

ANC



POPULAR MECHANICS

MAGAZINE

WE WRITE SO YOU CAN UNDERSTAND IT

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This Great Sport . . .
SPIN FISHING
Page 81

What Owners Say About the
PLYMOUTH
How to Install Dormers
Build an Auto-Top Sleeper



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Popular Mechanics Magazine

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H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



this month's cover

IF YOU WANT to pop the eyes of your fishermen friends just try the bow-and-arrow cast as depicted on our cover. It's the cast to use when overhanging branches make it impossible to flip a lure the overhand way. Just hold the line, flex the rod by pulling back the lure, then suddenly release the lure and it will zing out straight as an arrow toward your target. This unique cast—and others just as strange—are made possible by the new spinning reels. Spin fishing is becoming so popular that in many prime fishing areas the bait caster or fly fisherman is as out-of-date as a bamboo pole. Beginners like spin fishing because they can't backlash a spinning reel; old-timers like it because of its versatility. You'll find a big eight-page color story on spin fishing, its reels, rods and lures, starting on page 81. Here's the history of spin fishing, the equipment required, how-to-do-it hints—everything you need except some water where swims a fish

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Other items, and manufacturers of available products described, are listed on pages 12, 14 and 16

**Pipes
that
grew
without
getting
bigger**



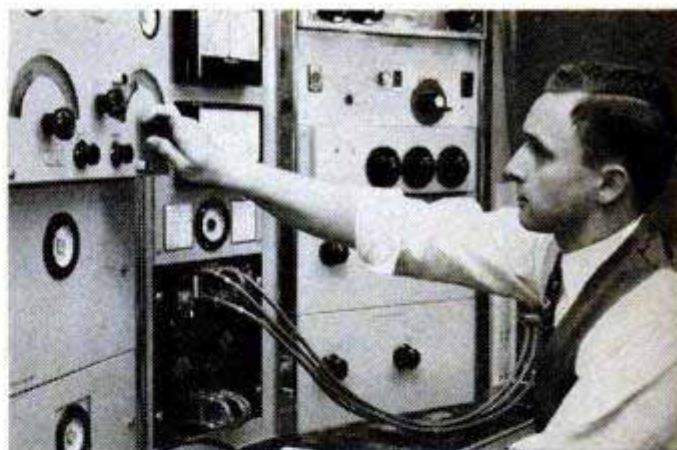
Cross-section of coaxial cable. To triple capacity, Bell Laboratories and Western Electric engineers had to make 1000 amplifiers work perfectly in tandem . . . feed repeater power along the same cable that carries messages . . . put signals on and off the line at numerous cities along the route without distortion.

Pencil-size pipes carry telephone messages and television across country through the Bell System's coaxial cable. Once, each pipe could carry 600 voices, or one television program. Now it can carry 1800 voices, or 600 voices plus a broadcast quality television program.

Yet the pipes aren't any larger. They are being made into triple-duty voiceways by new repeaters, new terminal equipment and other transmission advances developed by Bell Laboratories engineers.

The conversion expense is less than the cost of laying extra coaxial cables. But it calls for highly refined manufacturing procedures, made possible only by close co-operation of Bell Laboratories and Western Electric, manufacturing unit of the Bell System.

In improving the coaxial cable system, they created more than 20 years ago, engineers at Bell Telephone Laboratories devised a new way to give America still better telephone service, while the cost stays low.



Laboratories engineer tests new triple-duty coaxial system. It marks the first time that telephone conversations and television can travel through the same pipes at the same time. With a wider frequency band being transmitted, big problem was to eliminate interference between the two types of signals.

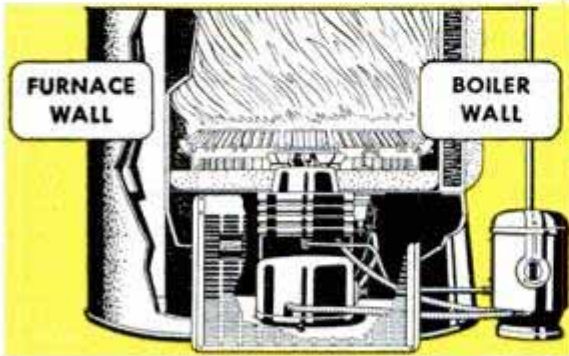


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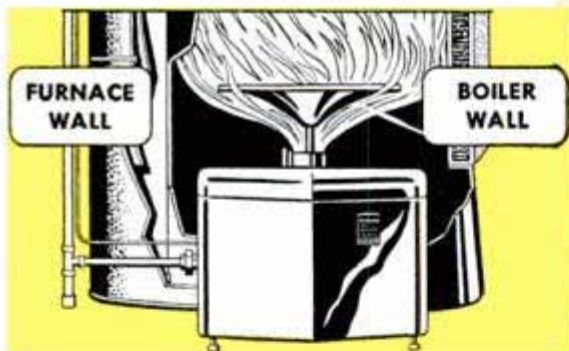
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THE EDITORS



To the Editor:

Very sincere congratulations, belatedly, on 50th anniversary of *Popular Mechanics Magazine*. I am quite attached sentimentally to your magazine because I have been a continuous contributor for 40 years. Incidentally, some of the payments for my articles in *Popular Mechanics Magazine* aided in defraying my expenses in college. I am wondering if I am not the oldest, in the point of service, contributor to *Popular Mechanics*.

S. R. Winters,
Orlando, Fla.

Editor's note: Mr. Winters' latest contribution is the "minnow harvest" item on page 117 of this issue.

To the Editor:

We read, with much interest, Floyd Clymer's piece on the new 1953 Dodge (PM, March 1953). We think it a very nice handling of the car and think that Mr. Clymer has done a very good job.

May we invite your attention to one point which we would like to see corrected? On page 272 there occurs the sentence, "... when the switch-starter key is turned, the engine will start whether the car is in gear or not."

The context makes it apparent that Mr. Clymer is referring to cars equipped with Gyro-Torque, our new torque converter. Actually, there is an interrupter switch incorporated in the vehicle, the purpose of which is to prevent the engine from starting when the car is in gear.

A. E. Horne,
Advertising Manager—
Passenger Cars,
Dodge Division
Chrysler Corporation
Detroit, Mich.

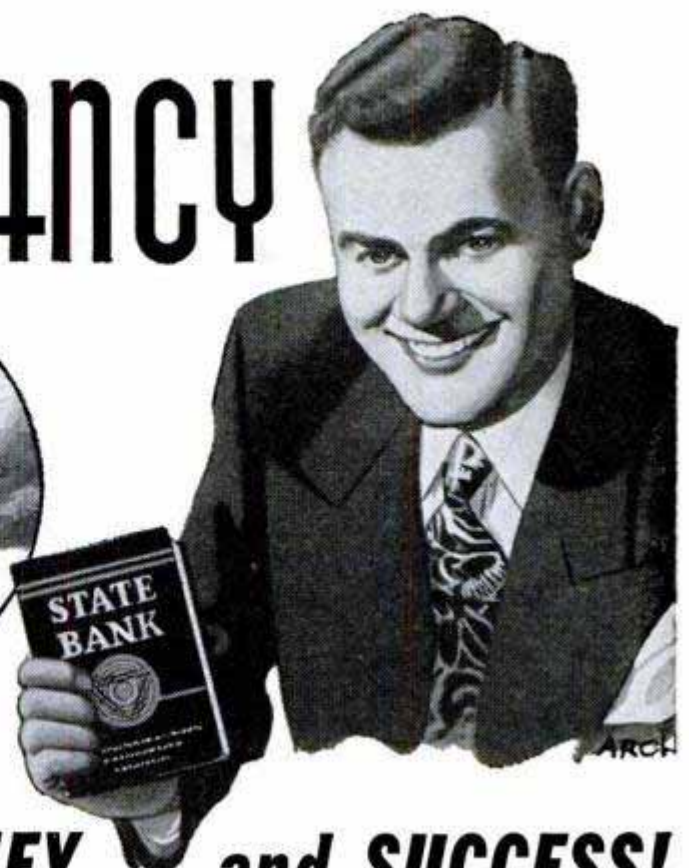
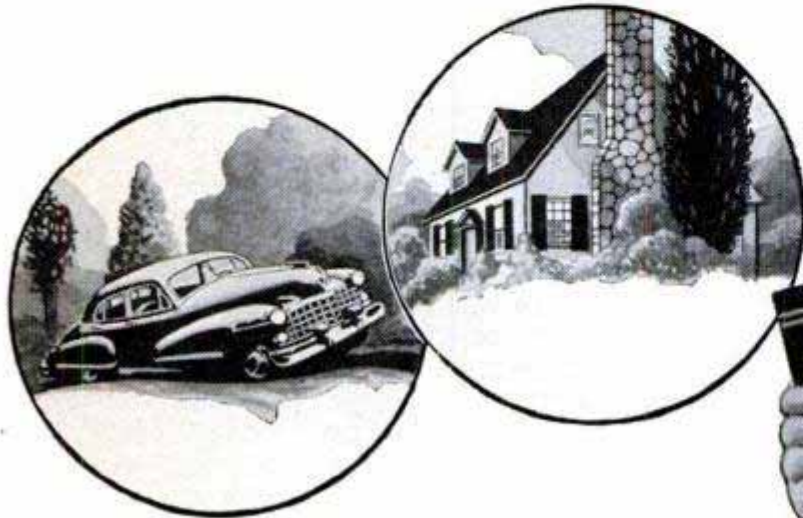
To the Editor:

In regard to your article on "Headaches of a Jet Designer" (PM, Jan. 1953), you stated that the AD Skyraider can carry only 8000 pounds ordnance. The correct weight is 9000 pounds bomb load not to mention 20-mm. cannon shells. . . . Being an ordnance man, having to load them, I just wanted to see 'em get the credit due.

