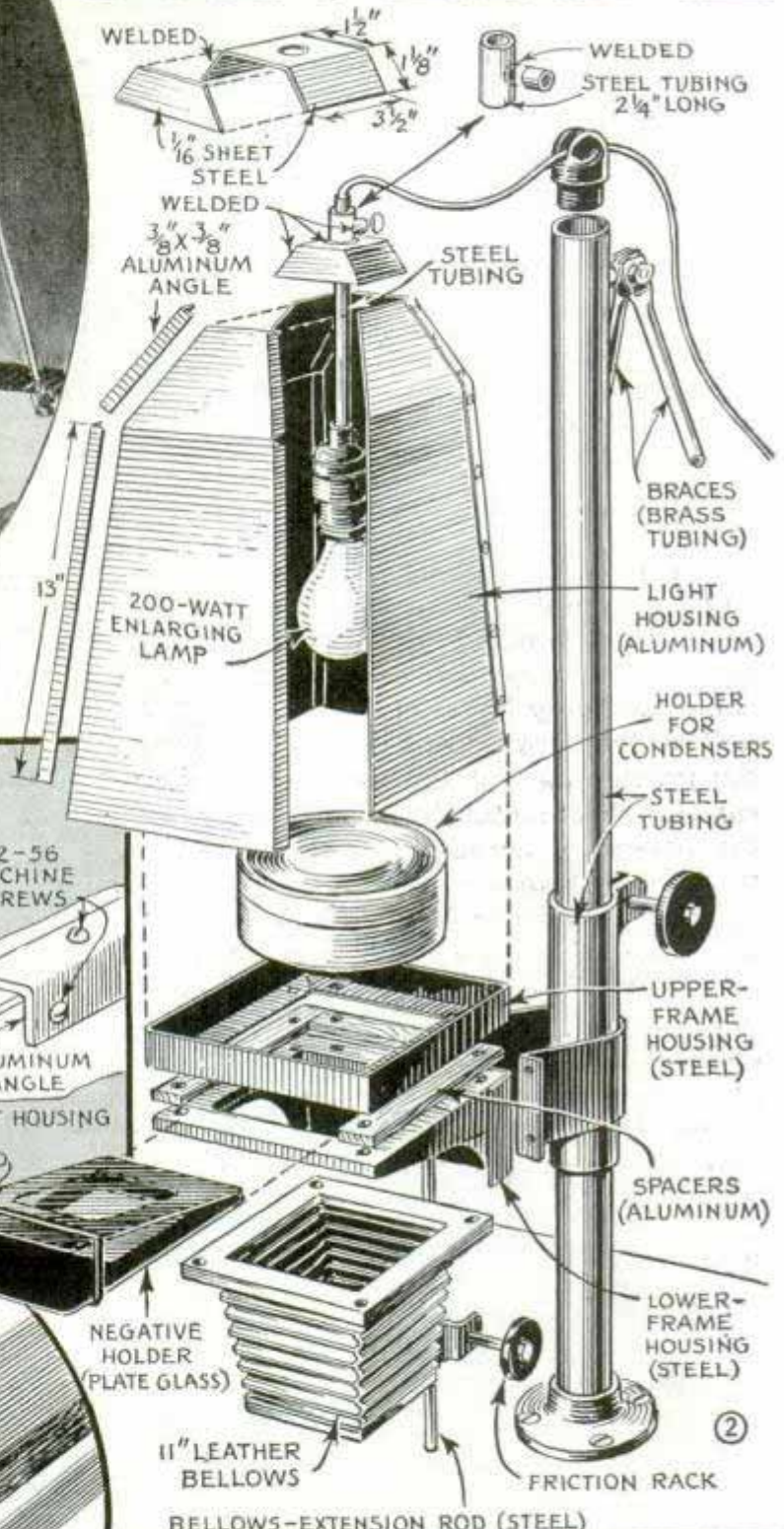
Small oil-color brushes may be kept soft between jobs if not thoroughly cleaned by rubbing a little lard or vaseline into the bristles. Rinse this out with turpentine before using. Glycerine will do for brushes used for showcard or tempera color.



UNIVERSAL



IT'S NO TROUBLE TO BUILD IT FROM STOCK MATERIALS



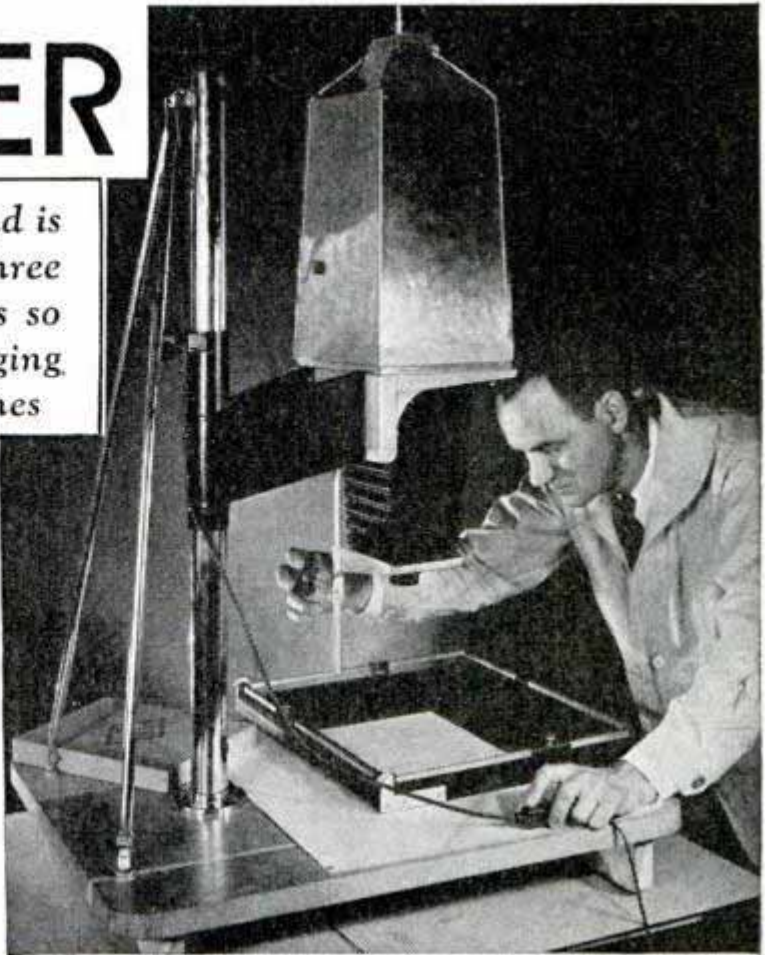
ENLARGER

... has an adjustable light and is designed to hold any one of three sets of lenses and condensers so you can enlarge negatives ranging from 35 mm. to 4 by 5 inches

By JOSEPH OTT

THIS photo enlarger has been especially designed for the individual builder, which means that the parts and materials used are easy to get and are inexpensive. The assembly has been so worked out that only a few common tools are needed to build it complete ready for work. As you will see from Figs. 1 to 4 inclusive, the greater part of the assembly calls for sheet metal. This reduces the necessary equipment needed for this work to a rule, a scribe, a pair of tin snips and a few blocks of hardwood to serve as forming dies. In certain details and in the material list the dimensions given are only close approximations because of the necessity of bending and fitting a number of parts.

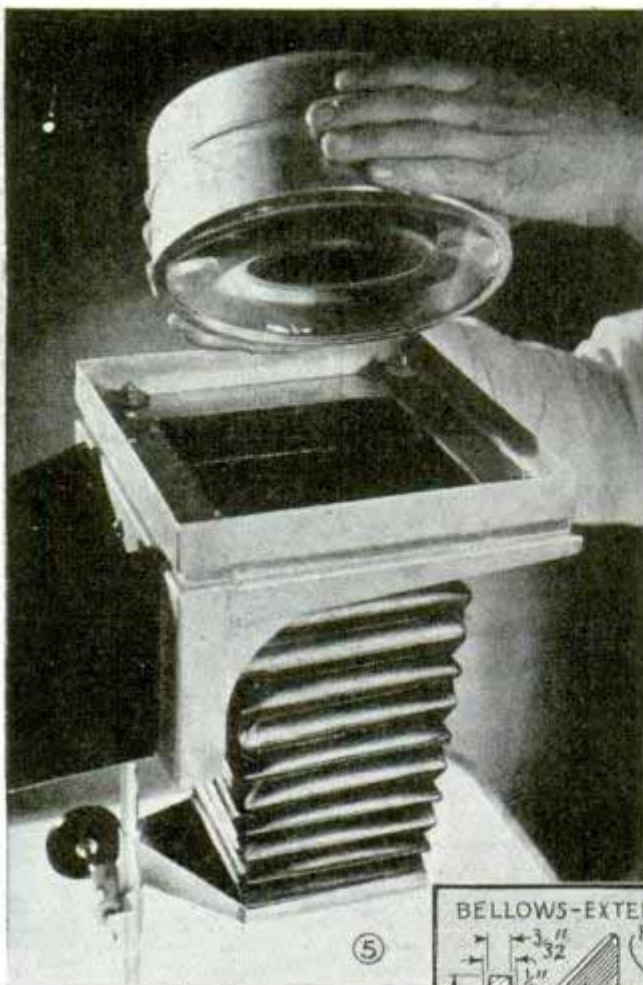
Now, to be truly universal in scope, an enlarger should accommodate, with simple adjustments, all film sizes ranging from 35 mm. to the popular large size, 4 by 5 in. This enlarger accommodates these and other intermediate sizes. To cover the three film sizes mentioned, it is necessary to have three different focal-length lenses with three matching sets of condensers, that is, the focal length of each lens should match the focal length of the companion set of condensers. If the enlarger is constructed to take the 4 by 5-in. film with matching focal length lens and condensers, the smaller lenses and condensers can be interchanged easily. For the 1 by 1½-in. or 35-mm. film, a focal length lens of 50 to 75 mm. will be required. Condensers to match should be approximately 3 to 3½ in. in diameter. The intermediate size of 2¼



THE TUBING AND RODS FORMING THE COLUMN AND BRACES MAY BE CHROMIUM PLATED FOR APPEARANCE. THE HOOD IS ALUMINUM AND THE BASEBOARD IS EITHER PLYWOOD OR GLUED-UP STOCK

by 2¼ in. should have a lens of approximately 4 to 4½-in. focal length and condensers to match should be approximately 5½ in. in diameter. For the larger size of 4 by 5 in. the focal length of the lens should be approximately 5¼ or 6 in. and the condensers 8 in. in diameter. The condensers when paired and placed in a frame, with convex sides facing, should give a focal length equivalent to the focal length of the lens. The above condenser diameters give the required focal length for the lenses mentioned. When the focal lengths of condensers and lens match, focusing of the image is sharp and the distribution of light to all corners is uniform. This equal distribution of light is very essential in practice. The reason for having condensers and lenses of various sizes is to shorten the movement of the enlarging unit.

A 1 by 1½-in. film can be placed in the 4 by 5-in. film holder and focused through the 8-in. condensers and 6-in. lens but it would be necessary to raise the enlarger to a height of from 6 to 10 ft. above the



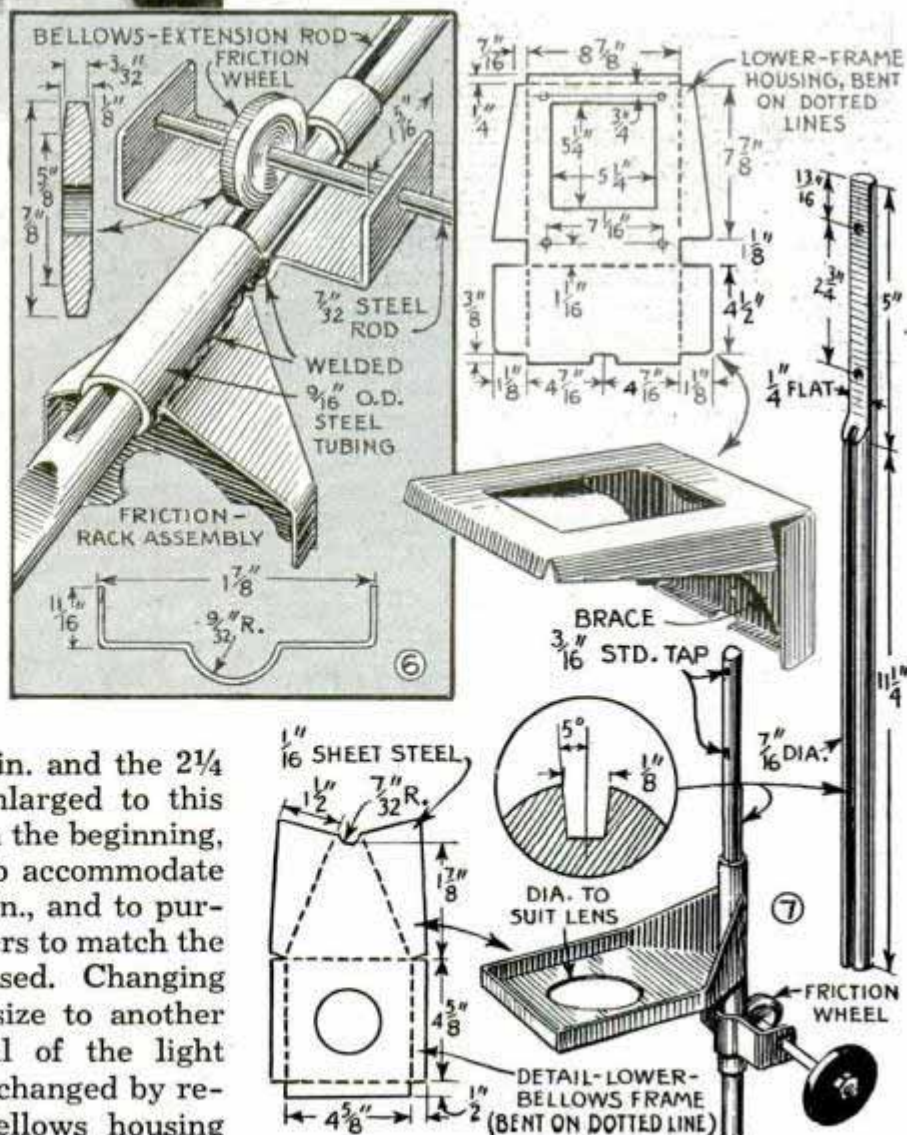
DOUBLE CONDENSERS GIVE HIGH ILLUMINATION FOR CRITICALLY SHARP FOCUSING AND SHORT EXPOSURES

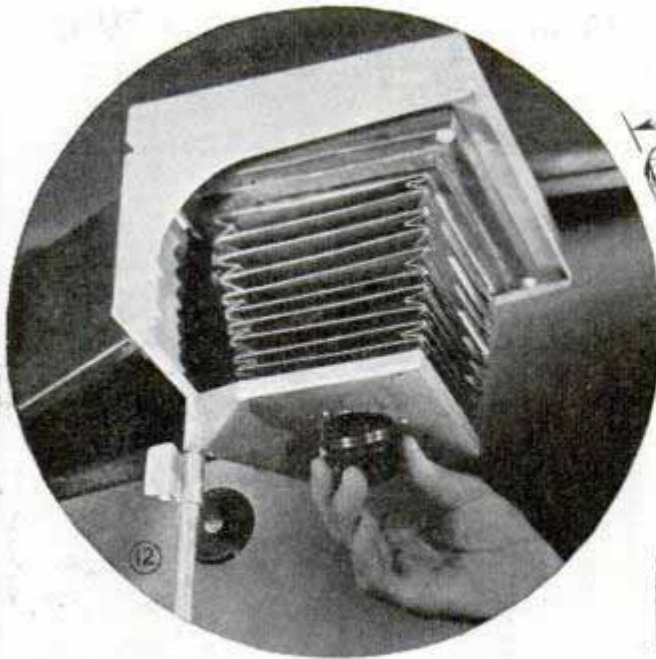
enlarging board. In most cases only a small part of the negative is used and it would be impossible to operate the enlarger because of the height necessary to secure the desired enlargement. This enlarger is designed to operate on an upright 42 in. high, which allows the image of a full 4 by 5-in. film to be enlarged to approximately 20 by 30 in. and likewise the 1 by 1½-in. and the 2¼ by 2¼-in. films can be enlarged to this same size. It is advisable, in the beginning, to construct the enlarger to accommodate the large-size film, 4 by 5 in., and to purchase the lens and condensers to match the particular size film you used. Changing the condensers from one size to another requires only the removal of the light housing and the lenses are changed by removing from the lower-bellows housing

as in Fig. 12. Flanges of different sizes can be fitted into the housing.

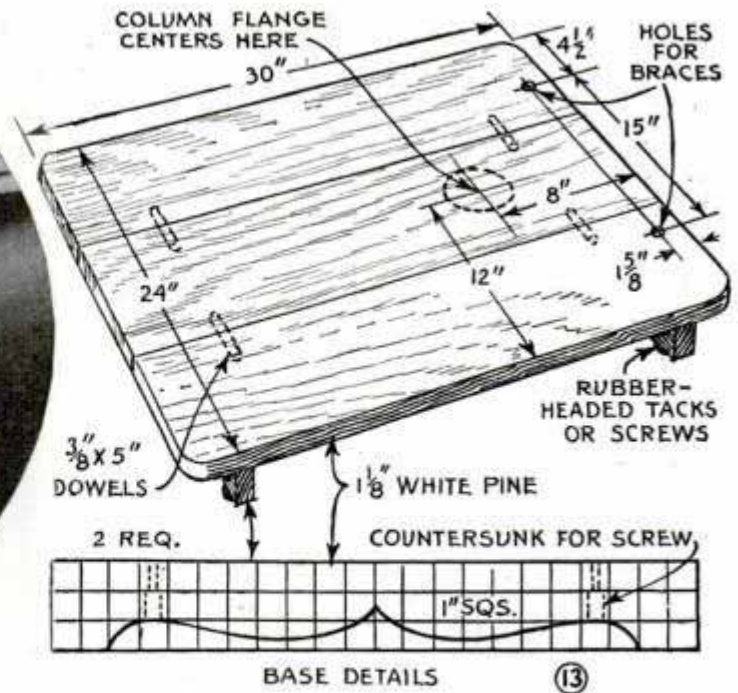
Provision is also made for the use of a ground or opal glass in place of condensers. Although certain advantages are claimed for the ground-glass diffuser, the amount of light necessary is approximately three to four times that required with condensers. Through ground-glass diffusion light falls off rapidly toward the edges and the image is not as sharp as with condensers. However, to reduce the cost of this enlarger, the builder can follow the general construction, using a ground-glass diffuser and a lens of the proper focal length. Later he may add matched condensers and still later other lenses and condensers to fit other films.

Now, in Figs. 5 to 11 inclusive you will find a number of the parts shown in Figs. 1 to 4 detailed separately. Although it is not especially important, proceeding to make the parts in a regular sequence will





FOR VARYING SIZES OF FILM, SIMPLY CHANGE THE LENSES AND CONDENSERS



MATERIAL LIST

Part	Kind of Material	Quantity	Size
Enlarging board	Pine	1	1 x 20 x 30 in.
Brace	Pine	2	1 x 4 x 18 in.
Upright column	Steel tubing	1	1/16 x 1 7/8 x 42 in.
Braces	Brass tubing	2	1/16 x 1/2 x 45 in.
Sliding column	Steel	1	10 in. long to fit over upright
Extension for housing	Steel sheet	1	1/32 x 5 1/2 x 20 in.
Bellows	Leather	1	5 x 5 x 11 in. extension
Film holder	Plate glass	2	3/8 x 6 1/2 x 9 in.
Lower-frame housing	Steel	1	1/32 x 10 x 14 in.
Upper-frame housing	Steel	1	1/32 x 11 x 11 in.
Spacers	Aluminum	3	3/4 x 1 x 9 in.
Top housing	Aluminum	4	1/32 x 9 in. at bottom 6 in. at top—20 in. long
Corner of housing	Aluminum	4	1/32 x 1 x 20 in.
Top of housing	Steel sheet	1	1/32 x 4 x 4 in.
Upright extension	Steel tubing	1	7/16 x 12 x 1/16 in. wall
Light socket	Standard	1	To fit enlarging bulb
Thumb setscrew	Steel	1	3/16 in. thread— 5/8 in. knurled head
Bellows-extension rod	Steel	1	7/16 x 16 1/4 in.
Lower bellows frame	Steel sheet	1	1/32 x 5 x 8 in.
Handwheels	Bakelite	2	1/4 x 3 in. diameter
Rack-wheel shaft	Steel	1	7/32 x 4 1/2 in.
Tapered rack wheel	Steel	1	3/8 x 7/8 in. diameter
Rack spring	Steel	1	1/32 x 1-5/16 x 4 in.
Upright flange	Cast iron	1	3/4 x 4 in. diameter
Anchor bolt	Steel	2	3/8 x 2 in. long
Flanged bolts	Steel	4	5/16 x 2 in. long
Finishing head	Wood-turned	1	To fit diameter of column
Rubber rests	Sunk screw and rubber	4	3/4 in. diameter
Diffusion glass	(Or opal glass)	1	3/16 in. thick to fit frame
Extension cord, switch and plug		1	12 ft. long
Nuts and bolts	Steel	8	1 1/2 in. long
Nuts and bolts	Steel	3	3/4 in. long
Rod	Steel	1	3/16 x 4 in.
Rod	Steel	1	1/2 x 4 in.
Housing-assembly screws	Steel	36	Size No. 2-56

this before drilling any of the holes. Note also that in Figs. 2 and 10 the lips or "ears" of the supporting arm are shown bent in opposite directions. On the original the lips were bent inward but, due to the weld at the tubular slide, it may be necessary to bend them outward as in Fig. 2, when fitting the parts together.

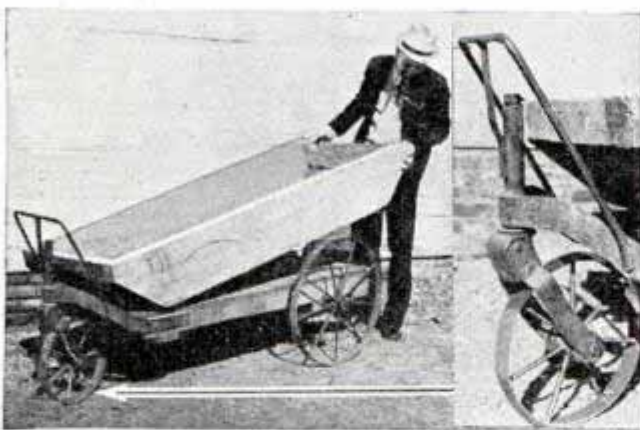
With the assembly at this stage you're ready for the lower-bellows frame and the friction-rack assembly, Figs. 2, 6, 7 and 9. This is a bit more exacting and several machine operations are necessary. It's especially important that the sides of the groove milled in the bellows-extension rod be inclined approximately 5 degrees and that the sides of the friction wheel be machined to correspond. Of course, some filing and trial fitting will be necessary after you cut out the lower-bellows frame or housing, Fig. 7, as the dimensions are only ap-

proximate. The complete assembly is shown in Figs. 6 and 9. The rack spring mentioned in the material list is dimensioned in the lower detail in Fig. 6 and shown in place in the upper detail. Bent to the shape shown and drilled, it provides tight bearings for the friction-rack hand-wheel, Figs. 6 and 11.

It should be noted in Fig. 2 that the enlarging bulb is placed in a socket attached to a tube which is adjustable through the top of the housing. When using condensers it is necessary to place the light far enough above the condensers to give uniform illumination. For this reason, the top of the housing for a 4 by 5-in. film is 18 in. above the negative. The enlarging lamp should be about 250 watts for a 4 by 5-in. film using 8-in. condensers. Without condensers a 1,000-watt light is required. For a 2¼ by 2¼-in. film with condensers, a 100 to 125-watt lamp is sufficient and for the 1 by 1½-in. film, approximately 60 watts.

Mortar Box on Wheels Is Moved Wherever Desired

A Nebraska farmer uses this portable mortar box, not only for transporting batches of concrete and plaster about the farm, but also for moving liquid feeds. The mortar box is carried on an iron frame fitted with three wheels. The front end as-



sembly comprises a swivel from an old side delivery rake and a wheel from a plow. The frame is welded together, the rear end of the cart being supported on two small cultivator wheels, which rotate on a pipe axle. A handle to pull the cart is attached to the frame directly over the front wheel. As the box is easy to remove from the cart, the latter can be used for other purposes.

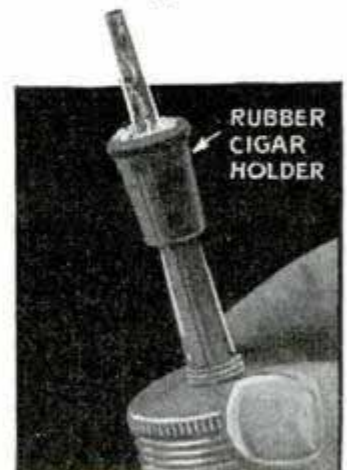
Fruit Trees Protected in Winter by Corn Shock



To protect his young orchard against broken limbs due to ice collecting on them during the winter months, and also to keep stock from rubbing against the brittle limbs, one farmer shocked corn around each tree. After setting one layer of bundles about the tree, a double binder twine was tied snugly around the shock to hold it in place.

Guard on Oilcan Spout

Light machine oil that has a tendency to run down the spout, when the can is used for numerous applications of oil, can be kept from getting on the can by using this guard. It is a rubber cigar holder with the small end cut out to fit snugly over the spout. A little waste packed inside the holder around the spout absorbs the oil as it runs down and can be renewed from time to time.



'Funnel' in Center of Hog Trough Avoids Spilling Feed



Spilling of feed when hogs crowd into a trough, was eliminated by one farmer who rigged up this "funnel." It is one-half of a rear-axle housing of an automobile and is mounted in a vertical position on a cross-piece in the center of the trough. The bell end of the housing projects upward, forming a funnel.

Cold Frame Built Against House Is Accessible from Basement

Highly convenient because it is accessible from the basement, this permanent cold frame nestles snugly against the house, and is centered over a basement window.



There's no need to go outdoors every day to water the seedlings, as you can do this and adjust the glass cover for ventilation from the inside. The preferred position is on the south side of a house because here the box will receive the most protection and prevailing sunshine in early spring. If the thing is to be a permanent affair, it is advisable to make the front and side walls of concrete rather than wood. The glass panel is hinged at the rear to permit adjustment for ventilation and it may be best to protect the glass with $\frac{1}{2}$ -in. galvanized wire mesh.

Measuring Shore Line with Wheel

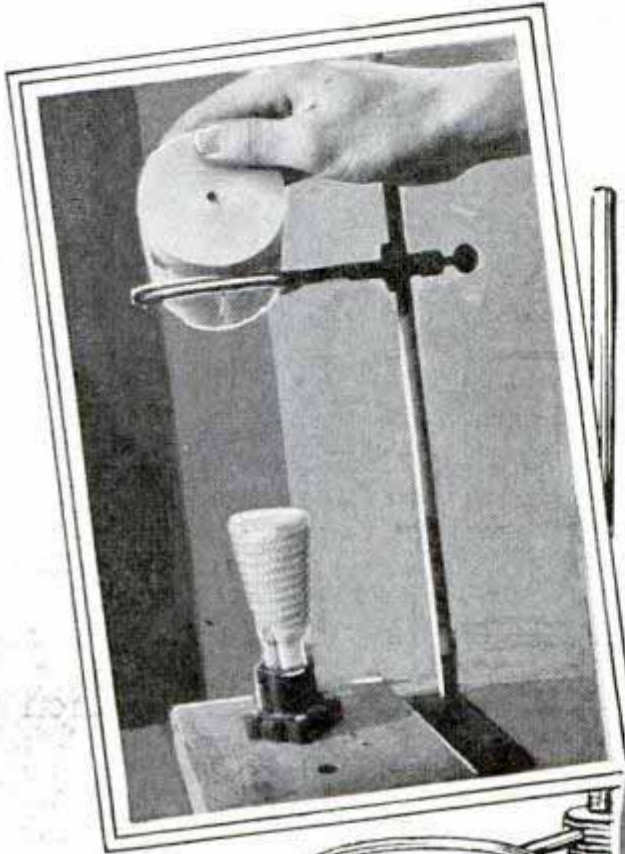
Having land that adjoined a lake and desiring to rent certain footages to summer campers, one farmer used a wheel and a forked stick to take the measurements. A lightweight cultivator wheel was set between the limbs of a forked tree branch



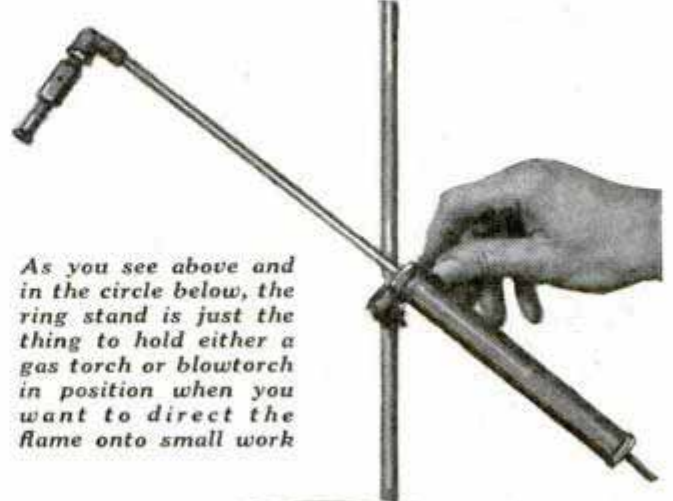
and held in place by a bolt, after which a red cloth was tied to one of the spokes. Counting the number of revolutions of the spoke and multiplying this by the circumference of the wheel gave the actual footage of the shore line.

☐ Transparent windows in envelopes may be made by rubbing the envelope with a solution of paraffin, 1 oz., and carbon tetrachloride, 4 oz., or some similar solvent.

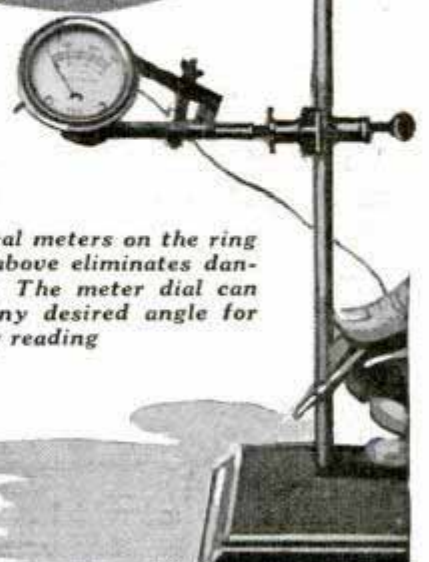
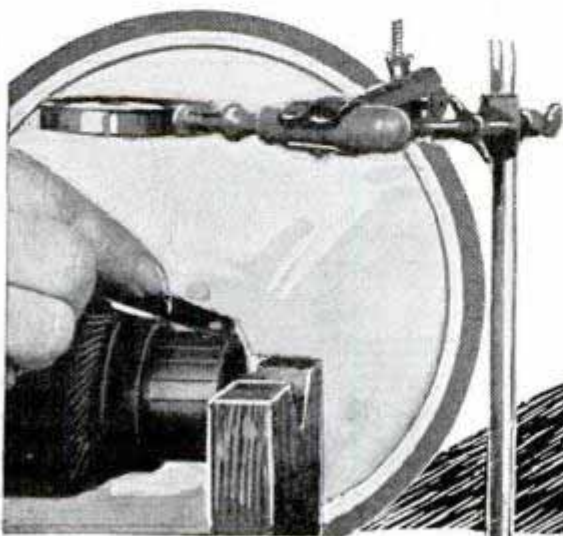
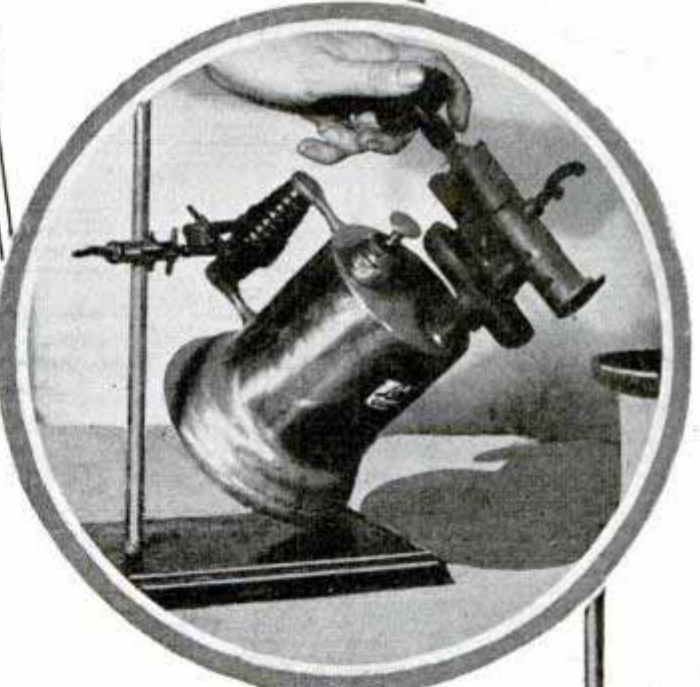
What You Can Do with a RING STAND



Above, a quick job of removing pins from aluminum pistons can be done by placing the piston on the ring stand and lowering it over a heater element as shown. This affords quick heat without danger of warping. Below, work on commutators can be done with greater ease and efficiency by mounting a reading glass in the ring-stand clamp. The glass can be held steady at any convenient height



As you see above and in the circle below, the ring stand is just the thing to hold either a gas torch or blowtorch in position when you want to direct the flame onto small work



Mounting electrical meters on the ring stand as shown above eliminates danger of breakage. The meter dial can be clamped at any desired angle for easy reading

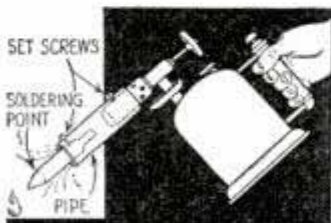
Adjustable Jig on Welder's Bench Grips Irregular Work



The problem of holding small irregular work while welding it is solved with this jig, the two arms of which can be adjusted to clamp around any part of the work. A 4-in. channel-iron base carries the arms, each rod consisting of three short pieces of flat iron pivoted at the ends. Each arm carries a C-clamp, which is welded to a short piece of $\frac{3}{8}$ -in. iron rod, the rods being fastened to the arms by means of U-bolts. These can be loosened to adjust the clamps in any desired position. Also, by loosening the bolts in the arms, they can be adjusted to almost any height or angle.—Clifford Tanner, Cranston, R. I.

Torch and Soldering Iron Handy for Roof Work

To save time in changing soldering irons and carrying them back and forth on a large roofing job, one tinsmith attached the iron directly to the torch. This was accomplished by fitting a soldering point inside of a short



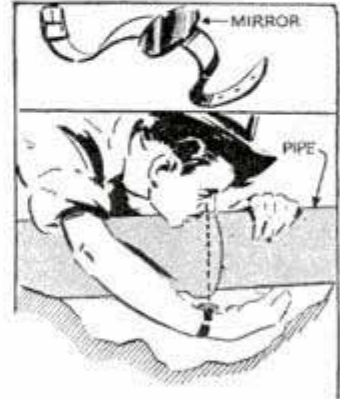
length of pipe, of which the inside diameter was slightly larger than that of the point. Two or three screws fitting tapped

holes in both pipe and point held the latter so that there would be a slight space between both. The pipe was then slipped over the flame tube of the torch, where it was securely fastened by a setscrew.

Wrist-Strap Mirror Aids Plumber

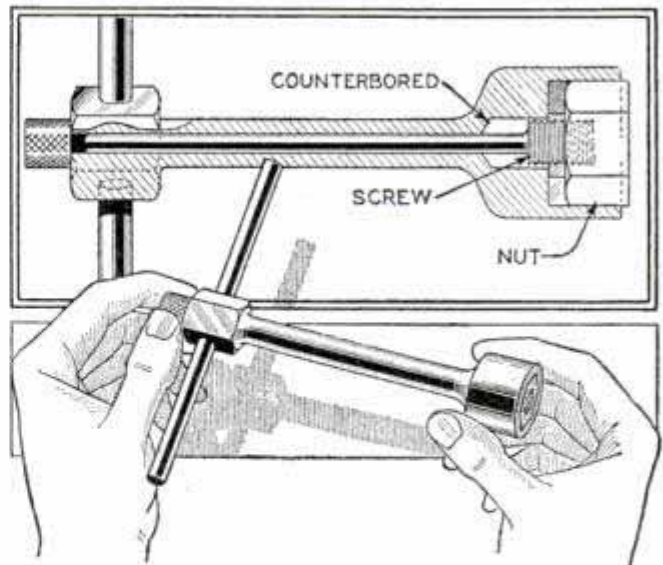
Plumbers, or pipe fitters, whose work includes laying and calking of water mains or soil pipe, will find the work somewhat simplified by the employment of a small pocket mirror, mounted on a wrist strap. By

placing the arm, or wrist, in such position that the mirror reflects the underside of the pipe, the calking of the joint may be observed and many possible leaks avoided.



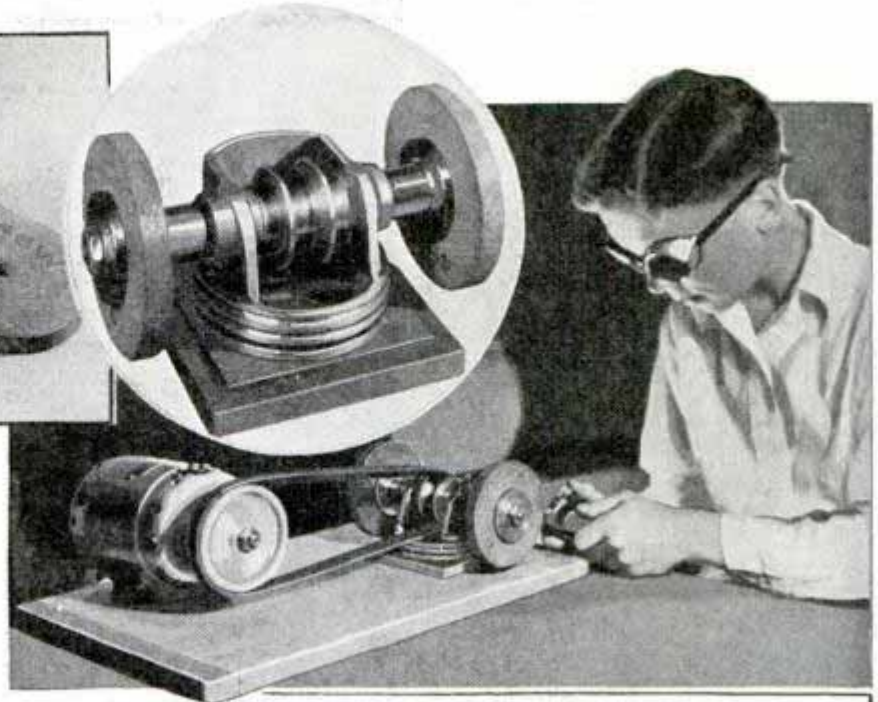
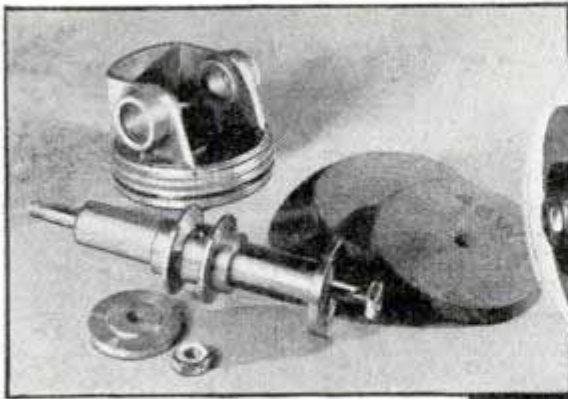
Nut Catcher on Box Wrench

Often when a box wrench is used, the nut drops out of the wrench into the work and is difficult to recover. To avoid this, the wrench can be fitted with a nut catcher by drilling a small hole through it

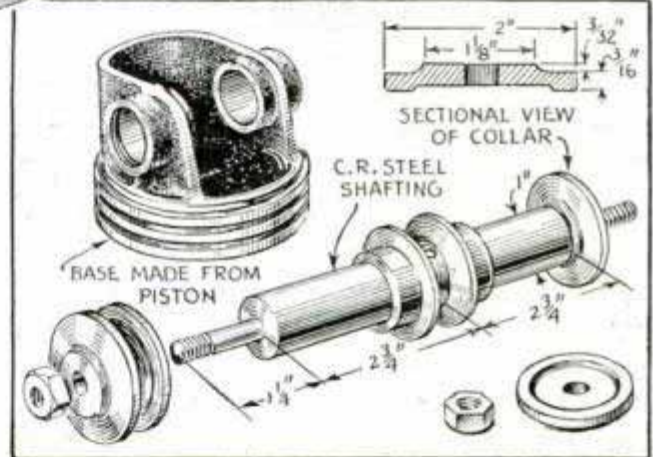


lengthwise and counterboring the boxed end as shown. A rod, with one end threaded to screw into the nut loosely, and having a knurled head on the other end, is all that is required. After the nut has been loosened, the rod is turned to screw the threaded end into the nut.