Cpl. Edward T. Stach,
Marine Attack Squadron 121,
c/o Postmaster, San Francisco, Calif.

(Continued to page 8)

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HAIR TONIC
WITH "V-7"

Product of Bristol-Myers

(Continued from page 6)

Editor's note: We referred Corporal Stach's comment to Mr. E. H. Heinemann, Chief Engineer, Douglas Aircraft Co. at El Segundo, author of the article, who writes:

The Marine corporal is correct . . . The 8000-pound figure, as I recall, consisted of a mixed load of bombs and rockets; whereas, when all bombs are carried, a normal bomb load of 9000 pounds results.

To the Editor:

I'd like to have my say about Floyd Clymer's "Owners Report on the Hillman Minx" (*PM*, Jan. 1953).

When I bought my present car, I was shown a Hillman Minx and a Morris Minor. After comparing prices (Morris Minor is cheaper) and driving both, I chose the Morris. And there was nothing to regret in the choice. Here are a few of my opinions regarding the Morris Minor and British cars in general.

One thing I was glad, in a way, to learn was that I am not the only one to experience the "maniac" drivers who hate the sight of a small car. Three times cars have passed me in the city and then have tried to force me into the curb. Another type is the driver who passes you even though you are driving at the speed limit. To verify this, I have driven 35 in a 30-mile zone and 40 in a 35-mile zone. You can depend on as many as six idiots passing at anywhere up to 60 miles per hour. I don't know what it proves, since I always meet them at the next red light.

As for the good features of these small cars, I think the ease of parking and the maneuverability are the finest features. I will never again drive an American car around town. The Morris is giving me 33-35 miles per gallon in the city against the 8 miles per gallon of my previous American car, which was the primary reason for buying it. The difference in my bill at the filling station more than makes the payments for me.

The Morris Minor still uses a floor shift and I find there is no difficulty in learning the gearshift positions.

I may be particularly lucky in this regard, but I have found that the dealer service in Denver can be rated as extraordinary. They are always courteous and do rapid but thorough work. The prices on parts occasionally stun me but, after all, there is always the matter of importing them to take into consideration. As long as I have no trouble with availability of parts, I won't complain about the cost too much.

Another nice feature is the excellent quality of workmanship inside and out . . .

(Continued to page 10)

Now They Earn 103% More!

WOULDN'T YOU LIKE to increase your present income by 103%? Think what this could mean to you and your family! To be free at last from the pressure of money worries . . . to be able to afford new home furnishings, new clothes, a new car, when you need them . . . to be able to plan now for a comfortable retirement income!

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And even these impressive figures do not tell the whole story. The truth is that I.C.S. training can help you go as far as you WANT to go. Among former I.C.S. students who have risen all the way to the top are men like Eddie Rickenbacker, President of Eastern Airlines; Charles P. Hook, Chairman of Armco Steel Corporation; Harry W. Morrison, builder of Coulee Dam; Wayne A. Johnson, President of Illinois Central Railroad.

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Recently I. C. S. made a survey of a sample group of I. C. S. graduates in order to determine how much their earnings have been increased.

HERE ARE THE IMPRESSIVE RESULTS:

Age	Occupation	I.C.S. Course	State	Yearly Earnings	
				BEFORE I.C.S.	NOW
49	Electrician	Electric Power	Alabama	\$1800	\$4000
39	Supervisor	Yarn, Reeling, etc.	New Jersey	\$1500	\$5600
45	Sales Prom.	Steam Engineering	Ohio	\$1400	\$6500
38	Field Supt.	Architecture	Texas	\$1800	\$4200
44	Signal Maint.	Railway Signalman	New York	\$1500	\$5000
36	Draftsman	Mech. Engineering	N. Carolina	\$4000	\$4300
30	Accountant	C. P. A.	Nebraska	\$3000	\$4500
37	Barber	Copy Writing	New York	\$3500	\$3800
35	Welder	Reading Blueprints	Wisconsin	\$3500	\$5500
41	Supervisor	Practical Telephony	Texas	\$ 720	\$6120
35	Design Eng'r.	Mech. Engineering	Georgia	\$1950	\$4000
59	Civil Eng'r.	Map Survey; Sewerage	Mass.	—	\$5500
36	Tool Eng'r.	Mech. Engineering	Mass.	\$3500	\$5500
34	Tool Designer	Tool Makers	Iowa	\$1040	\$5400
32	Foreman	Diesel Engine	Ontario	\$2400	\$3200
42	Electrician	Elec. Elevators	New York	\$2200	\$5800
41	Draftsman	Elec. Distribution	New York	\$1820	\$4500
47	Asst. Maint.	Spec. Electrical	Oklahoma	\$4195	\$5628
31	Prod. Clerk	S. U. Foreman	Conn.	\$3000	\$3200
37	Boilermaker	Boilermaker Appr.	N. Carolina	\$1000	\$3500
37	Asst. Supt.	Marine Engineering	Quebec	\$4800	\$7200
40	Chief Engineer	Steam-Elec.	Minn.	\$2000	\$6000
37	Personnel	—	Quebec	\$1800	\$6000
44	Head Oper. Eng.	Steam Engineering	Michigan	\$2500	\$6800
49	Plant Maint.	S. U. Electrical	Texas	\$3000	\$3500
27	Draftsman	Highway Eng.	Oregon	\$2484	\$4368
35	Coppersmith	Sht. Mtl., Boilermaking	New Jersey	\$2000	\$5100
36	Equip. Service	Aero Engineering	Maryland	\$3000	\$4000
47	Foreman	Cotton Mfg.	New Hampshire	\$1144	\$4000
44	Proprietor	Mech. Engineering	Mass.	\$1500	\$6000
55	Govt.	(Several)	Mexico	\$8000	\$24,000
50	Millwright	Blueprint Reading	Quebec	\$2021	\$6193
62	Housekeeper	Foods & Cookery	New York	\$ 300	\$ 600
34	Engine Tester	Diesel Engines	Illinois	\$3650	\$4680
31	Accountant	Accounting	Ontario	\$2460	\$3300
65	(Disabled)	C. P. A.-Arch. Eng.	California	—	\$ 150
42	R. R. Rate Clerk	C. P. A.	Idaho	\$2750	\$3700
53	Test Engineer	Int. Comb. Engines	Iowa	\$1800	\$5200
38	Elec. Engineer	Elec. Engineering	New York	\$1200	\$5800
33	Elec. Helper	Elec. Maintenance	Maryland	\$3521	\$3521
28	Carpenter	Bldg. Contractor	Alberta	\$1800	\$3848
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Average:				\$2514	\$5114

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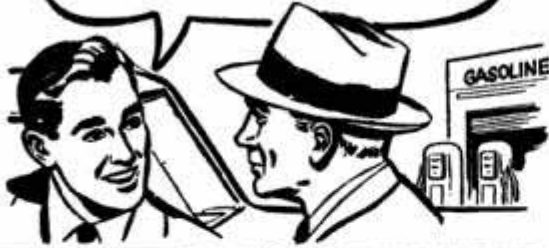
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(Continued from page 8)

and I don't feel quite so much like a peasant after reading the other day that the British aircraft genius, De Havilland, drives a Morris Minor. I am quite sure he could afford any car on the market.

Harry B. Bateman, Jr.
 Denver, Colo. (20)

1135 Poplar St.

To the Editor:

In your January issue you had a feature on deep-sea diving by the Danish ship *Galatea* at the depth of six miles.

As compared to deep-sea diving by the Russians, six miles just isn't anything at all.

In the Black Sea, they descended to a depth of eight miles and, after scraping the bottom, brought up what the Russians thought to be an entirely new species of bird life. What they thought were birds had no feathers at all, but the body was covered with very thin and hard translucent bony substance in the form of scales. The tail was thin, flat and very flexible, mounted edgewise and used to steer the "bird." Instead of wings, its method of locomotion was by fin-like projections, and on the end of the slender body, opposite the end carrying the tail, the head was mounted. But instead of having a beak, it had a very small mouth with thick, fleshy lips that were used for attaching itself to solid objects. Instead of breathing air, it breathed water.