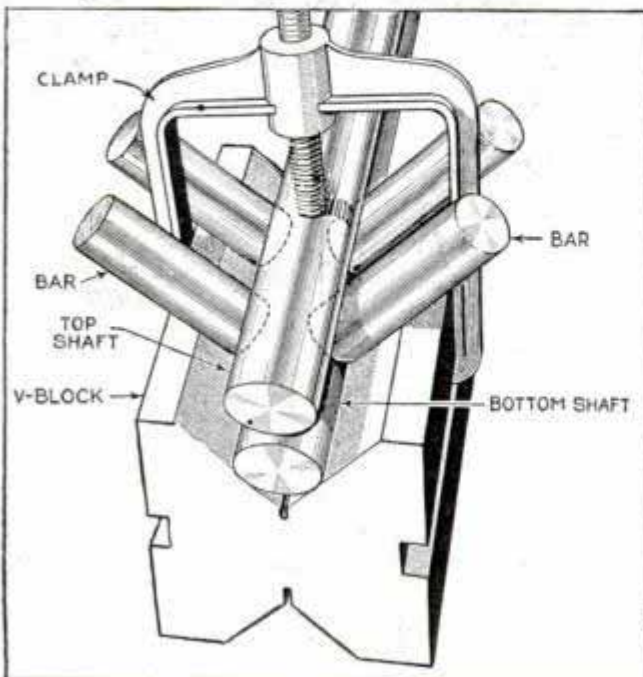
Altered Piston Forms Sturdy Grinder Head



With little alteration, an old auto piston can be converted into a grinder head for light work. The piston skirt is sawed off just below the wristpin bosses. Part of the remaining piston wall is then cut away to allow for the V-belt drive. By cutting a hole in the base of the grinder it can just as well be driven from underneath. The shaft is a cold-rolled rod with its ends turned down to fit the grinding-wheel holes and threaded for retaining nuts. Collars are made to hold the grinding wheel. The pulley is turned from steel and is held in place with a setscrew. Oil holes are drilled in the shaft bearings. After drilling screw holes in the base, the grinder is ready to fasten to the bench.



Two Shafts Gripped in Line While Transferring Holes

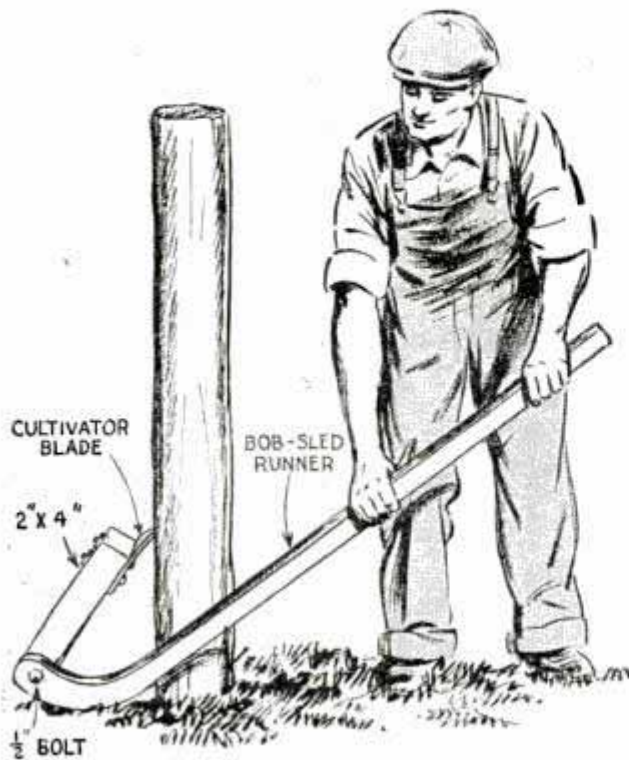


When it is necessary to hold two shafts, one directly above the other, for transferring or marking off drilled holes, the job can be done by using a V-block, a tightening clamp and four short pieces of round rod of slightly less diameter than the shafting. One of the shafts is laid in the V-block, two rods are placed on each side, as indicated in the illustration, and finally the top shaft is laid on these, after which the clamp is screwed down to keep the assembly firmly in position.

—H. Moore, Leeds, England.

☐ Nuts and bolts that are exposed to the weather may be prevented from rusting by applying a coating of asbestos roofing cement to the threads of the bolts before tightening the nuts.

Posts Removed Single-Handed with This Puller



To remove fence posts single-handed, one farmer devised this simple puller. It consists of a discarded bob-sled runner to which a short length of 2 by 4-in. wood is pivoted. The free end of the short piece is fitted with a cultivator blade.

Large Barn Door Easy to Open by Exerting Pull at Top

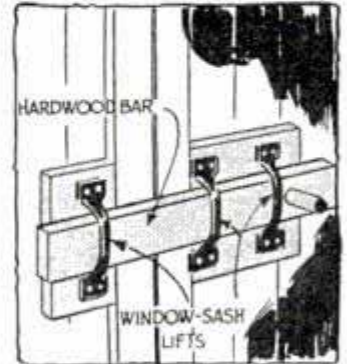
Large, sliding doors are often hard to open because the pull is applied at the lower corner, thus throwing all the weight



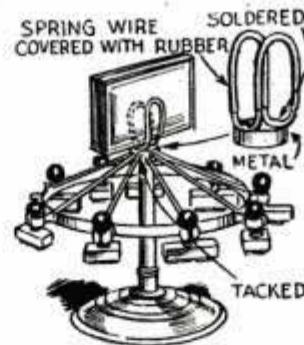
of the door on one roller. If a stout strap or rope is fastened to the door at the point indicated, it may be rolled easily as the door is not lifted from either roller.

Sash Lifts Form Brackets for Sliding Door Bolt

Desiring an inside sliding bolt for the door of his implement shed, one farmer screwed several metal sash lifts across the doors as shown. A hardwood bar to slide through the lifts freely served as a bolt, and a wood pin driven tightly into a hole in the bar provided a hand grip for operating the bolt.



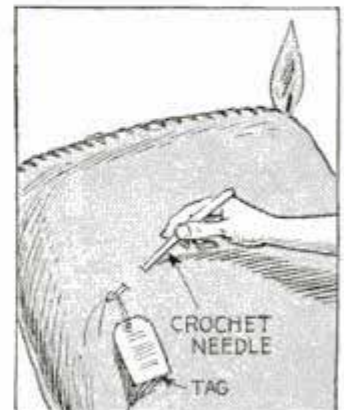
Stamp Pad Stored on Rack



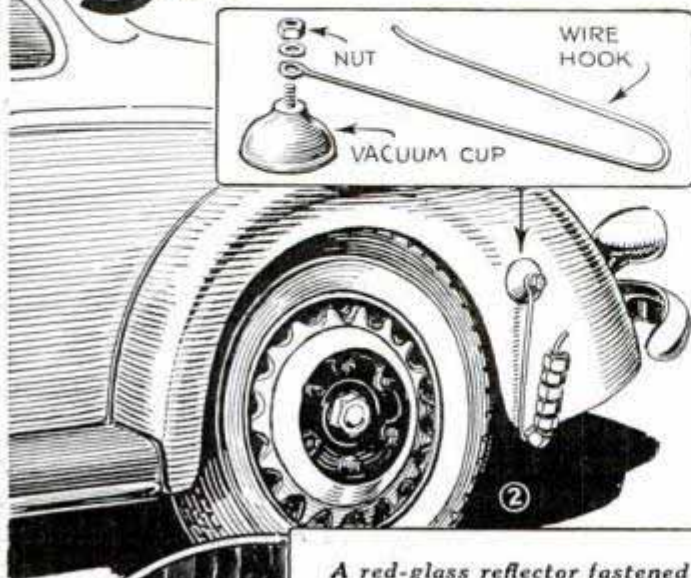
When a rotating rack is used to store rubber stamps, why not provide a clamp on the rack to hold the stamp pad? A clamp can be shaped from a piece of spring wire and soldered to the top end of the rack standard. If desired, the wire can be covered with a piece of rubber tubing.

Crochet Hook Fastens Sack Tags

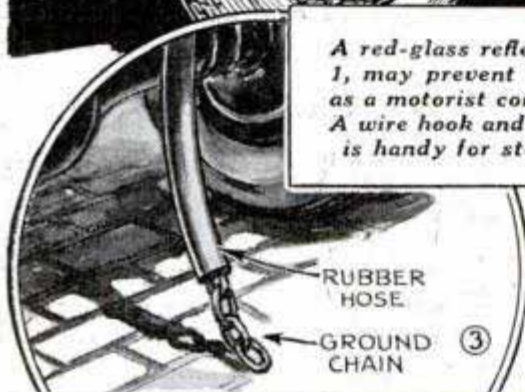
A Wisconsin grain and seed dealer, who found it difficult to thread a sack needle when stitching shipping tags to filled bags, used a crochet hook for the purpose. The hook is forced through the side of the bag to engage the string or wire of the tag and pull it through the cloth.



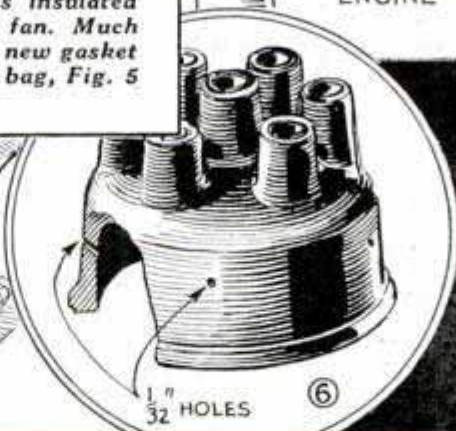
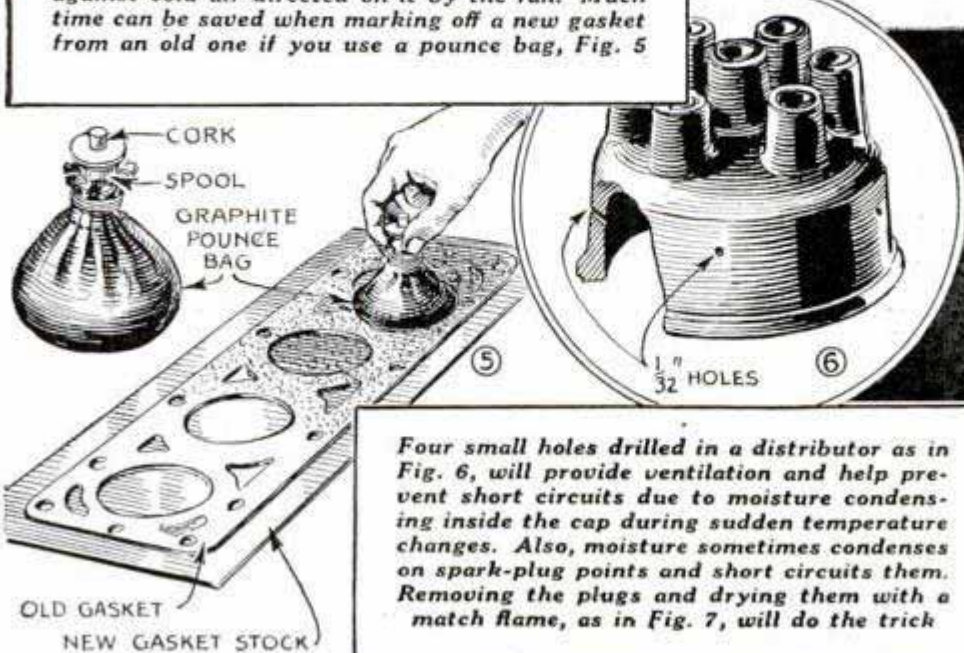
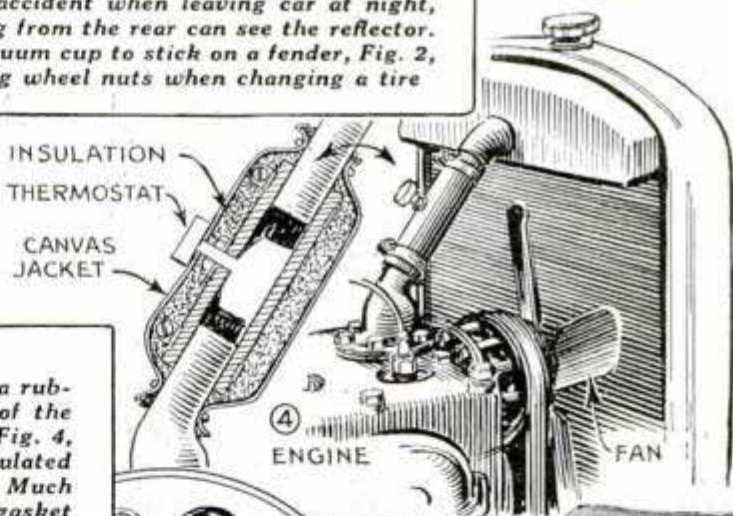
Auto SHORTCUTS



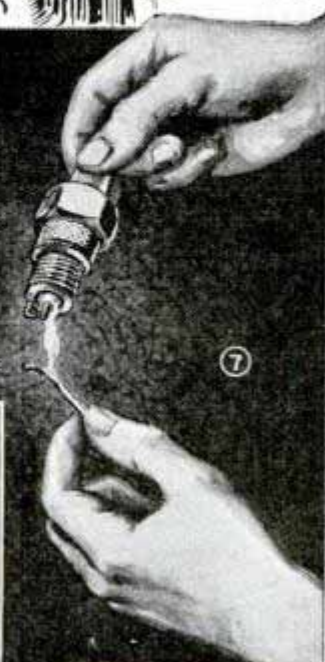
A red-glass reflector fastened inside the front door, Fig. 1, may prevent an accident when leaving car at night, as a motorist coming from the rear can see the reflector. A wire hook and vacuum cup to stick on a fender, Fig. 2, is handy for storing wheel nuts when changing a tire



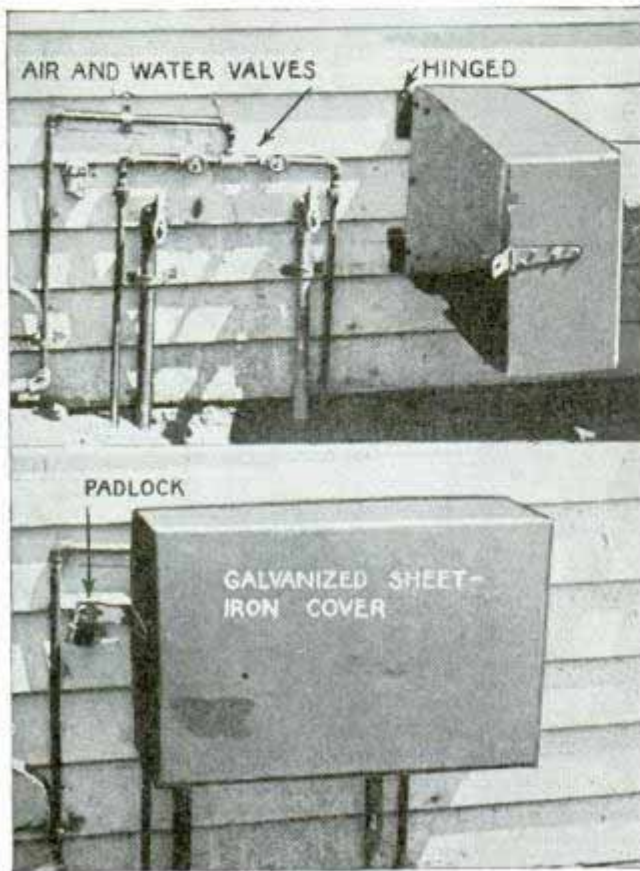
Encasing the drag chain of an oil truck in a rubber hose, as in Fig. 3, will reduce much of the noise. A thermostat of the type shown in Fig. 4, will operate more accurately if it is insulated against cold air directed on it by the fan. Much time can be saved when marking off a new gasket from an old one if you use a pounce bag, Fig. 5



Four small holes drilled in a distributor as in Fig. 6, will provide ventilation and help prevent short circuits due to moisture condensing inside the cap during sudden temperature changes. Also, moisture sometimes condenses on spark-plug points and short circuits them. Removing the plugs and drying them with a match flame, as in Fig. 7, will do the trick

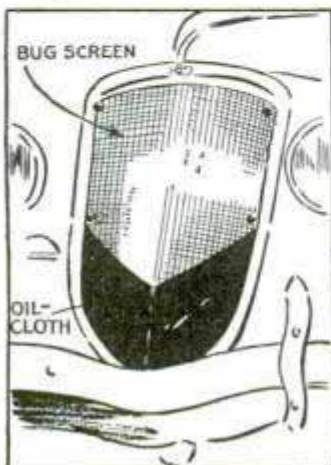


Valves Outside of Filling Station Locked by Metal Cover



Having the air and water valves located on the outside of the building, the owner of one filling station hinged a galvanized, sheet-iron cover to the wall of the building so that it can be swung around over the valves and locked. This prevented anyone from tampering with them at night after the station had been closed. The next morning it was only a matter of a minute to unlock the cover and swing it around to expose them.

Bug Screen Serves as Winter Front



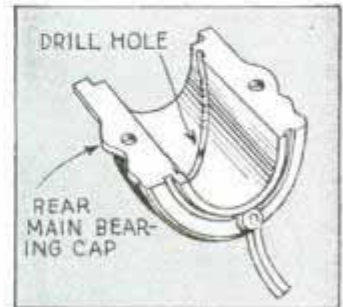
If you have a bug screen on the radiator grill of your car, you can improvise a winter front quickly at practically no cost. Just get a piece of oilcloth, cut it to the shape of the screen and stitch it to the latter. If desired, you can

slit the oilcloth down the center a few inches from the top to provide flaps. A couple of snap fasteners will enable you to open or close the flaps as desired.

—Charles Ahlgrimm, Bettendorf, Iowa.

Stopping Oil Leak in Main Bearing of Model-A Ford

Model-A Fords that have a tendency to leak oil through the rear main bearing often can be repaired as follows: Drop the oil pan, remove the bearing and drill a hole

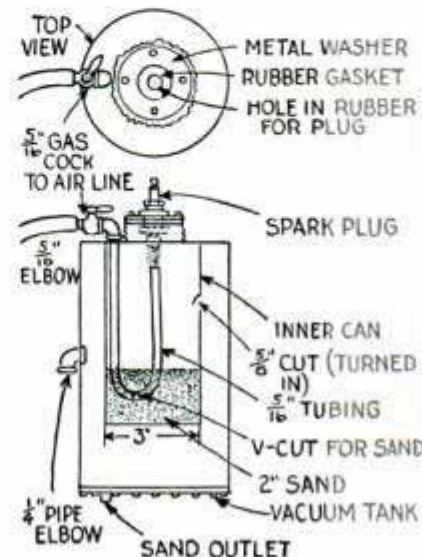


through it from the underside to break into the oil groove cut into the babbitt. This allows excessive oil to drain back into the crankcase instead of being forced back into the flywheel housing.