Here in Portage County, Ohio, the fishermen call this "bird" by the common name of *Sucker*.

With no sense of humor, I remain

Francis J. Baldwin,
 Ravenna, Ohio

Editor's Note:

Inquiries from readers have asked the location of "The \$500,000 Puppet Show," featured in our color section in September 1952. The theater is in Kungsholm restaurant, 100 E. Ontario St., Chicago.

20,000 Mile-Per-Hour Jets Predicted for Near Future

Jet-plane speeds of 20,000 miles an hour, 15 times faster than the earth rotates, are possible within the foreseeable future, asserted Prof. Frederick K. Teichmann, head of New York University's Guggenheim School of Aeronautics. Professor Teichmann based his prediction on the expectation that jet engines of 500,000-pound thrust, equal to 125 times the power of today's aircraft piston engines, will be developed soon.

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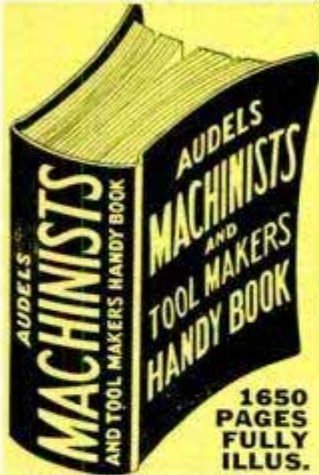
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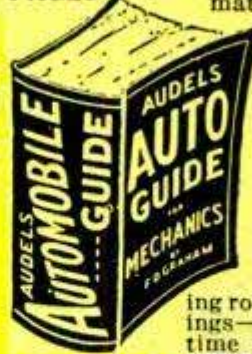
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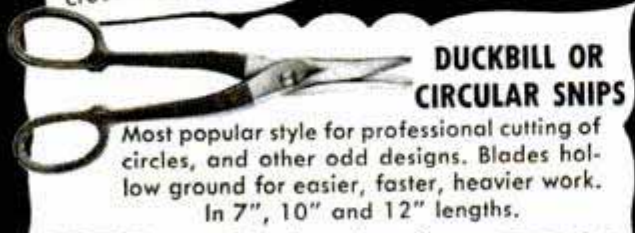
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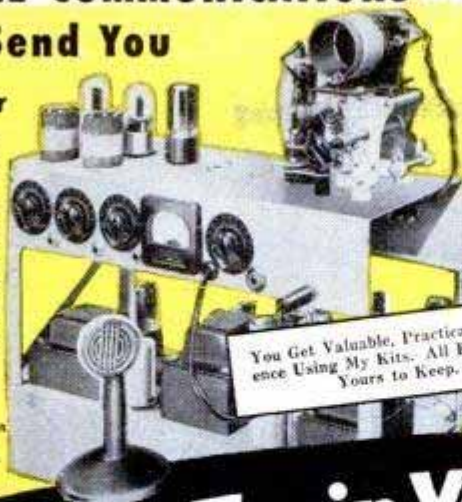
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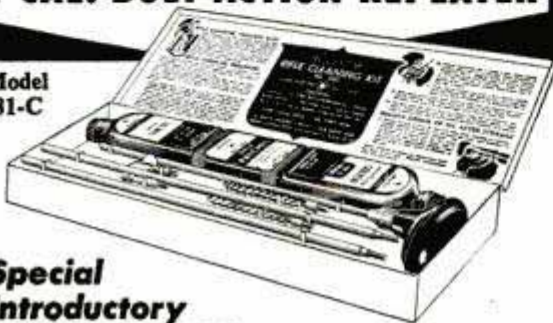
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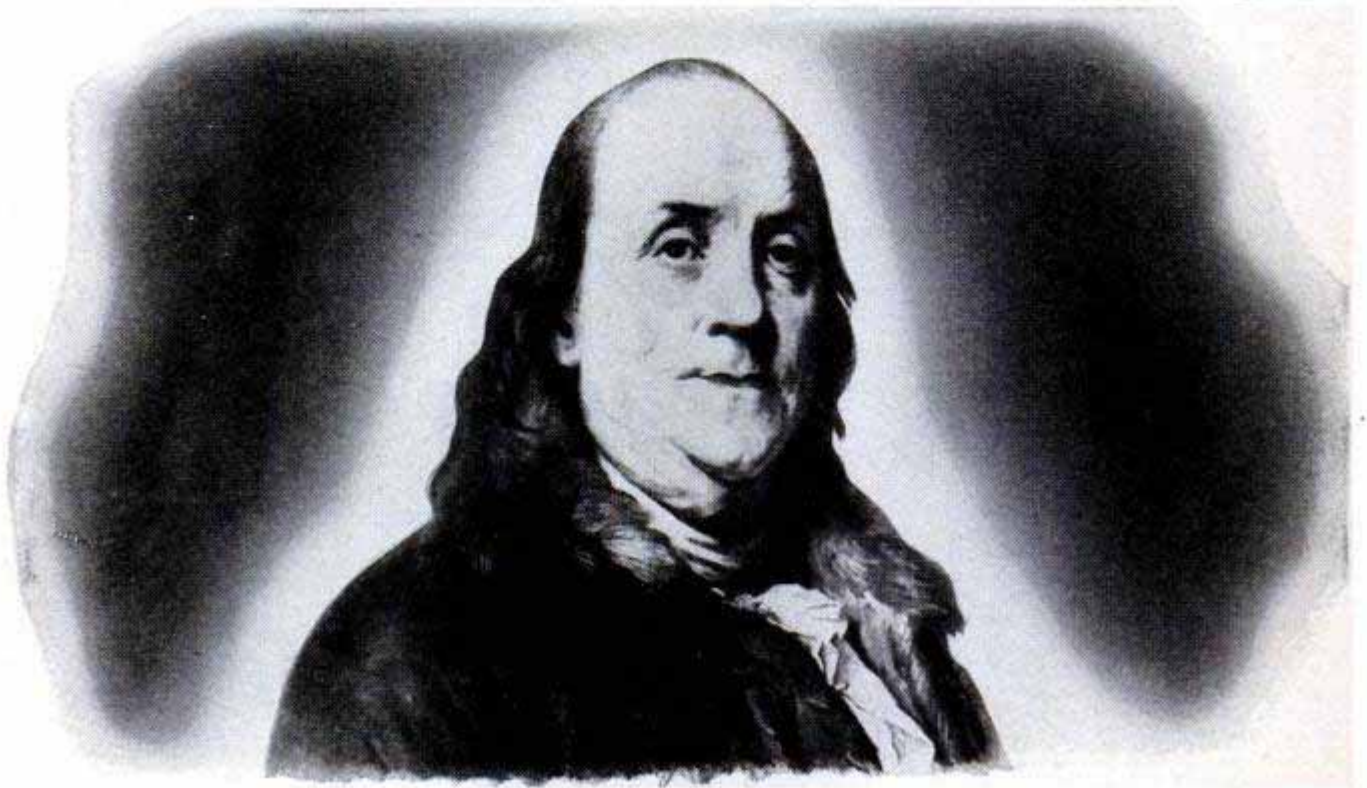
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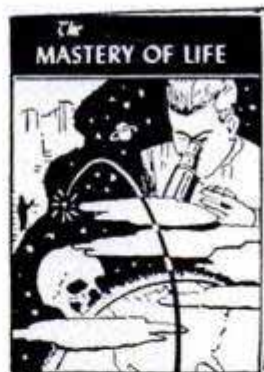
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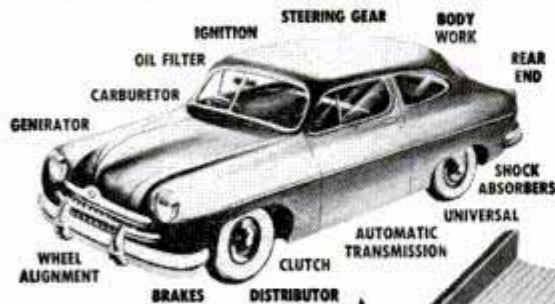
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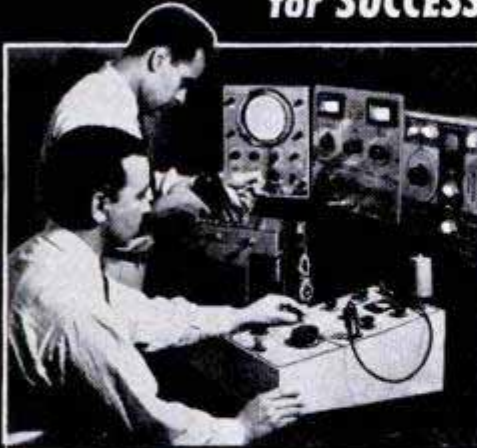
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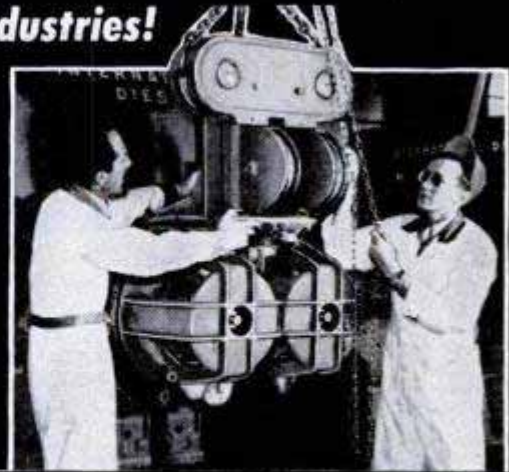
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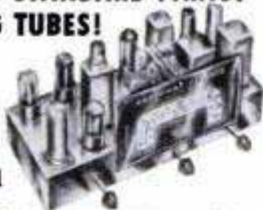