—H. Thomas Winston, Claremont, Va.

Sandblast Spark-Plug Cleaner

Here's a spark-plug cleaner that does the work in short order, and it can be assembled from an old vacuum tank and odd parts that are available in most any garage. First remove everything inside the tank. Then cut a hole in the bottom to take the top of a screw-top can, insert a U-shaped piece of tubing and connect it with the air hose by means of a gas cock. File a notch in the tube at the bottom of the U and adjust the free end so that it will be about $\frac{1}{2}$ in. from the bottom of a spark plug in-

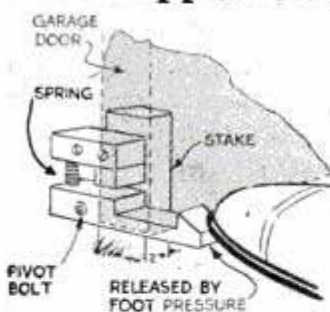


serted in top of the screw cover. Make a small cut in the side of the can and push it in to provide an opening for the air to escape. Now solder the can to the vacuum tank. Also attach an elbow to a hole in the side of the tank for the air to escape from it. Cut a 1-in. hole in the screw top of the can, stretch a piece of inner tube over it and fasten it in place with a metal washer attached to the cover with stove bolts. Make a small hole in the rubber to take the end of a spark plug tightly. Sand that escapes into the tank can be removed and put back into the inner can.

Dirt Between Fender at Joints Causes Squeaks

Squeaks sometimes result at the joints between the car body and its fenders, or similar places. The usual cause for this in the case of older cars, is road grit, which works into the fabric strips used between the parts. It is helpful to loosen the bolts at the joint a few turns, and then wash out the dirt by a stream from a garden hose. In old cars, when sections of the anti-squeak material wear or rot out, pieces of heavy gasket paper placed between the metal surfaces make a cheap repair.

Garage Doors Held Open by Latch Tripped with Your Foot



Much easier to use than a hook to hold garage doors open, this latch automatically grips the door and is released with your foot. The latch is pivoted to

a stake driven into the ground, and consists of a pivoted block beveled at one end and notched to accommodate the door. A coil spring causes the latch to bear up against the door while holding it. Pressing down on the beveled end of the latch with the foot frees the door.

☛ Tar spots on the enamel of an automobile or motorcycle can be removed without danger to the surface by rubbing them with a piece of cloth dampened with carbon bisulphide.

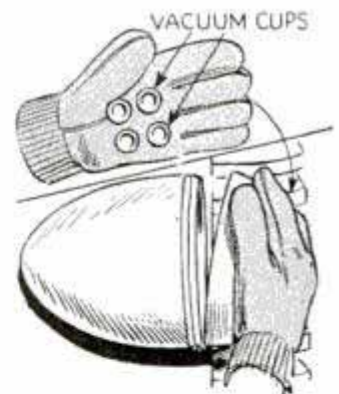
Blackboard in Top of Truck Cab Speeds Up Deliveries



To avoid any unnecessary driving on his delivery route, one truck driver writes the addresses of the various stops on a blackboard mounted above the windshield where they are seen easily. Before starting, he runs through the orders and plans the shortest route to the various stops, which are then recorded on the blackboard.

Headlight Lens Removed Safely with Gloves and Vacuum Cups

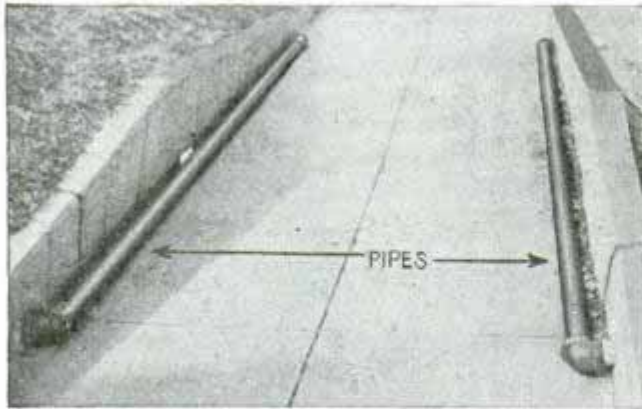
To reduce the possibility of breaking a headlight lens when removing it, one mechanic rigged up a pair of gloves for the purpose by attaching four small vacuum cups to the palm of each glove. The cups gripped the glass so that there was less chance of it slipping out of his hands.



Wanted—More Auto Kinks!

Simple things that will add to the convenience of driving and touring—easily made repairs for minor troubles and disorders of cars—precautions that will avoid troubles—these are some of the many things motorists would like to know about. Possibly you have devised something for your car or garage that will be helpful to thousands of others. Just describe the idea briefly but completely, illustrate it with a sketch or photo and let's have a look. Perhaps it fits in with our needs and if so, a check will be sent promptly. Avoid old practices, ideas that are of use only occasionally or those that involve too much trouble and expense. Ideas must be found workable by actual practice. Address Technical Editor.

Pipe Guards on Walled Driveway Prevent Cars from Scraping



The driveway shown in the photo had to be sunken considerably to lessen the slope from the street to the garage and necessitated concrete retaining walls. As the

driveway was quite narrow, there was danger of scraping hub caps, tires and fenders. To prevent this, 3-in. iron pipes were installed as shown to keep the wheels away from the walls.

Running on Bad Connecting Rod

When a connecting-rod bearing on my car burned out several miles from the nearest garage, I immediately disconnected the spark-plug wire over the damaged rod to eliminate explosions against the piston with consequent hammering on the crankshaft. This minimized the danger of damaging the bearing surface of the latter, besides greatly reducing noise as I proceeded at a slow rate of speed to the garage.—John P. Crandell, Urbana, Ill.

Plan-of-the-Month—A New Service

How to get a collection of plans designed by leaders in craftwork

Complete, easy-to-follow plans including photos, material list and full instructions on building simplified but worthwhile articles with hand tools, without previous experience

Send coupon and 10c in stamps for Craftplan of
COLONIAL COFFEE TABLE



This satin-finished coffee table stands 18 in. high and has a 22-in. top to which four tapered legs are pegged

DAILY USEFULNESS

Of practical, everyday value in any home, it's a worthwhile project if you want your share of interesting and valuable recreation possible from a home workshop.

THE COST IS SLIGHT

As you need only a few pieces of maple, some stain and shellac, the cost of the table is very little besides the time required to do the work—time that you will want to spend in the pleasures of woodworking at home.

CRAFTPLAN SHOWS HOW

You don't have to be able to read blueprints to understand the Craftplan. It includes simplified, easy-to-follow pictures showing all details and sizes, gives step-by-step directions for assembling; describes jigs to bore holes accurately; explains how legs are tapered and top is rounded so that even beginners can do it. Also contains material list and instructions for finishing.

MAKE SPARE-TIME PROFITS

Why not use your spare time to make simple things like this that find a ready market? Others have done so! Many a small but profitable business was started in a home workshop.

POPULAR MECHANICS PLAN SERVICE
200 East Ontario Street Chicago

Name

Use pencil

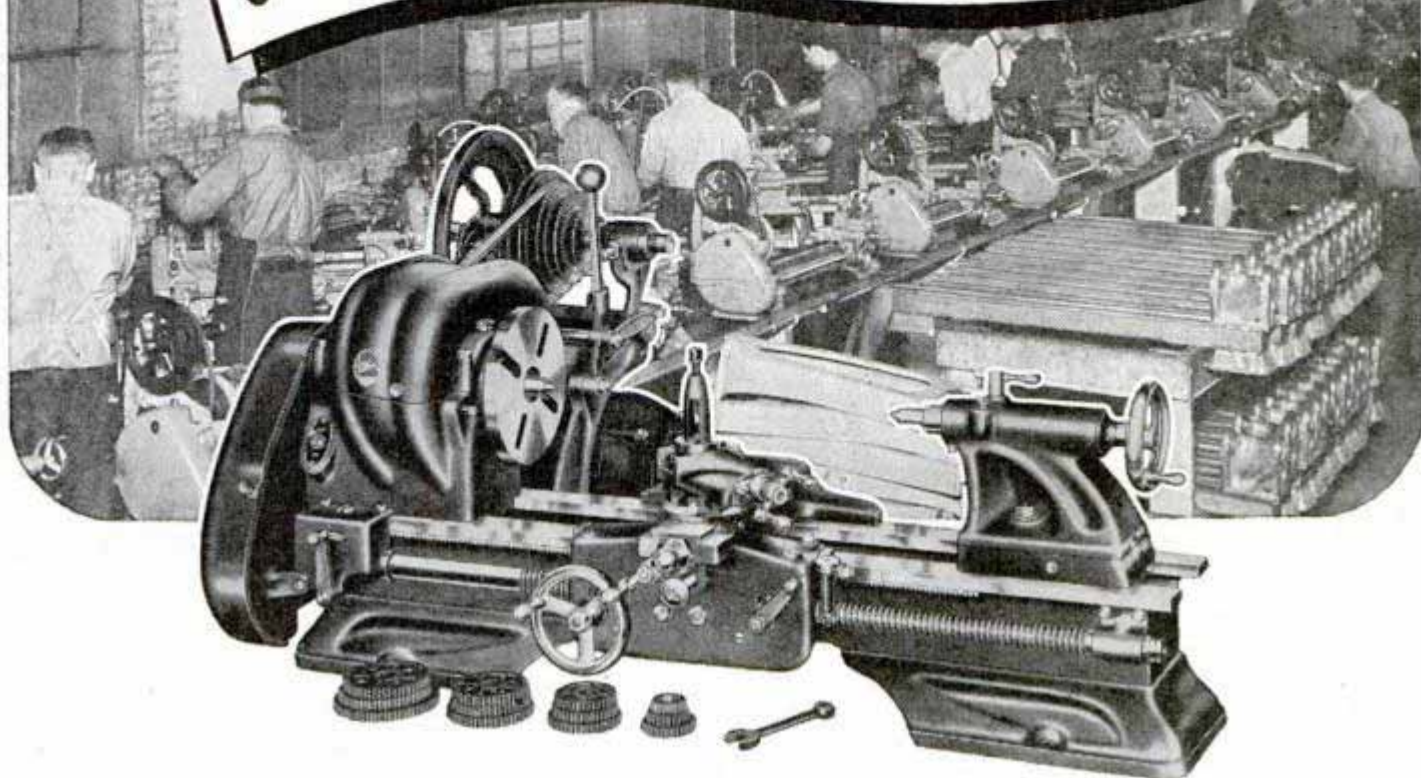
Street

City and State

Enclosed 10c in stamps.

* COFFEE TABLE—CRAFTPLAN No. 3001

Atlas PRESENTS THE NEW F-SERIES LATHES



THE ONLY POPULAR PRICED LATHE with ALL THESE MODERN FEATURES

Power Cross Feed Standard Equipment

Now it can be told! Today Atlas dealers in all sections of the country are ready to show you the new Atlas F-Series Lathes, with one of the most outstanding developments in our 28 year history. Now, for the first time, you can have a popular priced lathe with instantly reversible power cross feed and longitudinal feeds as standard equipment.

It's the only lathe, too, with complete V-belt drive, quick-change countershafts, compact controls, precision ground bed ways, custom-built spindle bearings, extra power for heavy jobs, and many other modern features at the low price of \$104.75 for the 10" lathe with horizontal countershaft (complete as shown less motor) or \$99.75 for the vertical countershaft model.

Ask your dealer to show you the new Atlas and send today for the big new 1939 Atlas Catalog.

**SEE IT
AT YOUR
DEALER'S AND
MAIL THIS
COUPON**

ATLAS PRESS CO., 143 N. Pitcher St., Kalamazoo, Mich.

Kindly send me your 1939 Catalog. I am interested in:
 New 10" Metal Lathes New Small Lathe New Shaper
 Drill Presses Arbor Presses Wood Lathes.

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Address.....

City and State.....

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CHICAGO
35 E. Wacker at Wabash

PHILADELPHIA
113 N. Third St.



LATHES · DRILL PRESSES · ARBOR PRESSES · SHAPERS

Picture Your Family

(Continued from page 47)

history book—especially the youngsters. Through the camera, you can watch them grow from babies to school age, 'teen age, maturity. Pictures of their hobbies, their activities, their friends, all provide rich material for memory.

Even ordinary household activities offer chances for good pictures. A picture of yourself repainting an old table, your wife dressing the small daughter for Sunday School, even a snapshot (with the aid of a "self-timer") of you both washing dishes



Letters are important chapters in a family history. Their arrival or posting makes a "newsy" picture

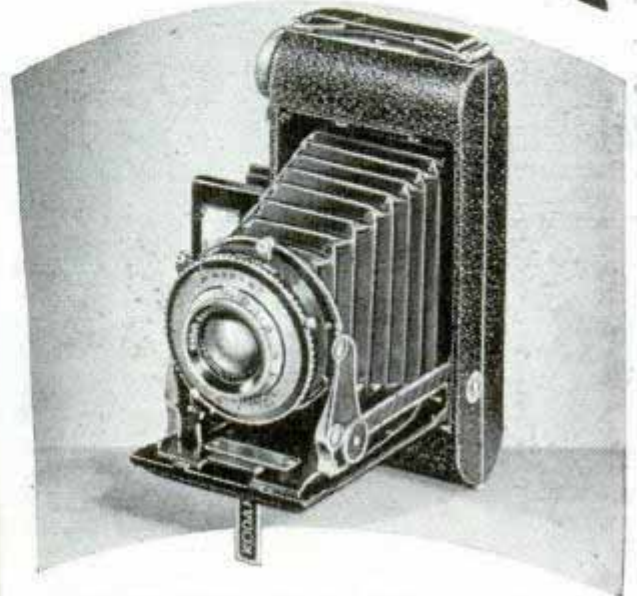
—all these are parts of daily life; and these snapshots in future years will call back many a happy incident.

Don't overlook the pets, for they are very much a part of the family, and appealing animal snapshots add spice.

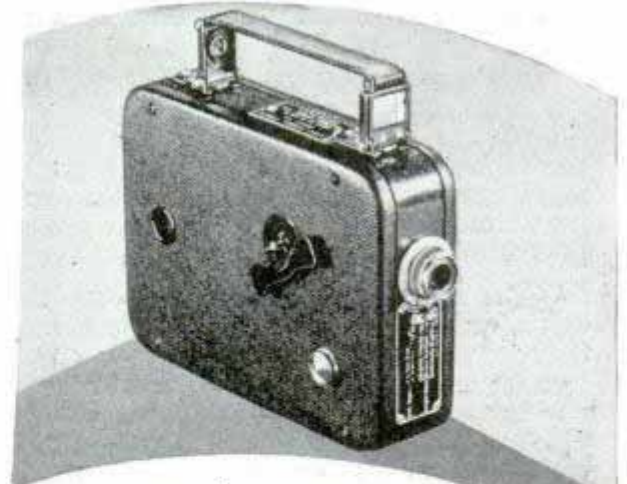
One caution: Have an idea behind each picture. Make each tell a story. A snapshot of your son standing beside the house and smiling is hardly material for the book. But a snapshot of the boy repairing his bicycle is a "news" picture—the sort that makes the record interesting.

(Continued to page 116A)

KODAK



KODAK SENIOR SIX-20 (f.4.5) . . . Combination of body shutter release and eye-level finder offers new picture-making certainty . . . minimizes camera movement, catches the scene when it's exactly right. Kodak Anastigmat f.4.5 lens; 1/200 Kodamatic shutter. One-finger bed release. 2¼x3¼-inch pictures. **\$28**



CINÉ-KODAK EIGHT

"Economy" movie camera. Gives you 20 to 30 movie scenes of newsreel length on a roll of film costing \$2.25, black-and-white, *finished, ready to show*. Kodachrome (full-color) movies cost just a few cents more a scene. **\$32⁵⁰**

CHRISTMAS CATALOG



KODAK RETINA II (*left*) with anastigmat $f.2.0$ lens. 1/500 Compur-Rapid shutter. Coupled range finder. Body shutter release. Price, \$140. Kodak Retina II, $f.2.8$, \$115. (Prices include sportsman's field case.) Both models load with a wide range of Kodak Film, including Kodachrome for gorgeous full color. **\$140**

KODAK RETINA I (*not illustrated*)... the original Retina, with Kodak Anastigmat EKTAR $f.3.5$ lens. Shutter, 1/500 Compur-Rapid. Film-centering mechanism. Exposure counter. **\$48⁵⁰**

KODAK BANTAM SPECIAL (*right*) Lens, Kodak Anastigmat EKTAR $f.2.0$ —extra-fast, super-corrected. Shutter, 1/500 Compur-Rapid. Built-in military-type range finder linked with lens mount gives hairline focus instantly. Film-centering device locks film accurately in position for each exposure. New low price includes field case. **\$87⁵⁰**

KODAK BANTAM FAMILY also includes Kodak Bantam $f.4.5$ at \$27.50 and Kodak Bantam $f.5.6$ at \$16.50. All three models load with full-color Kodachrome Film. Lower priced Kodak Bantams, for black-and-white pictures only, include the $f.6.3$ model at \$9.50 and $f.8$ model at \$4.75.



NEW KODAK 35 FAMILY (*left*)

A really outstanding group of new precision miniature cameras that are priced impressively low. Fast lenses—fully corrected for color—and accurate shutters. For critical results in black-and-white, or full-color Kodachrome. Kodak 35, with $f.5.6$ lens and 1/100 Kodex shutter (*illustrated*), \$18.50; with $f.4.5$ lens and 1/150 Diomatic shutter, \$29.50; with Kodak Anastigmat Special $f.3.5$ lens and 1/200 Kodamatic shutter, \$39.50. **\$18⁵⁰**



BROWNIES FROM \$1 — KODAKS FROM \$4.75 — SEE THEM AT YOUR DEALER'S
EASTMAN KODAK COMPANY, ROCHESTER, N. Y.

Only EASTMAN makes the KODAK

(Continued from page 114A)

Often, phases of the family history can be told in a short series of pictures better than in one. Your history of Christmas, 1938, could well begin with the decoration of the tree, and the hanging of stockings, then show the children discovering their gifts, close-ups of delighted faces as they examine new possessions, and shots of them playing with the new sled or train. Christmas dinner could well be pictured, and the holiday series might end with a shot of exhausted youngsters sound asleep, toys clasped in their arms.

No specialized equipment is needed to keep a family history, but a fairly good camera—say, one with a lens at least as rapid as f.6.3—is a great help. With such a camera, you can use a cable release and self-timer, which enables you to get into your own pictures. The extra speed of the lens is an advantage in taking night snapshots, with two or three inexpensive amateur photo bulbs providing illumination. And if you can get a miniature camera with ultrarapid lens, you can take these home snaps with no special illumination, just room light.

Make it a point to file negatives carefully, because in later years you may wish to have new prints made for a more elaborate and finished presentation. The value of these family books increases as years pass, and if one should be damaged it is a serious loss unless the negatives are available for reprinting.

If you are a movie-maker, you can keep your family history in movies as easily as in "still" form. Indeed, recently developed home equipment enables you to obtain enlarged still pictures from your movie frames. The movies can be in full-color, and the prints in black-and-white.

With movies, dramatic stunts are possible which add an extra touch of interest. For example, take one twenty-five-foot sequence of your boy or girl each year for a number of years. Splice these sequences together in proper order—and in a few minutes of projection time, you can watch the child grow up right on the screen!

A family history in pictures provides a rich storehouse of memories that can be obtained in no other way. The longer the maker lives, the more value they have.

"Minnies" Supply Punch to Movies

(Continued from page 69)

all vest-pocket cities was made for the film musical, "Just Imagine." It was a glimpse of New York of the future—a \$200,000 glimpse. Housed in a dirigible hangar, the reproduction covered seventy-five by 225 feet and some of its two-hundred-story skyscrapers were forty feet high. There were nine levels for subway and elevated trains; helicopters, dirigibles, and airplanes could discharge passengers at any building level, and streets and office buildings were perfectly illuminated.

Incredible action is achieved in the miniatures. Noah's ark in "Green Pastures" was loaded with small wooden animals that moved on a concealed track. The siege of the town of Port Royal in "Captain Blood" was made in this same way. The tiny town was built along the bank of Warner Brothers' tank and a fleet of battleships set afloat on the pond. When cameras were trained on the scene, fire spat from tiny cannons protruding from portholes. Shore guns retaliated and townspeople were seen running for cover. The citizenry were fig-

ures mounted on tracks and moved by wires, and the firing was done from an electric panel by an operator at the director's elbow. Electric wires led from each point where an explosion was to take place and it was just a matter of pressing a button to set off a gun or powder mine. The effect of shells showering about the warships was gained by snipers peppering the water with rifle shots from a perch high above the set.

Film experts regard James Basevi as Hollywood's ace man on special effects. He was responsible for the hurricane in the Nordhoff-Hall thriller, "Hurricane." The island of Manukura, which in the story is inundated by the sea whipped into wrath by the hurricane's force, was built. At one end of the island was the miniature village of Motu Tonga to be destroyed by the force of the wind and sea.

Coconut palms were made with trunks of lead and fronds of copper. Batteries of wind machines, four on each of the two

(Continued to page 118A)

The Movie Camera That Couldn't Wait For Next Year!



NEW 1939 MODEL "STOPS THE SHOW!" 60 GREAT NEW FEATURES MAKE FRONT PAGE NEWS!

Never before has a movie camera, at anywhere near this price, brought such perfection of detail . . . such simplicity of operation . . . such economy!

No wonder when it was previewed at the great International Camera Convention in Chicago, dealers said—"We want it now!" And so here it is—just in time for Xmas!

Check Sensational Features!

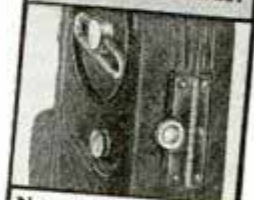
All America is talking about the new 1939 UniveX! Its magnificent new styling . . . its amazing performance . . . its 60 great features that you'd expect to find only in a high-priced camera! New built-in optical view-finder . . . new improved governor . . . new automatic shutter . . . new snap-lock hinged cover! Improved F 5.6 lens, instantly interchangeable. New quiet, powerful, smooth-running spring motor.

Just think—the new 1939 UniveX has all these important features—and many more! And, in addition, it's the only camera in the world that takes sharp, clear movies at less cost than snapshots! (UniveX Ciné film-roll costs only 69¢.)

DON'T DELAY! Know the thrill of taking living action pictures of your family and friends—movies you'll cherish all your life! See the new 1939 UniveX Ciné "8" at your dealer's today before his limited supply is exhausted.

Universal Camera Corporation
New York • Chicago • Hollywood

Features Like These Found Only in High-Priced Cameras!



New built-in optical view-finder insures getting exactly what you see



New re-designed loading mechanism. Self-locking hinged cover simplifies loading; makes film jamming impossible



New-type, quiet-running powerful motor. Automatic self-capping shutter. Automatic footage indicator.



Sensational New Guarantee Insures Your Movies!

For the first time, a movie camera makes this guarantee: "Satisfactory movies if instructions are followed or a new roll of film free." This is your proof that it is possible for a \$12.50 camera to get perfect results!

NEW 1939 UniveX CINE 8

BIG NEW STREAMLINED LATHE AT SENSATIONAL BARGAIN PRICE



Swings 10 inches

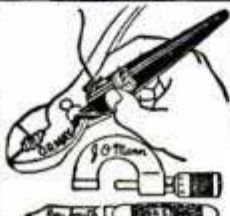
Imagine! This extra heavy wood lathe, steel bed 48" long, at low prices. Heavy duty head stock, 4-step cone pulley for V-belt, No. 2 Morse Taper Centers, Sealed ball bearings, 6" face plate screws onto spindle. Tool rest 10" long. Complete line of accessories at amazing low prices. Write today for free catalog describing Blue Star full line precision woodworking machinery. Factory-to-you prices. Not sold through agents.

BLUE STAR PRODUCTS, 601 Wood Ave., Fairfield, Iowa

BURN YOUR NAME ON TOOLS WITH THE ARKOGRAF

PROTECT YOUR TOOLS FROM THEFT

Write with electricity any name or design on the hardest and finest tools and instruments, or any metal, like writing on paper with pen or pencil. **Complete Outfit \$3.50—Prepaid Anywhere** Interesting illustrated circular free. Write today. Agents wanted. **ARKOGRAF PEN CO., 3027 S.E. Stark St., Portland, Ore.**



Home Craftsmen, Schools, Hobbyists METAL CASTINGS



produced in your own workshop allow you to design and build your own GASOLINE ENGINES, STEAM ENGINES, STATUARY, ART OBJECTS, SPECIAL TOOLS, NEW INVENTIONS, ETC. You can also make forgings and case harden steel. Your shop is not complete without a FOUNDRYETTE. Three sizes are available capable of making bronze castings of 1½, 3, and 6 pounds weight, aluminum, copper, brass, etc., in proportion to specific gravity. Clean scrap metal suitable for use. Each outfit includes a complete Blast furnace.

Domestic gas supply and 110 volt AC or DC Electric energy required for operation. Size Crucible Shipping Wt. Price

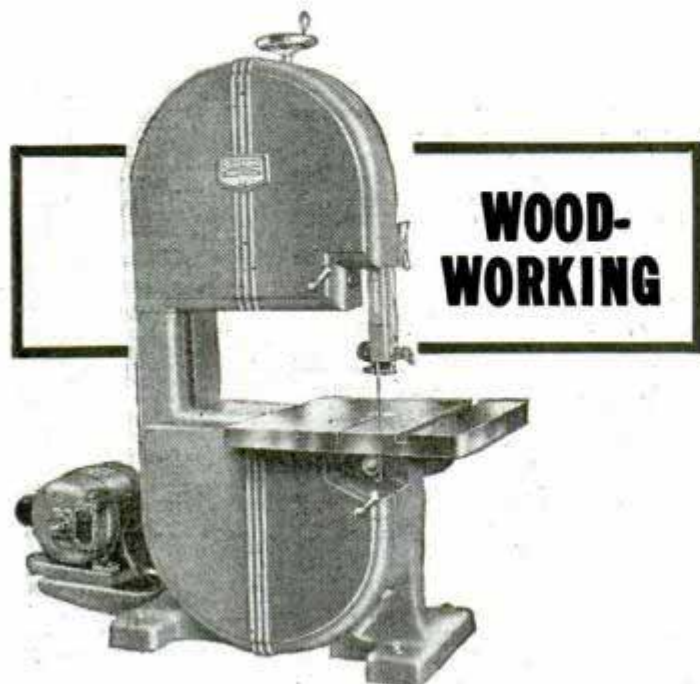
Capacity	Wt.	Casting Complete
351 6 cu. in.	25 lbs.	1½ lbs. \$13.50
352 12 cu. in.	40 lbs.	3 lbs. 19.00
353 24 cu. in.	65 lbs.	6 lbs. 27.50

Above price includes Universal high speed blower. Prices f. o. b. K. C. Check or money order acceptable, express charges C. O. D. Write for circular.

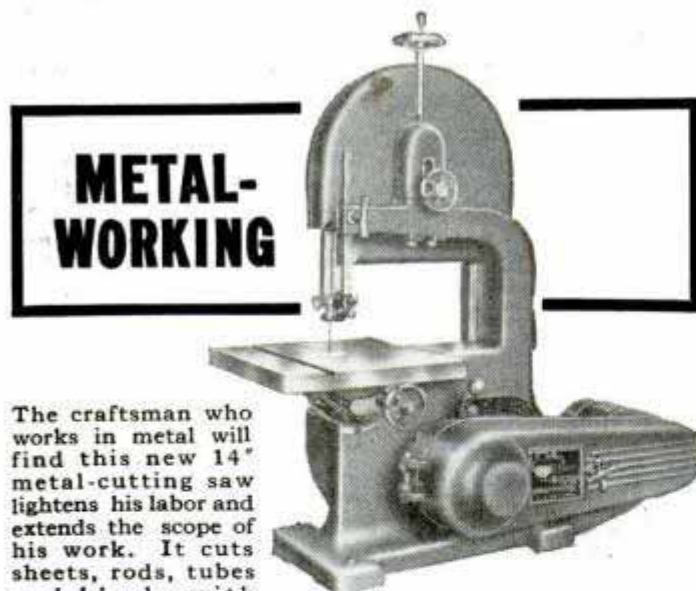
KANSAS CITY SPECIALTIES CO.
P. O. Box 6022 Kansas City, Mo.

2 NEW BAND SAWS

**PERFECTED FROM DRIVER'S
EXPERIENCE IN BUILDING 50,000!**



This new Driver Band Saw offers a wide usefulness. Its keen blade, traveling at 2535 feet per minute, zips through heavy oak or a scrolled panel with equal ease. It rips, cross-cuts, makes curved, angle and mitre cuts accurately. The carefully-balanced wheels, running on large, dust-sealed ball bearings—the heavy one-piece cast iron frame—the big 16" x 16" tilting table—all are quality features that will amaze you at the low price.



The craftsman who works in metal will find this new 14" metal-cutting saw lightens his labor and extends the scope of his work. It cuts sheets, rods, tubes and blocks with amazing speed and accuracy. Wide range of speeds permits cutting molded plastics or hard die steel. Speed range with recommended motor, 175 to 4630 feet per minute; eight speeds, provided by positive geared unit.

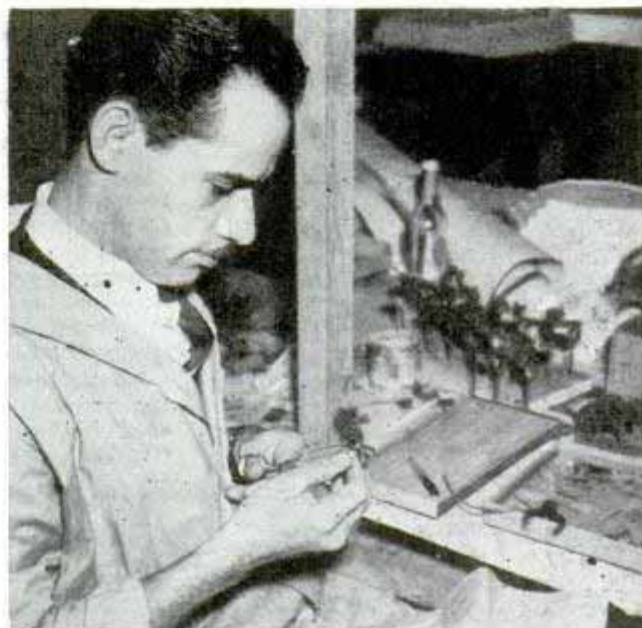
When you see these new saws and get the low prices, you'll appreciate the value built into them. New 1939 catalog on request. Walker-Turner Co., Inc., 119 South Avenue, Plainfield, N. J.

DRIVER *Engineered* **POWERTOOLS**

78/05
(Continued from page 116A)

sides of the 100-foot tank, provided the 110-mile-an-hour gale that devastated the island and supplied the realism in the close-ups when the principals were shown in the grip of the hurricane. Human wave-makers with large boxlike paddles helped churn up the waves.

Ship models usually are powered by a cartridge of compressed air with a vent beneath the surface or by Dry Ice that creates gas as it evaporates. The special effects men have another problem to contend with when they are working with ship models. If you have ever watched a toy



Cheesecloth and sponge go into the making of tiny trees for movie miniatures

boat on a lake, you have probably noticed it rolls and pitches much more rapidly than is the case with a real liner. Consequently, the motion of the model ships must be slowed down to the speed of their full-sized counterparts. A quantity of glycerin sometimes is placed in the water tanks to make the roll of the water appear heavier and more natural.

When the script calls for airplanes to fly in fog or close to mountains or tree tops, models generally get the assignment. In a small racing plane rigged for a breakaway, a crash in the "mountain" on which it is resting, the ribs and wing sections are complete in every detail so they look genuine when they shear off in the crash. The trailing edges of both wings next to the fuselage have small pieces of lead inserted in them to give a smashing effect at the moment of impact.

New Jobs on the High Seas

(Continued from page 43)

The age of hardtack and salt pork has gone and crews today are fed the same fare as passengers, possibly without some of the trimmings. Refrigeration has done away with the old practice of carrying livestock "on the hoof" on deck although chicken coops and pigpens may still be seen on some foreign vessels. Food that old sailors would hardly recognize is on the daily menu. For a coast-to-coast voyage a freighter is apt to carry seventy-five gallons of fresh milk and twenty-five gallons of buttermilk in the refrigerator rooms, as well as large assortments of meat. The cook, making up his requisitions, often includes asparagus, green peas, endives and what other fresh vegetables



Servicing a liner. Water and half a dozen different oils and fuels are taken aboard as soon as liner docks

may be in season. His department serves bottled pickles, olives, relish, onions, horseradish and assortments of fresh jams and jellies. The crew usually has a choice of ice creams for dessert.

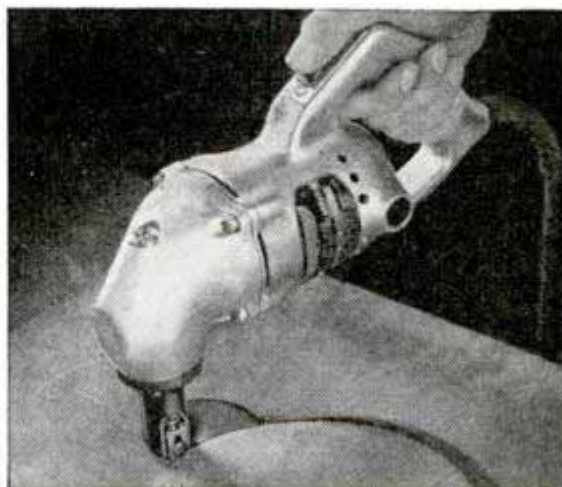
Pay at sea starts at around \$55 per month in addition to board and room. This is raised to \$72.50 per month after a man serves a year as ordinary seaman and passes an examination covering such subjects as deck duties, lines, knots and gear. He graduates as an able-bodied seaman although three years must pass before he obtains a full certificate. The A.B.'s keep the lookouts and steer the ship, as well as doing other work. The next promotion is quartermaster, who assists the mates.

With diligence and ability a man may graduate to third or fourth mate three or four years after he first ships and start

(Continued to page 120A)

LECTRO-SHEAR

**CUTS ALL SHEET METALS
QUICKER, EASIER,
MORE ACCURATELY**



Here's a versatile tool that saves endless time, trouble and effort on a wide variety of sheet metal operations. Once you use it, you'll never be without it—for with its powerful motor and specially designed cutting head, the Black & Decker LECTRO-SHEAR makes short work of cutting special shapes and patterns in varying types and thicknesses of sheet metal. Its easily adjusted, easily sharpened blades make faster straight cuts—sharper curves. LECTRO-SHEAR is light in weight, ruggedly constructed, easily-handled. Two sizes—with capacities up to 16 and 18-gauge metal. Sold through leading jobbers. Get full details today. Black & Decker Mfg. Co., 601 Pennsylvania Ave., Towson, Maryland.

BLACK & DECKER

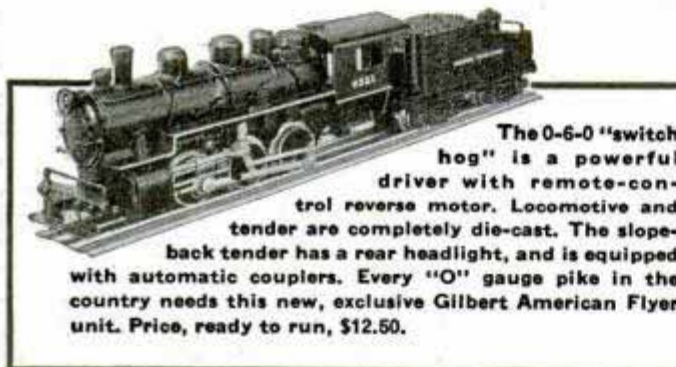
BLACK & DECKER

World's Largest Manufacturer of
PORTABLE ELECTRIC TOOLS

NEW MOTIVE POWER

● There are two "firsts" in the new Gilbert American Flyer line . . . the new switching locomotive and the new B. & O. "President Washington." "O" gauge men wanted them! A. C. Gilbert has built them, *just as they should be built*. Top quality in design, proportion and detail. Top quality in construction and workmanship.

FOR "O" GAUGE PIKES



The 0-6-0 "switch hog" is a powerful driver with remote-control reverse motor. Locomotive and tender are completely die-cast. The slope-back tender has a rear headlight, and is equipped with automatic couplers. Every "O" gauge pike in the country needs this new, exclusive Gilbert American Flyer unit. Price, ready to run, \$12.50.



Few "O" gauge locomotives offer the true-to-life lines and proportions of the new B. & O. "President Washington." It's the 4-6-2 Pacific type, with remote control and six-wheel drive. Locomotive and tender completely die-cast. A "natural" for fast passenger and freight service. Price, ready to run, \$15.

● Send for your FREE copy of the new Gilbert American Flyer Catalog. Get the latest train news right off the press.

GILBERT

AMERICAN FLYER TRAINS

MADE BY THE A. C. GILBERT COMPANY
516 Erector Square New Haven, Connecticut

(Continued from page 119A)

drawing \$135 per month. Getting his mate's ticket, however, is not the whole battle, for jobs are scarcer as he climbs the ladder. First mates draw an average of \$195 per month and masters' salaries are arranged in conference.

In the engine-room department a man may start as wiper, graduate to fireman at the end of six months, and then to water tender or oiler. On each step up the line he has to pass examinations. Wages are higher in the engine room than on deck. A chief engineer draws an average of \$275 per month.

Men in the steward's department on passenger ships work slightly longer hours



Gear and brake used for snubbing lifeboat as it is swung away from ship and lowered

and their wages are about the same as those on deck. Both members of the crew and the licensed officers have to pass rigid examinations in the shipping office of a port before they can be promoted to a higher rank. Oil tankers pay better than most cargo and passenger ships because the service is considered more hazardous and because the tankers are noted for short "turn-arounds," spending only a few hours in port before starting the return voyage.

☐ Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

John made **\$42⁵⁰**
in one day
in his **NEW**
Business



● **Get Into This Business Now —**

a business which is so new that it is practically without competition. This alone should enable you to make really **BIG MONEY**. Hotels, homes, clubs, office buildings offer tremendous possibilities. Our new **DETERGER** washes upholstered furniture, electrically right in your customer's home, with a new soapless soap whipped into **DRY** suds. *No liquid touches the fabric*, therefore the furniture is ready for use soon after cleaning. We have helped hundreds of men get into business for themselves with our automatic equipment. The U. S. Government and many of the world's largest hotels use our machines.

Make Money the FIRST DAY

The Deterger is ready to use when you receive it, so you ought to be taking in big profits the first day. We want an honest, ambitious man in every locality. If you are that man we will help you get started for yourself in a business with tremendous possibilities.

No Rent to Pay You don't have to rent a shop. You don't have to hire a building, for you do the work right in your customer's home. You save the expense of carting furniture back and forth to a central plant; the owner's home is your workshop.

J. S. Corson says

"I cleaned seven living room sets and fourteen chairs, as well as twenty-five automobile interiors the very first month and made \$279.50." Berger Hanson wrote "My investment in your **DETERGER** was the wisest I have ever made. It is my most valued asset." Barrett says: "Made \$28.00 in eight hours, on another job made \$11.00 in two and one-half hours." Alex Gulkin's business expanded so fast that he already has **SIX DETERGERS** making money for him.

Pay as you Earn

Only a limited amount of money is needed for a down payment. The balance you send on easy terms. Most men find it possible to make far more than the cost of the machine before the payments come due. Every machine is fully **GUARANTEED** and satisfied customers send their friends to you.