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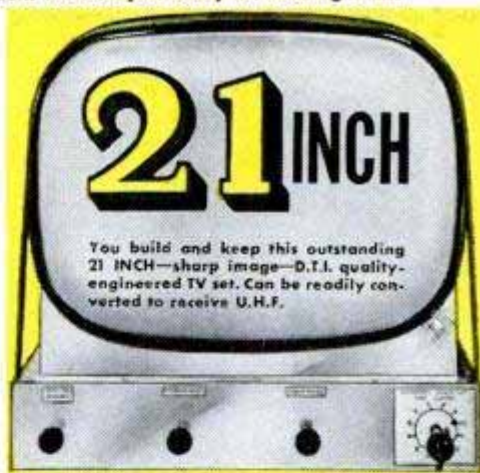
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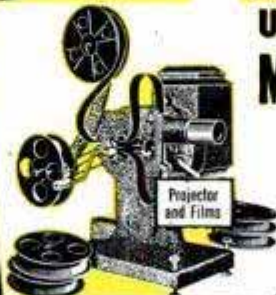
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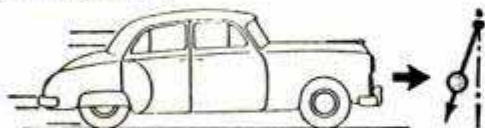
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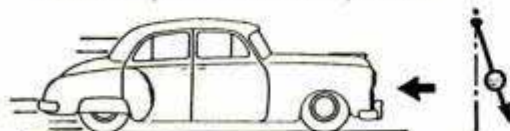
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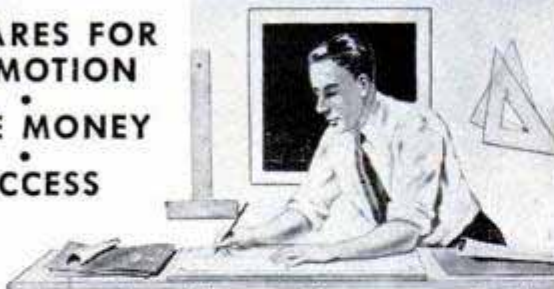
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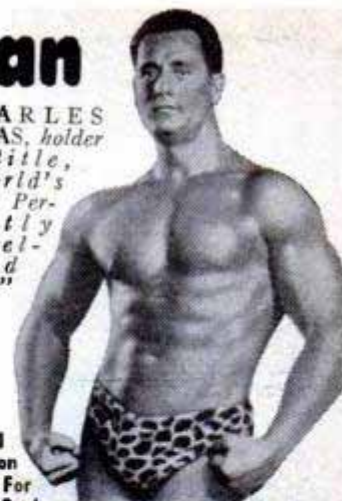
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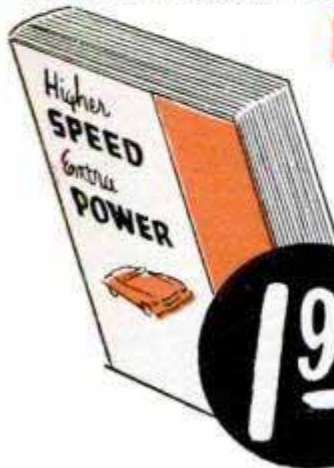
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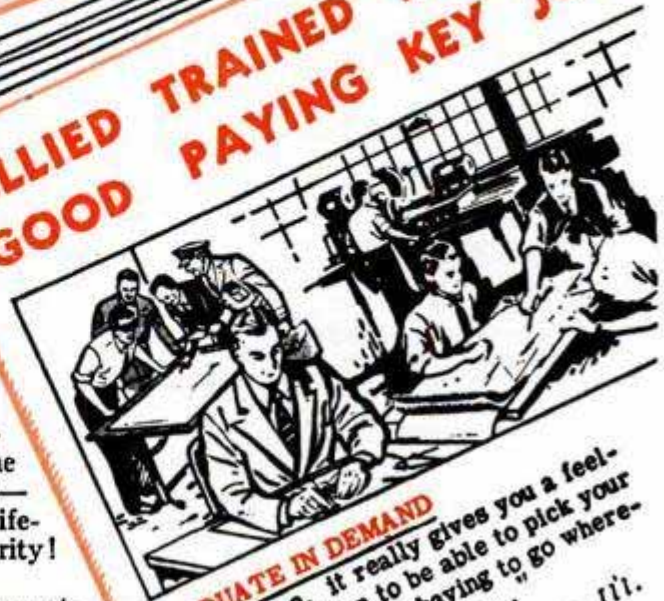
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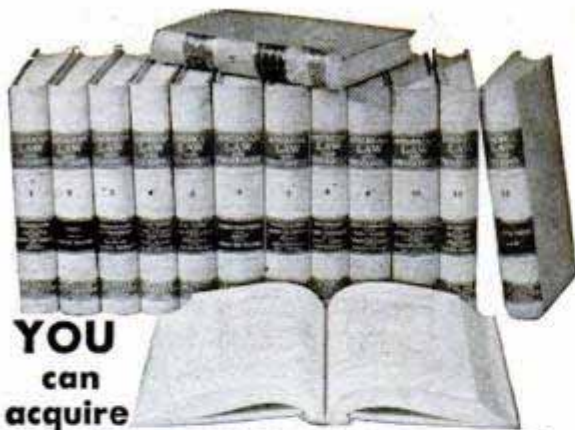
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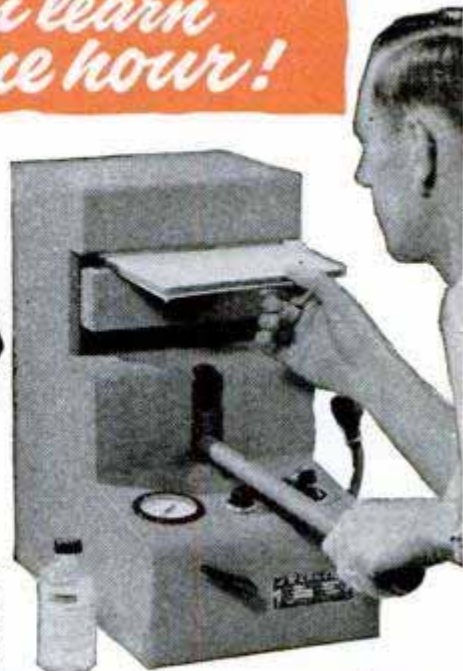
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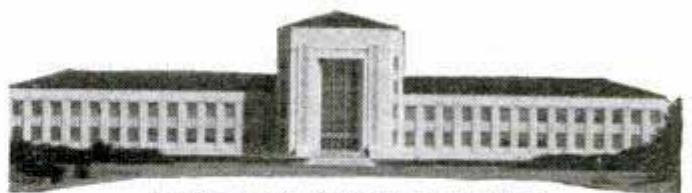
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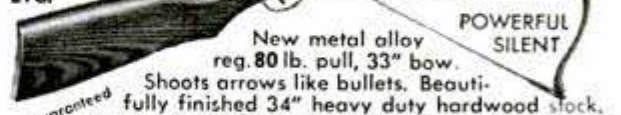
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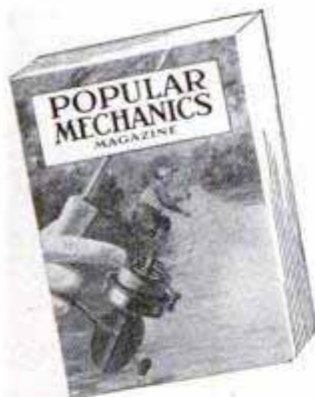
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PROSPECT For profit, fun and health. Industrial minerals, uranium, tungsten, metals. Free literature tells how, write today! Stratex Instruments, 1861M Hillhurst, Los Angeles 27.

FIND Tungsten, mercury, uranium with Mineralight. Free brochure. Write Dept. PM8 Ultra-Violet Products, South Pasadena, California.

GEMS And minerals, beautiful magazine tells how to cut and collect. Brochure and book list free. Gembook Co., Palmdale, Calif.

CEYLON Gems airmailed \$25 up. Sapphires, moonstones, topaz, etc. John Rajapakse, Negombo, Ceylon.

ANTIQUES, RELICS, INDIAN GOODS, CURIOS

4 PERFECT Arrowheads \$1.00. Fine grooved tomahawk \$3.00. List free. Lear's, Glenwood, Arkansas.

ANTIQUE Pistols, flintlocks, muskets, swords, list 25c coin or stamps. Westbrook, 5537 Lafayette Street, New Orleans, La.

4 PERFECT Arrowheads \$1.00. Flint knife 50c. Hide scraper 50c. Stone axe \$3.00. Perfect pipe \$3.00. Flint hoe \$1.00. List 10c. H. Daniel, Lamar, Arkansas.

HOBBIES AND COLLECTIONS

CIGAR Store Indians. Reproductions made to order. Peter Meindl, Raymond, N. H.

BIG Packet foreign campaign ribbons. Colored catalogues. \$1.00. Medcrafts, 421 6A St. N.E., Calgary 2, Canada.

UNUSED Matchbook covers—100 different \$1.00 36-page catalog 25c. Charles Edelman, 1311C East 84, Cleveland 3, Ohio.

INVENTING Can be an interesting and profitable hobby. Write for complete particulars. Institute of American Inventors, Dept. 40-E 631-E St. N.W., Washington 4, D. C.

MATCHBOOK Collectors. New safety series and lists 25c. Yeingst, Parkway Road, Harrisburg, Penna.

UNITED Nations cards, New York cards with United Nation postmark. I furnish United Nation stamps. One card 10c, three 25c. W. Segert, 305 East 75 St., New York 21.

LEATHERCRAFT Is fun especially now. Make your own leather belts, billfolds, purses, hats, dresses, blouses, from durable low-priced leathers. Supplement your spring wardrobe with leather articles. Free catalog. Tandy Leather, Box 397C, Tulsa, Oklahoma.

VIEW Cards used, unused, good condition, choice of kind. 25—25c and 15c. Darcy, 888-Y Washington, Stoughton, Mass.

PRESERVE Flowers fresh and alive looking almost indefinitely. Easy, enjoyable, profitable hobby. Details free. Armstrong Productions, 822 Richmond Ave., Silver Spring, Md.

EXCITING Hobby; collect authentic military patches, insignias, campaign ribbons, navy rates, etc. 57 assorted \$1.00. Free gift. Pritt, Dept. M-5, 12 West 27, New York City.

TROPICAL Fish—Information 25c. Clarke Enterprises, Box 413, Janesville, Wisconsin.

CAMERAS, PHOTO SUPPLIES

BASS Says: Trading since 1910. Used but good as new buys: 8mm. B.&H. Sportster \$52.50; 16mm. Keystone A-7, F:2.5 lens \$37.50; Voigt. 35mm. Vito II, flash shutter, Skopar F:3.5, like new \$38.50; Kodak Reflex F:3.5 lens, like new \$88.50; Contax I, F:2.8 Sonnar \$87.50; 3 1/4 x 4 1/4 Speed Graphic, Skopar F:4.5, Ibsor shutter, \$52.50. Satisfaction guaranteed. Bass Camera Co., Dept. AG, 179 W. Madison St., Chicago 2.

BUY Wholesale nationally advertised cameras, photo supplies, thousands of other products at big discount. Free "wholesale plan." American Buyers, 629-RR Linden, Buffalo 16, N. Y.

PHOTOMURALS. Your negative or ours. Catalogue 25c. Photomammoth Murals, Dept. M, 12048 Vanowen Street, North Hollywood, California.

BOLSEY B-2 \$53.50 new. Cameras, projectors, photo equipment, typewriters. Terrific savings. Specify your needs. Camera Shoppe, Box 601-M, Mt. Vernon, N. Y.

NEW Cameras! Loaded with film. \$2.00 postpaid. Wallace Jewelry, 3763 S. Wabash, Chicago 15, Ill.

NEW 12 Picture economy camera. Film loaded. Guaranteed. \$2.00 postpaid. David Ward, 1290 Berkshire Ave., Indian Orchard, Mass.

PHOTO FINISHING

WHOLESALE Photographic supplies. Cameras, films, projectors, enlargers. Write for free catalog. Capitol Photo Supplies, 2428 Guadalupe, Austin, Texas.

ENLARGEMENTS—Six 5x7, \$1.00; four 8x10, \$1.00. Brownell, 4315-M Eastside, Dallas 4, Texas.

8 CONTACTS 30c, Jumbos 40c, 12-45c, jumbos 55c, reprints 4c, jumbos 5c. Western Photo, Dept. PM43, Box 298, San Francisco 1, Calif.

DOUBLE Size prints—8 exposure roll 30c; 12, 45c; 16, 55c. Prompt service. Free mailers. Emerson Photo, Emerson, N. J.

JUMBO Prints (deckle edge)—8 to 12 exposure film 39c per roll, developed and printed. Same-day service. Dean Studios, Dept. 6, Des Moines 2, Iowa.

TWO Prints each good negative. 8 exp. 35c; 12 exp. 50c; 16 exp. 65c. Reprints 4c. Mayfair Photo Service, Box 617-K, Toledo, Ohio.

SATISFACTION Guaranteed! Eight jumbo size prints mounted in album, 35c—12 to 16 exposure rolls, 50c. Free mailers, quick service, finest developing, finishing. Crown Studios, Box 1223-PM, Dallas, Texas.

12 JUMBOS 25c, 16 Jumbos 35c, from any size roll or negatives, with this ad. Skrudland S, Lake Geneva, Wis.

GIANT Size deckle album prints. 8 exposure roll, 35c, 12 exposure 50c. Send money. Free mailers. Dowl Photo Co., P.O. Box 2077, Ft. Worth, Texas.

ENLARGEMENTS! Eight 5 x 7's or five 8 x 10's, \$1.00. Wilart Enlargers, Box 967, Little Rock, Ark.

CUSTOM Photo finishing guaranteed. 8 exposures 35c; 12, 50c. Bound in beautiful plastic ringed album. Special! 35mm., 36 exposure \$1.00. Free mailer. Flash Foto, Box 36M, Brooklyn 4, N. Y.

FAST—Same day service! 8 oversized prints in attractive plastic-bound book only 35c; 12-50c; 16-60c. Satisfaction guaranteed. Free exposure guide with first order. Pic-Sure, Box 899-B, Philadelphia 5, Penna.

6 OR 8 Picture roll 35c, 12 or 16 picture roll 55c. Each roll printed and developed. Handy album pack. If you fail to get pictures on your film a new roll will be sent you without extra cost. Send coin with roll. No c.o.d.'s. Mailing containers sent free. DeLux Film Service, Box 1268-A, Shreveport, Louisiana.

TOP Quality. Fast service. 8 Jumbos 35c in beautiful Super Pak Album. 16 contacts 40c. Reprints—Jumbos 4c; contacts 3c. Satisfaction guaranteed. Write for free mailers and circulars. Fast-X-Foto, Box A, Jersey City, N. J.

GUARANTEED Quality. Fast service. Eight jumbos in beautiful super pak plastic ring binder albums only 35c. Send for free mailers and particulars of our complete photo finishing service. Grand Fotos, G.P.O. Box 1410, New York 1, N. Y.

YOUR Picture on photostamps plus valuable free gift. Free information. Howell, Box 915, Brooklyn 12, N. Y.

DYE Transfer color prints from 35mm Kodachrome will do justice to your finest slides. 5x7, \$10.00; reprints \$3.50. 8x10, \$15.00; reprints \$5.00. Remit with order. Satisfaction or your money back. Percival E. Walsh, 232 Raines Pk., Rochester 13, N. Y.

JUMBO Prints 8, 50c; 12, 75c; 16, \$1.00. Art's Deluxe Service, Box 273A, LaCrosse, Wisconsin.

MOTION PICTURES AND SOUND EQUIPMENT

16MM Sound projectors, Castle sound film subjects, splicers, screens, lamps, etc. Projector repairs. Ideal Supply Service, 2101 Barclay Road, Oklahoma City 14, Oklahoma.

5000 NEW-Used 8-16mm. silent-sound films. International-B, 2120 Strauss, Brooklyn 12.

BARGAINS 16MM. sound films. Also for exchange. Bedner, 5300 So. Talman, Chicago.

8-16MM. Silent-sound films. Complete rental library. All latest subjects. Free catalogue, sample film 10c. Garden Film, 317 West 50th, New York 19.