No liquid touches the fabric when cleaning with the **DETERGER**.

Book sent FREE

Write today for copy of our booklet "Your Own Business, Profits Instead of Wages." Let us tell you how easy it is to get started in a year around business where you are your own Boss and can stop worrying about just a job. Write today—**NOW**.

VON SCHRADER MFG. CO., 551 Pl., Racine, Wis.



VON SCHRADER MFG. CO., 551 Pl., Racine, Wis.

Send me (without obligation) your free booklet telling me how I can own my own business and become financially independent and how I can pay for the **DETERGER** on easy terms.

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Men and Women, Make easy money selling
GENUINE LEATHER TIES
4-in-Hands and Bows, for Men and Boys. Beautiful patterns and colors. Won't wrinkle. **LOOK LIKE SILK**. Wear indefinitely. Cleaned with a damp cloth. Big profits; repeat orders. No sales ability needed. Big leader in necktie sales. Send 50 cents for sample kit. Information free.
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Over 100 pages! Beautifully Printed and Illustrated! Trailer Suggestions and Ideas galore! Catalog shows America's greatest line of Trailer Parts and Equipment at lowest prices. Everything from wheels to top. Rush 25c today. Satisfaction positively guaranteed!
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BUILD IT YOURSELF

The Jim Dandy Cabin Cruiser
The Trailer that has everything. Clean! Roomy. Easy to build in any size with my simplified Plans and Instructions—Price \$1.00. Rush dollar bill today to **JIM DANDY** Box 125-A WAUSAU, WIS.

NEW BRUSH PLATING OUTFIT For AUTO PARTS

Connects to a battery with no tanks necessary. Plates on iron, steel, brass, copper, etc. Almost as simple as painting. Hundreds of car owners waiting for this low-cost plating. Improves appearance and value of the car. Your opportunity to make good income plating auto parts, bathroom fixtures, reflectors, mirrors, etc.

FREE PROOF
Write quick—big season here. Get **FREE PROOF** and particulars that put you in a paying business of your own.

GUNMETAL COMPANY
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For less than the price of one of your least expensive tools, save all of them from rust. Quik-Trik removes rust from anything. Your money back if you don't agree that it's the best you've ever used. Tell your friends. Send 50 cents for one-half pound jar. Postage prepaid; U. S. only. **AGENTS!**

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MEGOW'S GAS-POWERED MODEL AIRPLANE

The Cardinal
World's champion Bassett's new 48" gas-powered crack-up proof sensation! Finished prop., many ready-made parts, rubber wheels. Also the famous **QUAKER FLASH, FLYING QUAKER** and others. Also rubber-powered Giant Fliers with motor-hum device \$1.00 up.
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SHIPS . . . carved hulls, many ready-made parts, complete plans and materials. **XEBEC** (Rob. Crusoe); **HISPANIOLA** (Treasure Island), **ARABELLA** (Capt. Blood) and others, \$2.00 (15c postage).

HO-GAUGE MODEL RAILROADS. Most realistic freight cars. 50c. Send 5c postage for 100-page illustrated catalog Model Kits, ready-made parts and supplies.

MEGOW'S Dept. PM., Howard & Oxford Sts. Philadelphia Pa. or 217 N. Desplaines St., Chicago, Ill.

XEBEC

When writing please mention *Popular Mechanics*

H 1099

Taming Wild Wells

(Continued from page 93)

sition on a carrying apparatus which can raise, lower, or tilt the stack. His method is to slide this seventeen-ton machine up to the casing head of the wild well, lower the stack and weld it to the casing. Then heavy valves attached to the bottom of the manifold are closed slowly. When they have been shut they are left upon the casing and the manifold is pulled away. The well is under control. Very simple.

But in the present instance it was not so simple. Before the manifold could be lowered to take in the entire flow of gas, part of the gas belched out at the bottom of the



Dredge trying to catch piece of broken casing with hook to pull it from crater

stack, enveloping the rig in flames and making it impossible for anyone to get near, even in an asbestos suit, to lower the stack.

So an irrigation canal was diverted into the crater until water was almost to the top of the manifold. But flames came up through the water and soon it was boiling. The crew rigged a boat with tin shields and rowed onto the boiling lake with a hook to try to catch the chain that would lower the manifold. Some under-water projection stove in the bottom of the boat and almost pitched the men out. With boiling water flooding into their craft they raced for shore, reaching it just as the boat capsized.

But the fighters were not stumped. With the crater full of water the manifold was pulled away from the casing. The gas roared unhindered through the lake, sucking up water as it went into the air. The

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Alka-Seltzer
Too!



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FOR A SOUR
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I LIKE
ALKA-SELTZER
FOR ACID
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FOR RHEUMATIC
ACHES and PAINS

Try This Easy Way to
Pleasant, Quick Relief

● An Alka-Seltzer Tablet in a glass of water makes a sparkling alkalizing solution, containing an analgesic (sodium acetyl salicylate). When you drink it, it gives relief in **TWO** ways—quick relief from the pain and discomfort and relief from the excess acid condition so often associated with common ailments.

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DO YOU

WANT a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and in a few weeks earn big income in service fees.—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address Stephenson Laboratory, 1 Back Bay, Boston, Mass.

K1099

water mixing with the gas raised its point of combustion, the fire wavered and wavered and then snuffed out.

When the crater was empty again, the manifold was ready to go in once more, this time with a long tapering swedge that would go inside the casing and wedge fast. The swedge went down into the casing and the stream of gas shot out of the top of the manifold. But suddenly gas began bubbling out of the ground near by. Evidently a leak had occurred underground. The swedge and manifold could do no good now. Frantically the men worked to loose their machine from the casing before the explosion that was sure to come. All at



Asbestos-clad men making cable fast to casing at the bottom of the crater

once some inner sense told them that it was time to go. And they went, running for their lives. Behind them the bottom of the crater let go with a tremendous roar and fire reached out over the crater rim. The concussion tumbled the men end-over-end, but only one was burned about the face.

From a distance they looked at the well, once more a tremendous furnace, but this time with \$2,000 worth of equipment at its bottom. Wearily they admitted defeat and went away.

But the well had not yet won the battle. M. M. Kinley, probably the most experienced fire fighter in the game, decided that it was not yet a hopeless proposition. He came with his crew and with high-pressure hoses washed away the earth from Patton's wrecked machinery, then removed it with tractors. Next his men carried in a can filled with forty quarts of nitroglycerine jelly and placed it beside the fire.

(Continued to page 124A)



... here comes a

**Flexible
Flyer**

They will have to get out of the way when you come down the hill with one of these new streamlined Flexible Flyers.

They sail along like nobody's business, ride bumps like a new car, sweep around curves like a racer. They're the smoothest, speediest, safest sleds ever made... just what you want for Christmas!

Tell Dad and Mother about Super-Steering, with a turning range double that of other sleds. It gives you full control at all times. Tell them about the new Safety-Runners, with no sharp ends to cut you.

Take Dad to the store and show him the smooth Airline Eagle. He'll understand why Flexible Flyer is still the favorite sled of red-blooded boys and girls — just as it was when he whizzed down the hills.

Show it to the folks and tell them why you want this streamlined beauty for Christmas. You'll be the king of the snow trails this year!

Write for FREE cut-out model of the Airline Eagle. It steers just like a real sled.

S. L. ALLEN & CO., Inc.
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*The
Airline Eagle*

**Flexible
Flyer**

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All-Purpose MOTO-TOOL

Moto-Tool makes an attractive, practical gift every craftsman will appreciate — for no other motor-in-hand tool in its class matches Moto-Tool in speed, power, ease of handling or in exclusive construction advantages that provide, long trouble-free service. Moto-Tool does in seconds jobs that require hours of hard hand work. Handles all accessories, works on all materials, runs on A. C. or D. C. Absolutely safe. Thousands in use. Model 1, 6 oz. 25,000 r. p. m., for light work. Model 2, more powerful, 13 oz. about 27,000 r. p. m. \$16.50 postpaid. At leading dealers — or order by mail on money-back trial. Write for free illustrated booklet. **Dremel Mfg. Co. 281 Ct., Racine, Wis.**



Price **\$985** Post-paid

Model 1

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\$7.50 EACH POSTPAID

Most Unusual MOVIE OFFER EVER MADE

GET BOTH CAMERA & PROJECTOR

for Only **\$13.50** Complete and Postpaid

Everything to take and show real 16 mm. movies at less cost than taking snapshots.

CAMERA — Spring Motor drive — Automatic Release Button — Footage Indicator — 50 foot capacity. No adjustments necessary.

PROJECTOR — Quiet, smooth and flickerless — Motor driven — sturdily built. Uses any standard 16 mm. film.

Write NOW for Big **FREE** Catalogue of Movie Supplies and Film Subjects. **We are never undersold.**

PARAMOUNT MFG. CO., DEPT. G - 96 BOX 224, BACK BAY, BOSTON, MASS.

JIG SAW \$1.50

COD or outside U.S.A. \$1.25

POST PAID

Including 12 assorted blades, Adapters, manual, and roller Saw Guide formerly found on expensive machines only. All metal, 15" long, 8" high, 3/4" table. A swift and easy cutter—best ever made for the money.

FREE CATALOG describing \$150 prize contest (1st prize, \$25; 2nd, \$15; 3rd, \$10; 66 other cash and merchandise prizes). Cat. illustr. complete power tool line: Shaper, Circular Saw with oilless bearings, \$3 each; Drill Press, \$2.50; completely equipped Lathes, \$2 and \$4.90; Sander, \$1, etc. Order today or send card for Catalog.

\$150 PRIZE CONTEST

"The Jigmaker" cuts wood 2" thick.

J & H Metal Products Co. 5 Commercial St. Rochester, N. Y.

(Continued from page 123A)

Heat could have exploded it before they regained the crater edge, but it didn't. When the charge was exploded electrically, the concussion snuffed the fire.

The men went back into the crater when the well had cleaned itself, dug down along the casing with hydraulic diggers, and poured tons of cement about the pipe. Then they cut off the battered top of the casing, and on a cable strung from side to side of the crater they ferried in a capping manifold. It was jockeyed over the casing, fastened solidly to stay bolts in the concrete.

When four flow lines had been laid up out of the crater to separators for extracting the oil from the gas and had been attached to valves on the manifold, the main valve was closed. The gas then passed out of the crater through the flow lines and deposited its oil in storage tanks at a rate of four hundred barrels a day. The dry gas shot out of a vertical pipe high into the air in the middle of a deserted field where it could do no harm. The wild well had been tamed.

The Latest in Aviation Radio

(Continued from page 85)

mounted above a bed of wires that act as reflectors in directing the signals upward.

The next step in the program will be the use of high-frequency radio sets in passenger transport cockpits next summer for talking with the control towers of airports while the planes are in range. Short-wave radio signals travel in straight lines and communication is virtually limited to line-of-sight distances. The new sets will be tiny in comparison with the equipment used for working on longer wave lengths and will require much less power.

With the aid of short waves, safe landings in fog so thick the pilots can't see their wing tips are expected to be ordinary routine within a year. United Air Lines pilots have made thousands of such blind landings in practice, utilizing a "bent" radio beam that leads them down safely to the field. TWA has been experimenting with the same system. Another method allows the pilot to "see" his landing field on the fluorescent screen of a cathode-ray tube in the cockpit, a short-wave transmitter on the field providing a point of

(Continued to page 126A)

see June 1937

New Invention WITH SUPERCHARGE PRINCIPLE SAVES GAS



AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline . . . produces split-second pick-up, sensitive accelerator response, quicker starting, greater speed and smoother running.

Automatic - Nothing Like It!

The self-starter — four wheel brakes — knee action — streamlining . . . and now VACU-MATIC! The sensational money-saving invention! With it, engineers have achieved a practical means of balancing air and gasoline automatically for all speeds.

VACU-MATIC is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you —so practical it will save you many dollars on gas costs.

USERS REPORT
3 to 7 MILES MORE PER GALLON
MOTORIST SAVES \$180.00 a YEAR
 "On my V-8 Ford it works miracles. Its added power, acceleration and top speed has sold me. The results are unbelievable."—Ralph Field, Mass.
 "Very glad to say, the Buick showed an increase of 3 miles more per gallon."—A. V. Grove, Washington.
 "On my Plymouth, I obtained an average of 22 miles per gallon, an increase of 7 miles. This means a saving of \$15 a month or \$180 a year."—F. S. Peck, Calif.
 "It saves me one gallon a day. I had to buy 2 gallons each day—now only 4 gal."—L. V. Sweet, Pa.
 "I have twelve VACUMATICS on cars now, and they all show an increase in mileage. The car owners are very well pleased."—Fred Taylor, Okla.
 "I have been placing VACU-MATICS on expert mechanics' cars. All are well pleased."—J. W. Donahoe, W. Va.

Guaranteed Gas Savings
 VACU-MATIC proves itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up, and more power or it costs you nothing. You can instantly tell the difference in added power and motor performance — you quickly notice the cash savings on gasoline.

Fits All Cars
 VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and sealed at the factory. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

Free Details
 You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation—so get the facts now! Write today!

The VACU-MATIC Co. Wauwatosa, Wis.

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Gentlemen: Please send me full particulars concerning the VACU-MATIC and details of your Free Offer. This of course does not obligate me in any way.

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 Check here if interested in selling proposition

COMET CLIPPER GAS MODEL

\$4.95

NEW 36 PAGE CATALOG
 Hundreds of models, 10c up. Gas model kits, motors, accessories. Send 5c stamps to
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Prize-winning, record-breaking, 6 ft. gas model. Removable power unit; detachable wing and tail; difficult parts finished. Kit with automatic timer, \$4.95; postage 25c, or buy from dealer.

New Adding Machine Fits Vest Pocket!..

Adds, subtracts and multiplies up to one billion. Weighs only 4 ounces. Not a toy—strong guarantee. Absolutely accurate, very fast. Sells to offices, stores, homes—wherever figures are used. Write quick for **FREE AGENTS** sample offer and Money-Making Plan.
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A real money maker for farm or factory. Uses Cheap fuels. Pays for itself out of savings. Costs Less to Own—Less to Operate.

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Make Money—Start a wood sawing business—turn spare timber into cash. Cash or Terms—Engine and Saw Catalog.

WITTE ENGINE WORKS
 1741 OAKLAND AVE., KANSAS CITY, MO.

While 1000 Sets Last! For Only 59 PIECES OF WOOD \$3.95!

MANY RARE PIECES

Here's a regular "treasure find" of all sorts of rare woods that will thrill every wood craftsman. Sensational low price Introductory Set of 59 pieces to introduce King Midas woods to you. Truly a great bargain!

ORDER NOW SUPPLY LIMITED

Only 1,000 sets at this amazingly low price. Mail coupon with \$1.00 deposit and this huge value of 59 pieces of wood will be shipped you C. O. D. for balance. Do so NOW while supply lasts.

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18 sq. ft. of Beautiful Plywood for Inlaying in Satin Wood, Zebra Wood, East India Rosewood, Gum, Oak, Poplar, Birch, Mahogany, and Walnut . . . from 1/8 in. up through 3/4 in. in thickness.

Also

- 4 Turned Legs
- 10 Dowels
- 1 Midget Table Top
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- 4 Knobs
- 16 Pieces Veneer, 3 ft. and over

A total of 59 pieces in all
 Shipping Weight Between 20 and 25 lbs.

FREE of Extra Cost With Each Order BOOKLET "How to Grade Plywood"

Gentlemen: I enclose \$1.00. Send me your Introductory Set of 59 pieces of wood. I'll pay balance C. O. D., plus postage.

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Split-second flash gets vivid shots like this indoors or at night. And you are sure of *enough* light for good, clear pictures with all modern film. Easy to use. Operate on flashlight batteries or house current. Grand for color shots. Each lamp gets one picture. For holiday scenes you don't want to miss, use G-E MAZDA Photoflash lamps.

FOR DOZENS OF SHOTS GET G-E PHOTOFLOODS

G-E MAZDA Photoflood lamps last for dozens of pictures. 2 G-E Photofloods in reflectors permit snapshots at night with box cameras and new super speed film. Great for home movies. Buy G-E MAZDA Photo lamps where you buy film.



For best results,
read and follow simple directions on each package.



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Other sizes to fit your needs

GENERAL ELECTRIC
MAZDA PHOTO LAMPS

2995
(Continued from page 124A)

light on the screen that is lined up with reference points of light obtained electrically from the artificial horizon on the instrument panel. Very narrow radio beams of less than one meter in wave length are being investigated at the Massachusetts Institute of Technology for use in blind landings. The Army Air Corps has worked out a blind-landing technique useful with any of the different radio guides, in which the automatic pilot is used to hold the plane in a "let down" glide after it passes over the radio landing approach beacon. With the plane descending in a safe landing position and with wheels and flaps down it practically lands itself. Airplanes are already making instrument approaches to airports but are not permitted to land unless there is half a mile visibility on the ground and a ceiling of at least 600 feet.

Another use to which the cathode-ray tube is being put is a hook-up by which "panoramic" reception from several different ground radio stations, obtained via the plane's radio compass loop, is shown visually on the screen. The angles between the different ground stations to the plane gives the pilot an accurate "fix" of his position. Another system allows the pilot to pre-select several ground stations, and to then obtain their directions one at a time simply by pressing a button that operates the small electric motor that revolves the loop mechanism. A still additional improvement lines the ground stations up in reference to true north instead of magnetic north, eliminating the need to figure variation.

For point-to-point transmission on the ground the air-line ground stations are working out new ideas in directional antennas that are revolutionizing radio communication. The new antenna systems throw as much as eighty per cent of the energy in one direction, focusing the power along a path toward the receiving station and reducing interference with other stations. Fractions of the power formerly needed to work long distances are being used. Such a directional antenna system consists of two parallel vertical wires, one of which radiates the signals and the other of which acts as the reflector. A few years ago stringing up an antenna was a haphazard job that could be done in a few hours but now the engineers spend as

much as a week in plotting radiation patterns and making slight changes in the system to get the best results.

On aircraft, signal strength can be controlled to some extent to radiate either in a fore-and-aft direction or at right angles to the path of flight merely by changing the length of the trailing transmission antenna. On Howard Hughes' world-circling Lockheed an electric reel was used for letting the antenna out to exactly the proper length, practically doubling the radiation in the direction desired.

The new directional ground antennas are being experimented with in the modernization of American Air Lines' radio system, which comprises sixty-six different transmitters in thirty-seven different stations, making it one of the largest private radio systems in the country. The radio network operates twenty-four hours a day over 6,700 miles of airways. New high-powered Bendix transmitters are being installed to operate on any one of ten frequencies which is selected by the operator by simply dialing a number. The sets provide 1,000 watts for voice and 1,250 watts for long-distance radiotelegraph. The Newark and Chicago stations of the system each has four transmitters with an operator on continuous duty at each set, two of them engaged in ground-to-plane transmission and the other two occupied with point-to-point radiotelegraph, flight contact, and weather reports. The system employs 175 operators and twenty-nine maintenance engineers and mechanics, including teletype personnel.

For convenience in arranging frequencies and schedules the major air lines have organized Aeronautical Radio, Inc., a non-profit organization that handles the ninety-nine different frequencies used by more than 250 ground stations and 350 aircraft stations in the country. The organization is working with the radio development section of the Bureau of Air Commerce on a long-range program of putting short waves to use, including the new frequencies between one and ten meters that recently have been assigned to aviation.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

BIG MONEY!

ASSEMBLING MEAD'S

New PORTABLE KI-YAK

IN A FEW DAYS AT HOME!



Weight as little as 20 LBS.

Use with PADDLE! OARS! SAIL! MOTOR!

—from Complete Cut-To-Fit Construction Kit!

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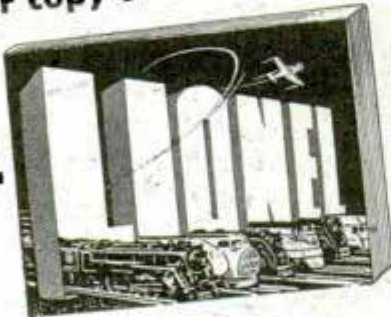
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Teaching Wild Animals New Stunts

(Continued from Coloroto Section)

stunts. Training starts when they are about eighteen months old. An intricate act such as the equestrian performance may take six months or longer to perfect, although an intelligent seal learns a simple stunt in a few days—as soon as he learns not to be frightened and that he will be rewarded with a piece of fish for doing what he is told.