RENT 16MM. sound films, 50c reel. Large selection; free catalog. Film Service, 138 Chestnut St., Roselle Park, N. J.

MOVIE Camera film: 8mm. roll \$1.50, 16mm. 100' \$3.00. Free processing. Better Films, 742 New Lots, Brooklyn, N. Y.

GUARANTEED Fresh 8mm. roll, magazine; 16mm. roll, magazine movie films. Color. b.&w. Free catalog. ESO-S, 47th Holly, Kansas City 2, Missouri.

NEWEST 8mm.-16mm. Film bargains at Blackhawk! New 150' 8mm. film, \$2.98; new 300' 16mm. silents often available at \$3.98; new 300' 16mm. sound regularly \$11.95—Postage extra. Tremendous bargain stock used films. 100' 16mm. used Panoram musicals, six for \$4.99. Good used 16mm. sound projectors, Ampros, Bell & Howells, Victors, often available at \$129.95. Lowest prices on reels, cans, editors, splicers, supplies. Big 24-page catalog free. Blackhawk Films Inc., 1222 Eastin Bldg., Davenport, Iowa.

TAPE Recorders, tapes, accessories. Unusual values. Dressner, 624-M East 20th Street, New York City 9.

STARTLING Rear projection screen of translucent material, unnecessary to darken room. Project motion pictures or slides color or black and white, make trick shots, pictorial backgrounds, etc. 10"x12" \$4.90 prepaid, brochure other sizes, items, 15c. Klearcite Screen Co., 1943 Fullerton, Chicago 14.

WILD Life films. Exciting, dramatic action in the natural habitat of animals of forest and plain. 8mm. or 16mm. in beautiful color or B & W. Also 2" x 2" color slides. Write for free illustrated literature. Wild Life Films, 5151AB Strohm Ave., North Hollywood, California.

EARN Up to \$15.00 daily with your movie projector! Metcalf, 10806 Glenroy, Chicago 43.

"ENTIRE Life Story of Christ." 8mm., 16mm., sound and silent, purchase or rent, state projector. Hemenway Film, 31F Church St., Boston 16, Mass.

BELL & Howell 16mm. sound projectors. Castle sound films, splicers, reels, other supplies. Free catalog. Ideal Service Supply, 2101-PM Barclay, Oklahoma City 14, Okla.

MUSIC AND MUSICAL INSTRUMENTS

PLAY Accordion the modern way from records. No instructor necessary. Send for circular O. Pagani, 289 Bleecker, New York 14, N. Y.

POEMS Wanted for musical setting. Send poems for free examination. Five Star Music Masters, 630 Beacon Bldg., Boston, Mass.

SONGWRITERS! Protect your ideas! Hold all songs, poems! Write for safe correct procedure first! Song Service, Dept. P, 333 W. 56th St., New York 19, N. Y.

MUSIC Arranged, songs printed. Frank Wildt, Music Publisher, Lancaster, Penna.

ACCORDIONS—Save 50% and up. Cash or terms. New and used. All brands. Wholesale to everyone. Free catalogue. Del Principe, 29 South Cicero, Chicago 44, Ill.

POPULAR Songs. How to write and sell them. Write for free booklet Successful Songwriting. Gateway Songs, Box 2470, Hollywood 28, Calif.

SONGWRITERS! Send poems, songs. Music Service, 243 West 72nd St., PM, New York 23.

POEMS Wanted to be set to music. Free examination. Send poems. McNeil, Master of Music, 510-PM S. Alexandria, Los Angeles, California.

WANTED! Poems for musical settings. Write Songwriters' Service, Clifton, N. J.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 4700 South California Avenue, Chicago.

SONGPOEMS Wanted. Mail to: Tin Pan Alley, Inc., 1650 Broadway, New York 19, N. Y.

POWERFUL, Dynamic voice quickly developed with diaphragm exerciser. Write, Voice Developer, Box 665 (34V), St. Louis, Mo.

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POPULAR Piano chords—Symbols, formation. Simplified. \$1.00. E. Smith, Box 217, Hackensack, N. J.

YOUR Words—Our music. Song Promotion Guild, 350-M Broadway, New York 13.

COLLABORATION Offer. Newart Publications, GPO Box 1226, Syracuse, N. Y.

POEMS Wanted for musical setting. Send poems. Free examination. Crown Music Company, 1472-F Broadway, New York City 36.

1953 **ACCORDIONS**—Wholesale. Free catalog. American Accordion Center, 5329 Belmont, Chicago.

ELECTRIC Guitars, accordions, amplifiers. Wholesale. Free catalog. Carvin, Baldwin Park, Calif.

FREE Record of your song. Your words—my melody. Free information. Johnny Mack, 1094-A West 39 Street, Los Angeles 37.

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MAKE Simple television picture tube rejuvenator. Illustrated instructions 25c. Complete kit \$2.00. Wagman Electronics, 223-A Degraw Ave., Teaneck, N. J.

REPAIR Your own radios. Complete, simplified, instructions only \$1.00. Details free. Slate's Radio Service, Corsicana, Texas.

EXPERIMENTER'S Plans, diagrams, blueprints, booklets. All kinds. Free catalog. Dittotax, 5208-A Onacrest, Los Angeles 43.

CLEARCO Crystal radio kit \$1.50; preassembled \$1.75. Free catalogue. Clearco Crystal Co., Box 1857, Milwaukee, Wis.

THEATRE-Like audio reception at home on your radio, TV, etc. Cross-over network kit, with only 1 1/4 decibel loss at 12KC, \$2.00 postpaid (money back if not pleased). Write for free wiring diagrams, specifications and charts. No obligation to buy. Audio Improvements, 252 Greenwich St., New York 7.

BUILD 15 Radios—Only \$19.95 complete. Free radio tester, tools, soldering iron. No experience required. Enclose 25c for valuable Radio-TV Repair Guide and kit catalog. Progressive Electronics, 497 Union Ave., Dept. PM-5, Brooklyn 11, N. Y.

FLASHLIGHT Battery radio, plans 25c. Boscia, 39 Spencer Road, Rochester 9, N. Y.

SCIENTIFIC Telecolorvision screen changes plain television pictures into beautiful exciting, life-like colors. Double money-back guarantee. Write National Telecolorvision Screen Co., Box 708, Brownsville, Texas.

CRYSTAL-Radio experimenters. Write Leslie Hulet, R4, Lakewood, N. J.

BUILDER'S Pictorial plans. Free list. Alena, Box 24, Astoria 6, New York.

F.C.C. commercial operator licenses in a hurry. Correspondence and residence courses. Free placement. Grantham School, 6064-R Hollywood Blvd., Hollywood 28, Calif.

BUILD Any 630 television set with Brooks life-size easy to follow step-by-step instructions \$2.49. Television literature package \$1. Instructions for installing a Cascade tuner in any television set 50c. Catalogs with wholesale offers on television, radios, equipment, parts, tubes, etc. Free with each order. Popular Electronic, 250 Crown St., Brooklyn 25, N. Y.

ELECTRONIC Ear—\$1.00. Obeys spoken commands. Turns lights, radios, etc., on or off. Not a toy. Plans. Mail \$1.00 to Dept. M-1, National Industries, Inc., 951 North La Cienega, Beverly Hills, Calif.

NEW! Just out, simplest capacity operated relay yet! Uses one tube, low power. Complete schematic, instructions \$1.00. Free details. Chemi-Technix Labs., 568RB Riley, Buffalo 8, New York.

ANTENNAS, Towers, boosters. All makes, complete supplies. Easy credit. Lowest prices. Allied, 2503 N. 3rd, Milwaukee, Wis.

AMAZING Television antenna eliminator. Small device attached to rear of set where it's out of sight. Outperforms outdoor aerials. No snow, no ghosts. Send only \$2.95 or write for free details. Arrow Sales, 2306 S. Howell, Milwaukee 7, Wis.

TUBES, Etc. Free list. Wholesale Electronics, 224 E. 204th Street, New York City 6.

PICTURE Tube revitalizer makes dim pictures bright. \$2.95. T.V., 6225 Market St., Philadelphia.

FREE Blueprint Catalog! Hundreds of projects—Motor scooter, furniture, toys, birdhouses, radios, garden furniture, power tools, boats, work benches, home freezer, many more! Send postcard to Popular Mechanics Press, Dept. 103, 200 E. Ontario, Chicago 11, Ill.

BUSINESS OPPORTUNITIES

LIVING Miniature ("Ming") trees only 10 to 20 inches tall. Grow at home. Big profits! Spare time opportunity. Fascinating! Amazing! Write for free seed and plan. National Nursery, Dept. FC, Inglewood 4, California.

YOUR Own business in your basement. Very profitable. Sideline or full time. Patterson, 2518 Beaver, Des Moines 10, Iowa.

MY Husband, college professor, devised a scientific mail order plan that brings \$1000 monthly to our mailbox. Since the plan works anywhere, we bought a beautiful ranch, operate here. Anyone intelligent can apply our plan. Details free. Eveningshade Ranch, Helotes, Texas.

NATURAL Molding latex. New low prices. Extra thick. Free sample. W. Wooley, 115-A Donald, Peoria, Ill.

NEED Capital? Where and how. 41 ways! Free details! Vault, 3757-B Wilshire, Los Angeles 5.

GET Dollars in your mail—Keep every cent. Orders filled free. Genmerco, Box 142, Boston, 24B, Mass.

START Home business. Fix (patch) dents, scratches, cracks, blemishes on all varnished wood surfaces. Experience unnecessary. Small investment. Amazing profits. Literature free. Monarch Specialties, 3449 N. Pulaski, Chicago 41.

NO Equipment, big profits selling, glass, wall, waterless hand cleaner. Add water to concentrates. Donnell Sales Co., 430 Base Line, San Bernardino, Calif.

LEARN Silk screen printing; invisible reweaving; repair dolls; make rubber stamps. Rubber for molds. Large catalogue free. Universal, Box 1076-A, Peoria, Ill.

OWN, Operate, route—"Wishing wells." Place these new \$7.50 skill games on counters in cafes, luncheonettes, clubs, etc., collect coins weekly. Legalchar, Box 929, Long Beach 1, California.

START Your own business on shoe-string, and earn a substantial income by mail, in your spare time at home. Full details free. Standout Products, 141-T North LaBrea, Los Angeles 36, California.

MAKE Money mailing cards, circulars. Peaceful, profitable. Paton, Box 55-E, New York 23, N. Y.

\$50 AN Hour in spare time. Johnson, 351-B, Ithaca, New York.

HAVE Big time mail business. Get ideas, help, inspiration from others who made fortunes. Fern, 513-A West 61st, Chicago 21, Illinois.

BUY It wholesale! Manufacturers, distributors offer 850,000 items. Literature free. Olsen, 1231-A East Third St., Duluth 5, Minn.

BREED Rare tropical fish at home. Earn big money! Learn secrets! Help fill huge demand. Amazing opportunity! Free plan. Tropicals, 1008-F Los Angeles St., Los Angeles 15.

NEW Fabulous home-business. Pearlize baby shoes. Free money-making plan. Pearl-Art, 7216F Bear, Bell, Calif.

MINIATURE Golf. Exceptionally profitable business. Detailed plans of 18 holes, \$2.98. Dixieland, 2924 Douglass, Memphis, Tenn.

EXTRA Dollars. Spinning angora wool for us. Angora House, PM, Springfield, Illinois.

MAILORDER Instructions. Get. "Dollars in the Mail." Eliminate expensive mistakes. Ransie, Box 1719, Richmond 14, Virginia.

USED Oil re-refining. Free facts about this amazing business. Severs, 3909 67th, Des Moines, Iowa.

INCOME From local information. No selling. Write Neherco, La Verne, Calif.

BOOKKEEPERS, Keep books, small firms spare time. Manual latest technique by C.P.A., \$3.00. Modern Business, Box 406, Youngstown 1, Ohio.

MADE \$24,500 Using money making plans from Schemer Magazine, world's oldest mailorder publication. Box 275M, Canfield, Ohio. Year \$1.00. Sample 20c.

\$46 FROM Square foot plywood; jigsaw necessary. Write: Woodarts, X-154, Bridgewater, Mass.

FREE Particulars "Profitable Home Business Projects" plus wholesale sources 740,000 items. Cottage Industries, Omaha 12, Nebr.

PRINT Without printing press—Posters, banners, greeting cards, toys, glassware, neckties—anything! New "easy" revolutionary method. No special equipment or experience needed. Work full or spare time at home. No selling. We set up "your own local business." Wonderful moneymaking opportunity. Free sample. Profitable ideas, beautifully illustrated plan free. Write Screen-Print, 1010 South Los Angeles Street, Los Angeles 15.

FREE Vending machines; if used to sell our profitable nuts. Continental, Box 1361-A, Milwaukee 1, Wisconsin.

WHOLESALE Of sensational nationally advertised appliances, silverware, watches, cameras, etc. Start your own business. Full details. Send 25c for catalogue. International Sales Co., 175 Fifth Ave., New York 10, N. Y.

EARN Extra money with profitable home business projects, free particulars. Chamberlain, Box 894, Manchester, New Hampshire.

START Own business—Local mail order. Folder describes collection of 137 plans free. A Sales, 16P City Terrace, Newburgh, N. Y.

PROFITABLE Home business, electroplating novelties, giftwares, auto parts, mirrors. Easy, inexpensive home processes. Free booklet. Tyco Metals, Box 13231-MJ, Houston 19, Texas.

SELL Printing by mail! We fill orders. Free plans, samples. Sutton Printing, Box 853-G, Waycross, Georgia.

COLOR Concrete with chemicals. Marble-glaze cement benches, pottery, garden ornaments. Home—shop. 10c garden sample, pictures. Hollywood Cementcraft, 8527-R Wonderland, Hollywood 46, Calif.

MAKE Gifts, novelties, jewelry, from sea shells, fish scales, plastics! Wholesale, illustrated catalog 10c. Giftcrafts, Box 4550-PM, Coral Gables, Florida.

PROFITABLE Home business. Make fast-seller chenille monkey trees, dolls, flowers. Terrific holiday demand. Information free. Velva, Bohemia 16, N. Y.

TO \$35.00 Weekly. Spare time, home operated, mailorder business. Successful "beginner's" plan. Everything supplied. Lynn, 10420-M National, Los Angeles 34, Calif.

LIQUID Rubber, make flexible molds. Free sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

RAISE Fishworms. Easy, profitable. Complete instructions 25c. Huffmans Worm Ranch, Rives Junction, Mich.

FIX Typewriters. Free booklet describes our modern, inexpensive home-study course. Factory methods taught. Write: Typewriter, Building 1, Tarentum, Penna.

\$25 WEEKLY Working two hours daily. No canvassing. No manufacturing. Lycke, Box 2471-A, Cleveland 12, Ohio.

RESILVERING Mirrors, formula 50c; two-way lookout mirrors, (No one sees you), 50c; coppered mirrors, 50c. All \$1.00. Nelko-Mir, Box 3462-J, Chicago 54.

FIGURINE Molds and many others, liquid rubber, statuary plasters, flock finishes, Glo-candle wax, etc. Illustrated catalog and "Plastercraft" manual free. Blue Rapids Supply. Blue Rapids, Kansas.

START Home manufacturing business. Make cleaners, soaps, polishes, cosmetics. Free literature. Kemix, Park Ridge, Ill.

HOW And where to obtain capital? Free details. Star Service, Wapakoneta, Ohio.

BIG Profits making new greaseless doughnuts. Start in kitchen. Wholesale to grocers and cafes. Free plans. M. Ray Company, 3605 South 15th Ave., Minneapolis 7, Minnesota.

MAKE Money spare or full time, casting metal toys and novelties. Big wholesale and chain store demand for autos, soldiers, ashtrays, banks, etc., keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. Write for information and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

NEW Exceptionally profitable plans, ideas for home operated mail business. Rush name. Miller, 1772-P Carlyon Road, East Cleveland 12, Ohio.

MAKE Flexible molds! Cast plaques, bookends, figurines! Free sample! H. Tooker, 630-R Chestnut, Hamilton, Ohio.

21 POPCORN, Candy apple formulas, proven money-makers. Send \$1 today for formulas, catalog of money-making ideas. Concession Supply, 3916 Secor, Toledo, Ohio.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

READ "Advance"—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 35c. Yearly subscription \$2.00. Advance Publishing Company, 313 East 21st Street, Suite 450, New York 10, N. Y.

GOOD Paying business silvering mirrors, plating autoparts, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required. Outfit furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Illinois.

BUY Wholesale. Thousands articles. Supply directory, 10c. Ideaco, Park Ridge, Illinois.

EARN Extra money! "Homeworker Magazine" tells how. Sample 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30.

EXTRA Money—No selling, operate vendors. Amazing profits, details free. Silver King, Suite 220, 622 Diversey, Chicago 14.

OPERATE Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

DOLLARS in personalized baby record books. Sell by mail. Use same literature we do. No-Co-Ro, Oakland 6, Calif.

MINK Raising information free. Complete. Lake Superior Mink Farm, Superior, EE1, Wisconsin.

COPUBLISH Leading m.o. paper. Latest copy. Mail Sale Advertiser, details, dime. Vanroy Shirk, Lebanon, Penna.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men Only National Potteries Company, Grand Rapids, Minnesota.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

POPCORN and potato chip equipment. Long Eakins Company, 5360 High, Springfield 99, Ohio.

START Venetian blind laundry. Profitable lifetime business. New machine. Free booklet. F. C. Co., 442 N. Seneca, Wichita 12, Kansas.