"In the equestrian act there is one thing I would like to teach the ringmaster seal. I would like the ringmaster to toss hunks of fish to the mounted seals as rewards, but so far every piece of fish the ringmaster gets vanishes right there and I have to feed the mounted seals myself."

Ice Crusher on Wall Bracket Chops Ice in Three Sizes

Built to fit into a slotted wall bracket that accommodates other kitchen tools, a hand-cranked ice crusher just brought out will deliver ice in three sizes. A flick of the finger changes it from fine to medium and coarse. The working parts are all non-rusting stainless steel. The ice cup is of colored plastic.



#90
 #162
 and Carter St Louis
 triple
 Casey Churn & Ice Warmer

Mining a Glacier

(Continued from page 53)

perature of 150 degrees Fahrenheit. Deep crevasses in the ice breathe it also.

The crater is surprisingly big. Mountaintop distances are always magnified because you can't walk fast at high altitudes without stopping often for breath, and in this case it is particularly hard going because the snow and ice are honeycombed by the wind into thousands of pinnacles each about two feet high.

Eventually the visitor reaches a spot where several men, hunched against the wind, are working. In perfect harmony



Ice and snow-encrusted cabin after severe blizzard has swept the mountaintop

with the frigid surroundings, their Arctic garb is crusted with ice and their faces are a leathery Eskimo brown. As a protection against the extreme cold, the glaring sun, and the driving wind, they cover their skin with a special preparation consisting of equal parts olive oil and vinegar and a few drops of iodine. To prevent snow blindness as well as eye injuries from the tiny wind-driven ice pellets, they wear colored goggles with shielded sides. For warmth they have parkas lined around the face with wolverine fur, the one part of their clothing to which ice will not cling.

Some of the men are digging holes with pick and shovel—test pits from which to get samples of the sulphur ore for laboratory examination. Others are operating a gasoline-engined diamond drill. One test

(Continued to page 131A)



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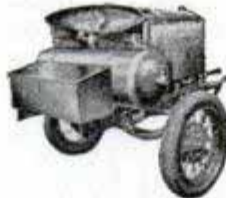
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(Continued from page 129A)

hole that goes down sixty-eight feet through solid ice was abandoned when the drillers found no sign of rock bottom. The hole is four feet in diameter—just room enough for one man at a time to hack the ice away while a helper at the surface hauled up the buckets. You can picture the plight of the workman—alone in the bottom of the shaft, close-quartered with flint-like ice at his feet and at his elbows, and icy blue shadows far above. At least once or twice he must have imagined the floor giving way and dumping him into some hot cavern in the maw of the crater.

In an attempt to find how deep the ice really is in the middle of the crater, Dean and his crew put the diamond drill to work. It was still chipping through ice at 308 feet. They had no more drill rod. All but one of several other drill holes reached through to sulphur.

At the edge of the crater, the visitor looks down into ice crevasses 200 or 300 feet deep, a vacant blue to the bottom. Perilous as this may seem, men work deep in those crevasses. One man, lowered 150 feet down on a stout rope in search of precious yellow samples, shouts, "Come on in, the ice is fine."

The wind suddenly becomes colder and noisier, and a new fog, phantomlike, forms out of nowhere, stinging faces and hurrying on its way to form a "cloud cap" at the lee side of the summit.

The cabin is a twelve by twelve foot room with an addition on one side full of bunks. It contains a radio that plays swing music, to the accompaniment of the high wind's roar. The crew eats at a square shiplap table. But they never get hot coffee because at this altitude water boils at too low a temperature.

A member of the original crew of seven that shouldered thirty-five-pound packs and labored seven miles to the cabin tells this story:

"When we took over this cabin it was solid ice inside," he said. "Three winters on this iceberg makes the snow hard as stone, and the snow in here had stood for eight years. We had a tough time hacking out room for our sleeping bags."

The mountaineers are well accustomed to blizzards. Three or four "good" storms, ordinarily lasting from two to four days,

(Continued to page 132A)

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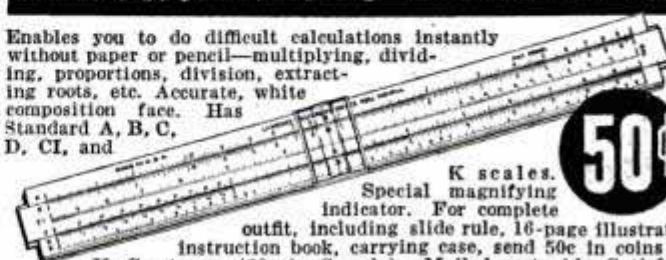
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(Continued from page 131A)

are part of the normal summer-weather menu on the summit. The wind reaches an estimated velocity of seventy-five to 100 miles an hour. Between storms the temperature varies from twenty or so degrees below zero to thirty-five degrees in the shade, or warm enough for shirt-sleeve working in the sun.

"We get an electric storm once in a while," one of the men says. "One time when we were sitting here at dinner there was a blinding flash and a wild crackling noise and the sparks hopped around in front of our faces. The lightning had skipped the guy cables outside. It came in through the wall over there, crossed our dinner table, and crashed through that window. On the way out it melted a hole through a washpan by the window."

More feared by the workmen than either the storms or the ice hazards of the summit is the sulphide gas that often catches them unaware in the prospecting holes. All of them have had close brushes with death after inhaling the gas.

As a result of five full summers of prospecting and many conferences with experts, Dean is convinced this mineral wealth can be mined profitably despite the extreme barriers. His projected nine-mile tram, from the summit crater to a base with a year-around water supply, would consist of a chain of towers and suspensions as high as two or three hundred feet above the surface of the mountainside in places, carrying half-ton capacity buckets spaced three or four hundred feet apart. The weight of descending ore would more than offset the weight of ascending freight and passengers. Under a permanent shelter, the upper end of the tram would connect with a 1,500-foot ventilated tunnel leading under the dome of the mountain into the beds of ore.

Dean pictures a complete mining community built into the mountainside, with living quarters, stores and recreational facilities deep inside where workmen would be immune from the ravages of high-altitude winters.

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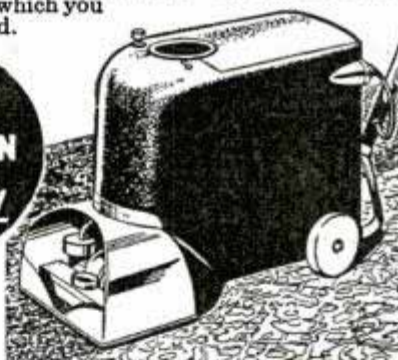
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A-1085
Trackers of the Highway

(Continued from page 37)

er arrests of the culprits as a result. This is especially true in Michigan, New York, New Jersey, Pennsylvania and Connecticut where state police are equipped with all the latest devices for war on crime.

"Time and again a local station announces a hit-and-run car last seen traveling in the direction of some neighboring village," says Commissioner Olander: "State Police Radio Station WRDS relays the announcement to patrol cars whose operators adjust their movements to head off the fleeing motorist.

"Checking of garages is standard practice in practically all cases where an apprehension is not made within a reasonable time after the accident. In Michigan we have a law which requires garages to report damaged vehicles to the police. Cooperation on the part of the garages is good. Much of our information comes from garages and service stations."

A garage man, as Mr. Benson points out, who has been supplied with information regarding mechanical or structural defects of a car involved in a crime can be of aid to the police even if the driver has attempted to cover his steps by hastily repainting his car, and straightening out the bent bumper or mudguard. Mr. Benson explains:

"Clues which tire experts discover from tire prints—wheels out of alinement, chassis out of alinement, uneven brake drums and similar deficiencies—are rarely thought about by the lawbreaker who is principally concerned with the external appearance of his car. These are dead giveaways which may be instrumental in effecting his arrest and conviction."

Cattle thieves of the southwest and freight and merchandise thieves of the east use trucks, so tire prints of truck tires are playing an increasingly important part in combating these types of crime.

"Truck and bus tires operate under their own peculiar conditions and have their individual problems of wear," says Mr. Benson. "Although the ordinary driver is not aware of it, it is a fact that truck tires generate heat that reaches over 300 degrees—eighty-eight degrees higher than the boiling point of water.

"Often the dual tires on the rear of a

H 1085

truck are not properly mated. The inside tire paralleled on one side by its mate and in most instances mounted directly over the brake drum has less chance to cool and at the same time is subjected to greater heat. As a result the pressure in the inside tire increases more rapidly than that in the outside tire. This increased inflation makes it less flexible than the outside tire and consequently it carries more of the load. Again, a truck riding the center of a crowned road would be supported more by the two inside tires because of the shorter perpendicular distance from the axle to the road at those points.

"Knowing these facts, it does not take an expert long to identify a tire as having been used as an inside or outside dual truck tire. In some cases it is even possible to tell the general locality from which the truck came, as in the case of cambered roads.

"A tire sleuth can quickly determine from a tire print whether the truck leaving the scene of a crime is over-loaded. In some cases he may even make a general estimate as to its getaway speed. A ten-ply tire, for example, which is not driven in excess of forty miles an hour has a thirty per cent greater carrying capacity than the same tire driven at fifty-five miles an hour.

"These are some of the telltale clues revealed to the modern trackers of the highways. American tire manufacturers have spent \$55,000,000 on research in the past ten years. It is this intensive study and a thorough knowledge of their product that now make it possible to turn fingerprinting of tire treads to the use of the law."

Fingerprints of Fisk tires are made on a tread contact machine in the factory. When a new tread design goes into production, a print is produced and forwarded to the Federal Bureau of Investigation.

To make such a print, the tire is inflated to the pressure it will use when mounted on a car wheel. The tread is inked and white paper placed under it. Then the tire is lowered and pressure equivalent to the weight of an automobile is exerted on it, and a perfect print of a normal tire is obtained.

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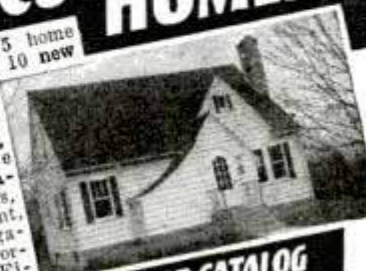
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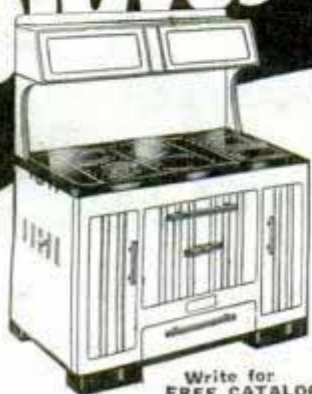
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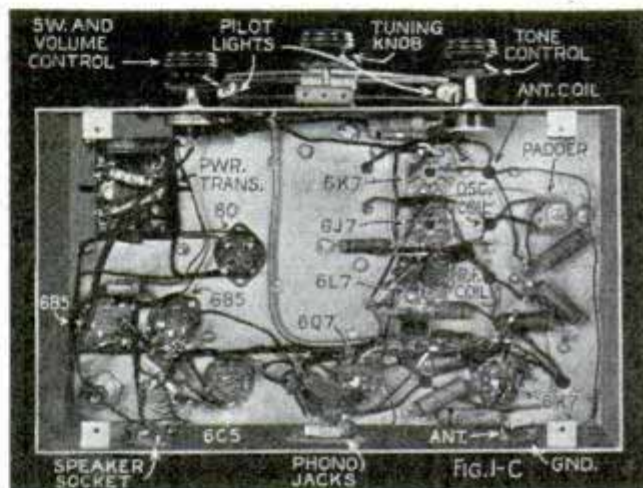
A Kalamazoo Direct to You

PM Economy Nine Receiver

(Continued from page 99)

in this receiver are not expensive they should be of good quality and just as specified, to insure maximum results. A list of the original parts used in the model can be obtained from Popular Mechanics radio department without charge. The blueprint number is R-262. Inside dimensions of the cabinet shown in the photos are as follows: 15 1/2 in. wide, 11 in. deep and 20 in. high. Any table-type cabinet or console of similar chassis-space size may be used.

When wiring the set keep all grid and plate leads as short as possible, and be sure the soldered connections are mechanically and electrically tight. No. 20 hookup wire



with push-back insulation is employed for all wiring; this wire is available with insulation in various colors. The antenna, oscillator and r.f. coils specified are provided with the color-coded leads indicated in diagrams Figs. 1 and 4. Rosin-core solder is recommended for all connections; do not use acid-core solder. Cable connections for the speaker plug are shown in Fig. 3 as viewed looking into the plug. Always be sure that this plug is inserted in the speaker-plug socket before turning on the set.

To balance the receiver, turn all four top I.F. transformer trimmer (Tr.) screws completely closed, with a small screwdriver, then turn them out about 3/4 of a turn. Next, turn the 3-gang variable condenser to minimum capacity, fully open position. Now screw the trimmer (Tr.) on the oscillator condenser section (C₂) down tight and then back it off one full turn. Connect an-

(Continued to page 140A)

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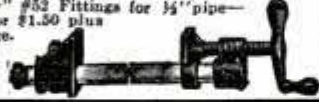


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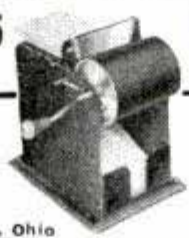
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Flying Above the Weather

(Continued from page 27)

minute. But the passengers will be climbing only 300 feet per minute, at least as far as pressure changes are concerned. They will not experience the usual discomfort of a fast climb because the atmospheric pressure inside the cabin will be reduced at a slow and comfortable rate.

Shortly after taking off the pilot cuts in the cabin superchargers at low speed. At 5,000 feet the passengers will be in an atmosphere of only half that apparent altitude. At 10,000 feet the pilot shifts the superchargers to high speed and by the time he has climbed to 14,700 feet the apparent altitude inside the cabin is only 8,000 feet. At 20,000 feet the pressure inside the cabin is the same as at a 12,000-foot altitude, still low enough for comfort. It will take about forty minutes of climbing for the pilot to reach his cruising altitude. In approaching his destination the pilot will start descending while still half an hour or more out, dropping at an efficient angle in order to recapture some of the power expended in the climb. During the descent, cabin pressures will be held at a rate of change more comfortable than is possible in present transports.

The Boeing pressure air liners will have two independent sets of supercharging and heating apparatus, either one of which can assume the full load.

Twenty thousand feet is just about the optimum altitude for passenger-carrying. When we go much higher than that all sorts of complications appear. The air becomes so thin that engines are hard to cool in spite of the low temperature. Gasoline starts to evaporate and fuel tanks and carburetors have to be supercharged. The cabin structure must be built strong enough to withstand pressures of more than 1,000 pounds per square foot. Air is not a good insulator above 25,000 feet and we run into spark-plug trouble.

To me, predictions that we will be flying at 100,000-foot, 50,000-foot, or even 35,000-foot levels within five or ten years are ridiculous. By that I don't mean that higher flight is impossible or that it won't be done now and then as a matter of research or for military purposes, but that the idea now appears impractical as a passenger-carrying project.

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A 1132

(Continued from page 21)

tractor-grader it is customary to first cut a "shelf" from which grading operations can follow. A blade mounted on the front of a tractor is ideal for this. The U. S. Forest Service has developed such a tool called



Tractor equipped with bulldozer building rim road at east edge of Crater lake

a "trailbuilder." Its blade is set at an angle so it cuts into the bank with the point and delivers the materials toward the rear. The blade also is reversible and can be set at a right angle to the tractor axis, whereupon it becomes a bulldozer.

Earth-moving operations, especially in rolling country where "cut and fill" constitutes much of the work, may be classified in general as, loosening, loading, transporting, dumping, spreading and compacting. Sometimes several of these are done at one time, or by one piece of equipment. For example, an elevating grader may loosen and load. Again, scrapers may load dirt without any previous loosening and may transport, dump and spread it.

When earth is "drifted" with a bulldozer the tractor is kept on the same path with each successive trip. This causes the material wasted over the ends of the blade to fall in windrows. After the windrows are formed they serve to hold the material in front of the scraper or blade and thereby prevent wastage. On big jobs these dozers work in pairs, often moving an amount of earth rivaling that of a landslide.

The elevating grader is considered one of the most efficient pieces of equipment in earth removal for side casting earth directly into an embankment or fill, or for loading trucks or tractor wagons for hauling to a fill. The apparatus is essentially a

plow, disk shaped, and a belt conveyor mounted on a frame supported by four wheels. It is drawn by the tractor, the plow cutting the soil and turning it onto the belt. The belt carries the material upward and finally discharges it.

When fills are made, the subsequent settlement problem is of great importance. Usually the earth is spread in layers with bulldozers and blade graders, after which the compacting is done with tractor-drawn tamping rollers also called "sheep-foot tampers." These are heavy hollow cylinders with projecting steel pins or feet, eight or nine inches long, spaced all around the surface. As the roller is pulled forward over a layer of loose soil, the feet penetrate the layer and drive some of it down, compressing it to great density.

The earth borer, which contributes its share to labor-saving equipment, is especially valuable in setting poles. The equipment generally is mounted on a twenty-five horsepower tractor. The boring bit whirls downward to dig a hole quickly and then the equipment hoists the pole so it can be placed into position.

Terracing is being used more and more today as a means of soil-erosion control.



One of the biggest trucks ever made for earth movement moves eighty-five cubic yards per hour

Present-day methods and equipment, as in other great earth-moving projects, have made it possible to build bigger and better terraces not possible a few years ago with hand labor. Blade graders, elevating graders and terracers of different sizes do the work behind track-type tractors of corresponding size.

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"They're Off!" to New Thrills

(Continued from page 75)

had many arguments as to whether all four hoofs of a horse ever leave the ground at once. It was not until men developed cameras with fast lenses and shutters that it was proved that all the hoofs of some horses are completely off the turf at once while making fast strides for the wire.

Photography has played a big part in the improvement of American racing. Photo-finish outfits have given race fans added confidence as the camera doesn't lie if properly installed. Business has doubled at many tracks that have adapted photo-finish cameras to decide nose finishes.

At Hollywood Park a large silver screen has been built in the inclosed paddock. After a race the picture of the finish is flashed on the screen for fifteen minutes.

Some tracks also hire several miniature movie cameramen, to film the race from different points around the mile oval. If rough riding is charged, one or more of the films usually reveal the episode. Several tracks are experimenting with a motion-picture camera that can follow the horses around the track from its high position on the grandstand roof. The camera is equipped with powerful telephoto lens. To be effective it must be able to keep well in focus and take sharp close-ups that will reveal "wild west" riding by jockeys.

Most tracks today have a horse ambulance, a trailer-like affair usually pulled by a truck or tractor. It is low built, the floor being only six inches from the ground. Lamé horses easily can be led into it. On an overhead beam is a block and tackle for lifting in sick horses.

It takes a dozen or more men to keep a mile track in good shape. Where the weather is dry, it is often necessary to sprinkle the track after every race. The sprinkler is followed by two tractors, dragging harrows to keep the "cushion," as the top of the track is called, in fast shape. Rain brings mud and that's another problem for the track maintenance crew. The track must be drained as well as possible. Pools of water are filled with dry dirt.

Race-track people have their own lingo, just as circus, railroad, motion-picture, and other groups have. "Swipes" are the fellows who manicure and massage the

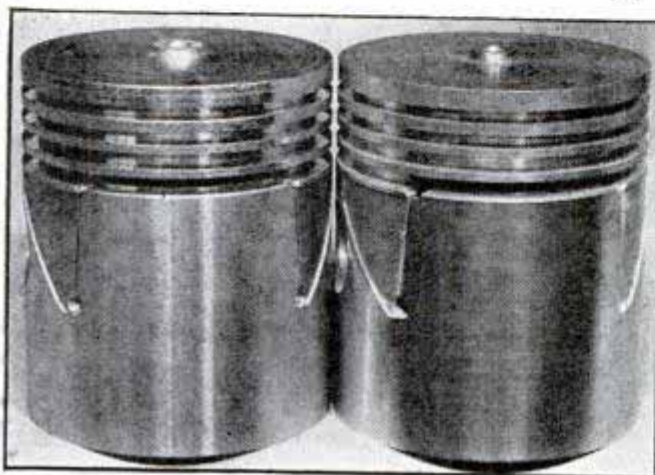
(Continued to page 149A)

Making Metal Smooth as Glass

(Continued from page 3)

moving parts, thus resulting in longer life for machines.

A part treated by this process appears to the eye to have a beautiful nickel finish, but under the microscope, or by microphotography, it appears black because no scratches remain to reflect light. A so-called bright mirror finish entirely satisfactory to the eye does not necessarily mean that all the surface material has been removed from the metal. If the surface still appears bright when microphotography is used, it means that there are enough



Piston before and after Superfinishing. Smooth surface at right fails to reflect light

tiny ridges to reflect light to the camera's eye and that the finish contains numerous defects.

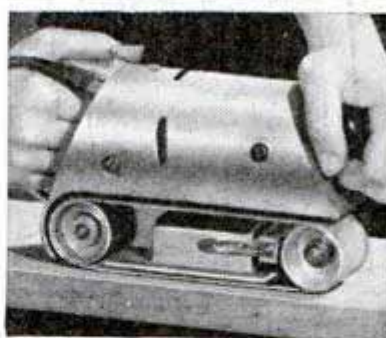
So fine are Superfinished surfaces that it is necessary to measure them with an Abbott Profilometer, a special instrument whose readings are in millionths of an inch. This instrument uses cathode rays to reveal the character of a surface as a tiny diamond point is drawn over the surface. Movement of the diamond tip up and down as it follows the irregularities in the surface sets up an electric current that is strong or weak in proportion to the height or the depth of the irregularities. The current is amplified and sent to a meter which gives a reading on the roughness of the surface in terms of millionths of an inch.

Among the parts of Chrysler Corporation automobiles which have been treated successfully by the new process are crankshafts, camshafts, cams, pistons, brake shoes and brake drums, tappet heads, tappet stems, valve stems, flywheel clutch faces, cylinder block line bearings and pis-

(Continued to page 148A)

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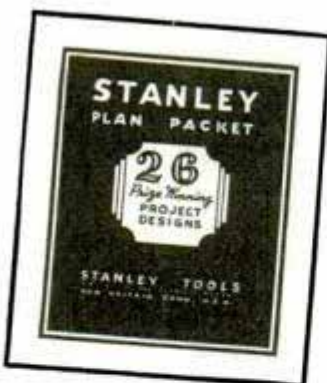
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(Continued from page 147A)

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ton pins—almost all the working parts of the engine.

As outlined by the developers, these two advantages are obtained through use of the Superfinish method:

First, the crystalline surface, when exposed in an undisturbed condition, provides a much finer surface for supporting



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oil film, carrying off heat and load-carrying capacity on either a moving or static part.

Second, the mechanical work produces a true surface which allows a greater contact and a more constant contact so that the pressure on the oil is uniform and eliminates surface points and projections above the bearing surface that rupture oil films under high pressures and thereby permit metal-to-metal contact that will wear or destroy a bearing.

Soil Pasteurizer Makes War on Enemies of Plants

Man's newest weapons in the eternal war on insects and other enemies of plants are an electric soil pasteurizer and a "hot box." Wedge-shaped metal strips of the pasteurizer are thrust into the soil of the greenhouse "flats," in which young plants are started. Electric current generates heat in the soil, kills the microorganisms, insects, weed seeds and other elements harmful to the plant. The treatment takes only six or eight minutes. The hot box is a chamber in which flowering plants are placed to rid them of the troublesome cyclamen mite.

W. C. ... College
 new Brunswick, N. J.
 d. ...
 N. Y. Agricultural Station
 Dr. Mr. Clyde

(Continued from page 146A)

thoroughbreds. A "run-out bit" keeps a horse from racing wide on a turn. A jockey who shuts off other horses is called a "herder." A horse that gallops last all the way is said to have "carried the target."

Maybe you wouldn't expect to find monkeys, dogs, cats, goats, ducks, chickens, sheep and various other pets wandering around the stable area, but you will at most tracks. They are companions for the horses and help to make the thoroughbreds less nervous.

Everything is done to make the horses comfortable in their stables which are made as draftproof as possible. At Santa Anita they even have a pile of sand for the horses to roll in. This same track maintains an X-ray room for injured bangtails.

A New Frontier

(Continued from page 59)

To see the cabins of some of the trappers, prospectors, and homesteaders in the more remote sections of the northwest is to be reminded of the days of the Pilgrim Fathers. Both had the same materials and tools with which to work and so achieved the same results. Yet these modern pioneers do not think of their life as one of hardship. They pity the city dweller, with all his conveniences, for his lack of freedom and his dependence on others.

The 1930 census showed there were only about 60,000 people in Alaska, half whites, and half natives, in a territory of 586,400 square miles—about one person to every ten square miles. But that doesn't tell half the story. Three-fourths of these people live on the coast, only one-fourth in the great interior. And this one-fourth lives mostly along the Yukon river or the Alaska railroad, the main routes of travel. Most of them have never been more than a few miles from home. That accounts for the fact that there are vast unpopulated areas where one can travel hundreds of miles without seeing a single human being. In most of the interior the population probably averages less than one person to every thirty square miles.

Yet some authorities estimate that about one-fifth of the total area of Alaska, about 64,000,000 acres, is suitable for agriculture. It lies mostly in the interior. There is about

(Continued to page 150A)

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Cuts
Carves
Routs
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A treasure chest. De Luxe Model and 26 popular Accessories in metal case. This practical gift will be appreciated, used for years. \$25.00 postpaid. Project book included.

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Free plan tells you how to start. The Foley Lawn Mower Sharpener turns out perfect work quickly and easily, no experience needed. Simply put the mower in the machine and turn on the power. Uses same system as lawn mower factories. Sharpens all sizes and types in 15 or 20 minutes.

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FOLEY MFG. CO. 107-9 Foley Bldg., Minneapolis, Minn.

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(Continued from page 149A)

KRW Inveradiant Gas HEATER!



**RADIATES HEAT
DOWNWARDS—WARMES
THE COLDEST
AREAS
FIRST!**



This sensational new heater operates on a scientific principle which directs the heat outwards and downwards, thereby warming the "living zone" of the room first. Result is greatly increased efficiency and operating economy. Light, compact, portable, beautifully finished in heavy chrome-plate and assorted colors of crackle enamel. Fully approved by American Gas Ass'n and other testing laboratories—no odor, fumes or carbon monoxide—healthful and safe. Price, only \$12.00, cash with order, or C.O.D. shipped express collect—wt. 14 lbs. Fully guaranteed, with 30-day return privilege if not entirely satisfied.

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Complete set of two foils (swords) and free instruction booklet, only \$1.98. We pay postage. **ORDER NOW.**

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WORLD'S GREATEST all around ELECTRIC TOOL

DRILLS — GRINDS — SANDS — SAWS
POLISHES — SHARPENS — CARVES

The new WHIZ ELECTRIC TOOL is the handiest power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drills through 3/4 inch iron plate in 42 seconds or engraves intricate designs on jewelry. Handles any material: Metals—Woods—Alloys—Plastics—Glasses—Steel—etc. Saves time. Eliminates labor. Plug into any socket AC or DC, 110 volts. Chuck 3/4 inch capacity. Ball bearing thrust. Powerful, triple-gear motor. "Worth its weight in gold." STANDARD MODEL with Normal Speed (uses 50 different accessories, instantly interchangeable.) Special Introductory Price for limited time, only \$6.95.

FREE Accessory outfit (Value \$2) includes set of drills, mounted 1 1/2 inch grinder, sanding discs, cutting wheels, mounted brush, polishing wheel, carving bur, etc. **FREE** with each outfit ordered NOW. We pay postage. Will send C. O. D. if desired. **10-DAY TRIAL—MONEY BACK GUARANTEE.**

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Work Faster Make More Money with the

Red UNIVERSAL TRACTOR

With this practical machine and attachments you can do all field and belt work hours faster at the low cost of 33c per day. Many units pay for themselves the first season. Unusually easy to handle and operate. Absolutely safe. Hundreds of users. Buy direct at low factory price. Two weeks' trial—satisfaction guaranteed. Write for colorful, free catalog.

PIONEER MFG. CO. Dept. V-19 West Allis, Wis.

the same amount of grazing land. The census showed that there were about 9,000 acres of improved land in 1930. There is about the same proportion of agricultural land in northwestern Canada.

Here are some of the advantages of life in the wilds of the north. There are no poisonous snakes, no snakes at all, for that matter. There are no poisonous plants, berries or mushrooms—at least we couldn't find any, and we sampled everything we could find. Meat can be obtained almost anywhere. Reliable estimates place the number of caribou in Alaska alone at more than 2,000,000. Moose are numerous and almost as tame as cattle in some parts of the country. The meat is as good as any beef. If you like fishing, you will be in a fisherman's heaven. The one bad pest is the mosquito.

On land suitable for agriculture, hay, small grains and most of the vegetable crops of the more northern states can be grown very successfully. During the summer, the long days make up for the shorter season, so that the total hours of sunlight between spring and autumn frosts are about the same as in localities farther south. The crops mature rapidly, producing vegetables of fine quality.

But, you say, where is the market for these crops? There is no market at present. These farms are subsistence farms, as were those of our pioneer forefathers. For his money crop, the northern pioneer can trap, fish, mine, raise fur animals, guide hunting parties or cut cordwood for nearby settlements—to mention only a few possibilities.

Even the steady cold winter is often an advantage. The average winter temperature is around zero, although acclimated inhabitants prefer the calm crisp clear days of ten to thirty below. Then one can work in the timber in shirt sleeves without getting too hot. That seems odd, but Alaskans have a saying that "as long as you can keep cool you are not apt to freeze." It is dampness, such as perspiration, that is dangerous in winter. You must learn to dress cool enough, not warm enough.

The constant cold preserves food perfectly. Frozen carcasses stay fresh all winter. Bread, cakes, pies and pastries all are kept fresh by freezing and wrapping in

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waxed paper to prevent them from drying out. Even left-over beans or stews can be kept for months. Just freeze them in a tight container, turn them out like loaves, wrap in waxed paper and store in the woodshed or cache.

Housing is one of the simplest problems for the northern pioneer. Most of the interior country is covered with a fair growth of spruce or jackpine. Both make good cabin logs. It has been demonstrated many times at Fairbanks and Dawson that a properly built log cabin is as warm and comfortable as the most modern insulated house. Clothing is the biggest economic problem, although native garments can be worn—the moose-hide moccasins and mittens of the Athabaskan Indians, or the mukluk boots, caribou socks and parkas of the Eskimos. The main luxury of most "old-timers" is woolen underwear, which they wear both winter and summer. They say it keeps them healthy.

This brings us to the health problem. We have gone through the sticks all summer, half the time wet to the skin from tramping through wet brush or wading streams. And not once did we have a cold while we were away from habitations. When we did come to a village, though, we often caught cold, regardless of our physical condition.

But what about the danger of accidents? What if one should break a leg, or have appendicitis? There are many pursuits right here at home that have more risks. Some will say that the life of the pioneer is alright for a young man but not for a young woman. But doctors with long experience in the north claim that a woman of average health and strength, such as the girl who goes out for school athletics, often can outdo a man in the north. She has more native stamina. It has been proved many times among tribes of Indians and Eskimos that the women survive long ordeals better than the men.

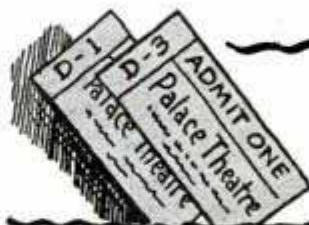
We traveled this great interior territory from southern British Columbia to Cape Prince of Wales, Alaska, and it offers splendid opportunities to those who want to strike out for themselves. The principal requirements are moderately good health, plus the ambition and willingness to adapt oneself to whatever conditions one may encounter in a frontier country—and make the best of them.

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FLOWERS ~



NOR TICKETS
TO A
SHOW ~



BUT THAT
SAME
THIN DIME ~



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SO
NICE!

WILL TAKE
YOU A
LONG WAY
ON A DATE



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DO THIS -

TREET
BLADES!

YESSIR
4 FOR 10¢



-AND TREET YOURSELF
TO A PACK OF
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IN FINE
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Month for 12
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No. 415-YA, 9 $\frac{1}{4}$ " swing by 3'
bed Workshop Bench Lathe
with Horizontal Motor Drive,
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Switch, Belts and Adjustable
Belt Tension
Countershaft **\$117.00**
(\$15 down—\$7 Mo. for 18 Mo.)

Weight
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lbs.

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NO METAL working machine has ever before been offered to equal the high quality and low price of the 9-inch Workshop South Bend Lathe. It is capable of doing the finest work on tools, dies, jigs, and fixtures. The exacting requirements to which this lathe is held in thousands of industries is guarantee and proof of its precision.

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Features include: V-ways on lathe bed, Precision Lead Screw for cutting screw threads 4 to 112 per inch, Ball Thrust Bearing on Spindle, Automatic Longitudinal Screw Feed, Twin Gear Reverse to Lead Screw, $\frac{3}{4}$ " hole through spindle for collets up to $\frac{1}{2}$ ", Precision cut steel gears, Tailstock set-over for taper turning.

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This 9-inch South Bend Lathe used by:
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The 9" x 3' South Bend Precision Lathe does these operations:

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—DOES MILLING,
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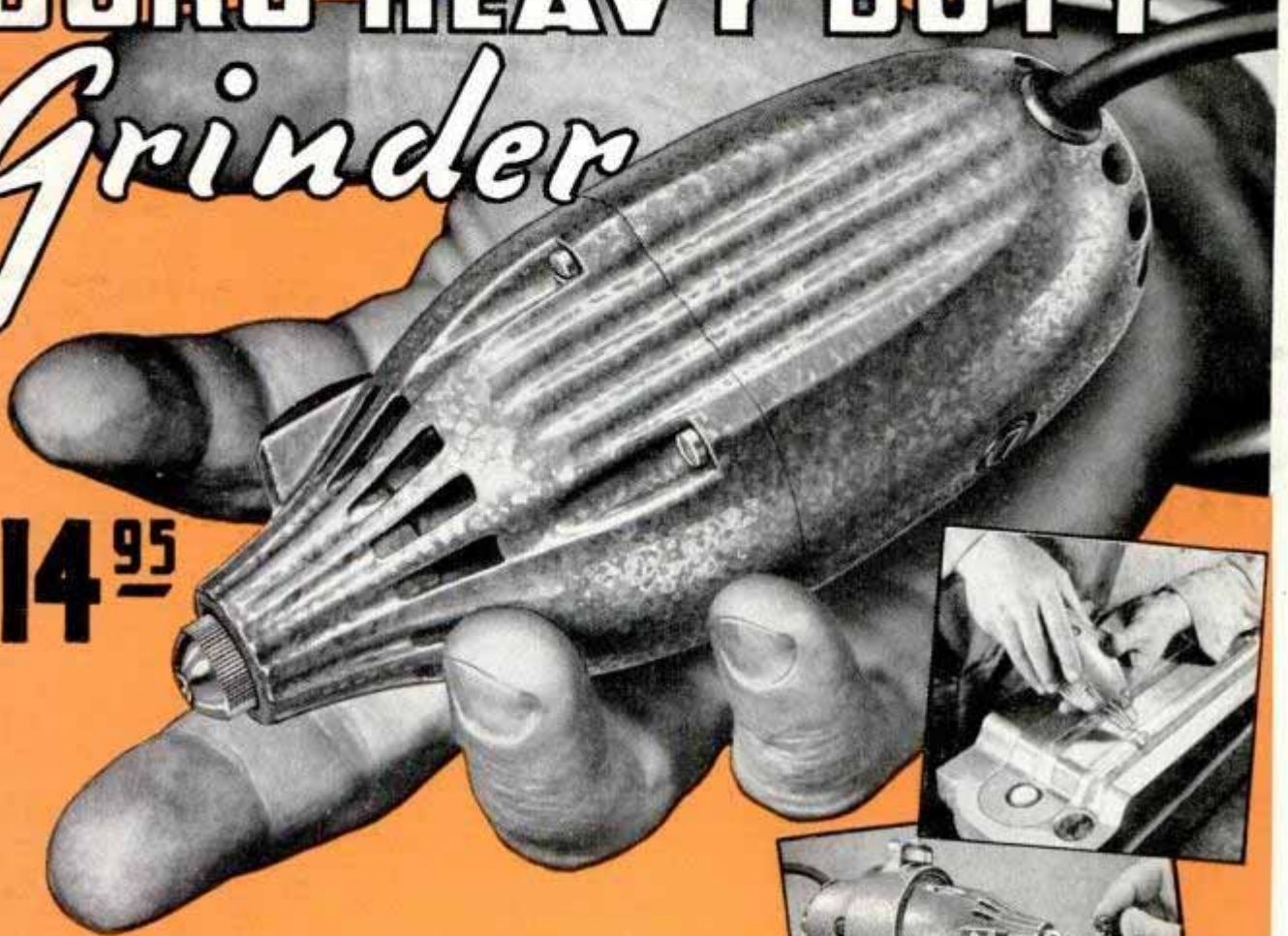
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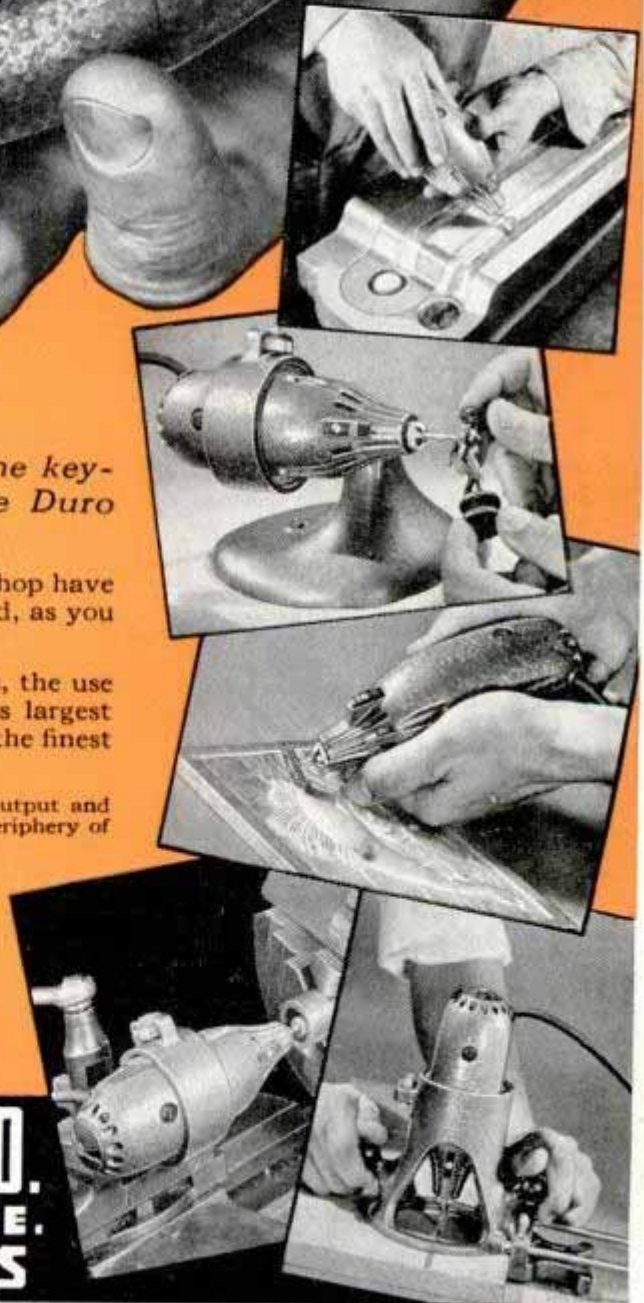
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