BOOKKEEPERS, Increase earnings operating sensational bookkeeping service. C.P.A. system. Kern, 4942 Vineland, No. Hollywood, Calif.

SELL Books by mail! Wholesale catalog, 25c. Monarch, Auburn, New York.

MAKE Money from newspaper clippings. Siegel, Box 183 PM, New York 2.

137 PLANS for starting home business. Details: Elite Co., 220 Grand St., New York 13.

VENDING Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, Dept. 72, 715 Ensor St., Baltimore 2, Md.

BE Independent. Small investment. Full-time or part-time. "Reel chair" for jobs large or small. Cleaning, painting, repairing, window-washing, etc. Write Finney Co., Platteville, Wisconsin.

LEARN Sewing machine repairing, etc. Everywhere our spare time men-women are cashing in. Parts, motors, zigzag, and other machines wholesale. Earnings confidential. Write Taylor Service, Hamilton, PM-5, Ohio.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. MX-553, 7530 Greenwood, Chicago.

START Your own business on credit. Your own boss. 1586 of our dealers sold \$5000 to \$27,500 in 1951. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. E-U-PPM, Freeport, Ill.

SPECIALIZED Magazines covering your field of interest help you to greater success. Get latest copies through our easy-to-get-acquainted service. Hundreds of business, trade, professional, educational, sport, hobby, fashion, fertilizer, florist, food, foreign trade, forestry, fruit, funeral director, and others covering all interests. Send for list today. It's free. Commercial Engraving Publishing Company, 34C North Ritter, Indianapolis, Indiana.

IMPORT-Export! Opportunity, profitable, world-wide, mail-order business from home, without capital; or travel abroad. Established World Trader ships instructions for no-risk examination. Experience unnecessary. Free details. Mellinger 25, Los Angeles 24.

START Mail order business at home. Expert will show you how. Now owns \$100,000 business built in 4 years. Dime brings amazing proof and valuable information. No postals. Northmore, Ravinia, Illinois.

WANTED! Home producers, by manufacturers in our clearing house service. Become a sub-contractor, casting plastic products for these companies. Thousands of easy-to-make items required for consumer and industrial use. Cash in at home, without previous experience. Write Plastic Service Associates, Dept. PM5, East Boston 28, Mass.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 627-PM Linden, Buffalo, N. Y.

NEWEST Spare, full-time home business, \$5 to \$10 hour possible. Paint with suede—The finish with touch and eye-appeal. Beautiful auto dashboards, signs, radios, toys, figurines, lamps—1001 others. Complete, step-by-step instructions sent for no-risk examination. Free details. Coast, 1004-HP So. Los Angeles St., Los Angeles 15.

MAKE Perfumes at home. Write, "Carey Laboratories," 1914 Chouteau PM-5, St. Louis 3, Missouri.

SELL Popular Mechanics and all other magazine subscriptions. Free catalog, supplies. Subscription Service Company, Dept. A, P.O. Box 2070, Birmingham, Ala.

MAIL Order opportunities. Write F. Tyler, 528 Piqua Place, Dayton 7, Ohio.

MAKE \$6.73 Every time you sell one—And they're amazingly easy to sell! We have new adding machines in original factory cartons you can sell for only \$14.95 and you make 45%. They're executive model portables, precision built with automatic clearance, direct subtraction, fully guaranteed. Send for life size color photo with full details. Write today to Lightning Adding Machine Co., Inc., Dept. P-29, 1260 West Second Street, Los Angeles 26, Calif.

MAKE Perfume. Sell on smell. Mail order or local. Wilson made \$7200.00 first year. Free sample, plan revealed. McCann, 4019-21 Rio Grande, Amarillo, Texas.

"MAKE Products"—Sell mailorder formula catalogue free. "Imasco," 6347 Parnell-PM-5, Chicago 21, Illinois.

GOOD Pay making cement blocks. Bob's Workshop, 3228 So. Wabash, Chicago 16, Ill.

"HOW To Raise the Money You Need." \$2.98 postpaid. Refund if dissatisfied. Free details. Enterprise Bureau, Syracuse 2P, N. Y.

"MAKE Perfume." Catalogue free. "International," 6347 Parnell-PM-5, Chicago 21, Illinois.

FREE Booklet reveals amazing secrets behind 301 new profitable enterprises! Many mailorder! Includes confidential instructions for starting wholesale buying service. Deumant Business Surveys, 79-PM Deumant, Kenmore 23, N. Y.

FREE Wholesale catalog. Make up to 500%. Be your own boss, work full or spare time. Everyone a prospective customer. Sell costume jewelry, wrist watches, religious items, novelties, toys, gifts and prizes. Write today, specify catalog PM4, Heath Distributing Company, 3253 Vineville Avenue, Macon, Georgia.

OPERATE "Escalator" mailorder system, selling our products or any products. Fastest, most revolutionary mailorder system known. Write: Selbyco, Decatur 156, Ill.

FLEXIBLE Rubber moulds for plaster and Marbleite figurines. Sample and large illustrated catalog 25c, refunded on first order. K-C Novelties, Dept. 33, Easthampton, Mass.

MAIL Order business using profitable free advertising method reaching 66½ million. Revealing information free. H. F. Seidel, 7070 Hollywood Blvd., Hollywood 28, California.

MAKE Money at home as renewal headquarters for all magazines. Liberal commissions. No experience, no capital needed. Supplies furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500B, Mount Morris, Ill.

TAKE Your choice of a profitable business of your own. A better job or high sparetime earnings in uncrowded, billion-dollar field of custom furniture upholstery. Earn while you learn at home to turn your hobby skill into a career, easily, quickly, through the famed N. Y. state-licensed Upholstery Trades School course. Course includes—Free of extra charge—4 big outfits of tools, complete frames and materials to make beautiful upholstered furniture you can keep, or sell for more than the cost of tuition. You can actually make and repair furniture soon after starting—earn money, get "set" for a steady prosperous future. Master craftsmen teach you custom upholstery, re-upholstery, car upholstery, furniture finishing—Plus 4 big extras—slip cover, cushion, window cornice and drapery making! Free book tells all about this ever-growing business, explains how you earn as you train at home. You don't leave your job until you're ready for a big pay, big profit opportunity. Write today to Upholstery Trades School, Dept. BE-1402, 721 Broadway, New York 3.

FOR Pleasure and profit. Send for free illustrated instruction book and business plan: how to permanize, metalize, ceramize, porcelainize baby shoes, mittens, booties, cloth, lace, etc. No equipment, no firing, no baking. Professional Art Products, Dept. PM-5, 825 South Wabash, Chicago, Illinois.

OPERATE Profitable mailorder business. Particulars free. George Lenhoff, Lincoln 8, Nebraska.

START Your own profitable home mail-order business! We supply everything! Write today! Studio Products, Box 564-AF, Glendale 5, Calif.

OPERATE Profitable mailorder business. Details. Natel, 411-C Paulison, Passaic, N. J.

SECURITY And profit in the country. Live happier. Earn comfortable income. Free facts. Hermes Publishers, 152-E West 42nd Street, New York.

WHERE To buy at wholesale 100,000 articles. Free list. Also extra-income information. Maywoode, 1135 Broadway, New York.

FABULOUS Florida—Cool in summer, warm in winter. Many opportunities in fast-growing Florida. If you are interested in going into business in fast-growing Florida, write State of Florida, indicating type of business you are interested in and stating your specific requirements. You will be put in touch with communities where opportunities exist. Get complete information, without cost or obligation. Write today. State of Florida, 4217B Commission Building, Tallahassee, Florida.

STAMINITE Offers you a lifetime money-making opportunity selling newest, greatest discovery of world-famous chemical corporation converted into products used by every householder, hobbyist; industrial, institutional and commercial establishment in U.S.A.! Earnings limited only by your initiative and sales ability. Don't miss this opportunity! It's the biggest news in a giant, basic industry. For details write Staminite Corp., Dept. P-5, New Haven 11, Conn.

\$5,000-\$10,000 YEARLY Breeding chinchillas in your home, garage, back-yard. Handbook 25c. Behnke Chinchillas, Guttenberg 99, Iowa.

BUY Wholesale—Thousands nationally advertised items. Save, make money! Free details. Durex Co., Box 672-U, Chicago, Ill.

START Home mailorder business. Details. Gedgard, Box 798-K, New York 1, N. Y.

STOP Money worries, own profitable business, mailing advertising literature. Write Specialty Products, Box 166, PM2, Mt. Holly Springs, Penna.

TIN-Cans. Turn them into cash. Nine methods. Instructions 50c. Charles Company, 12-DBC, Norwood, Ohio.

AMAZING Crushed redwood cedar! Cedarizes closets, drawers, trunks; prevents moth damage; applied like paint; stores, builders, contractors buy quantities; big profits; low cost; attractively packaged. Exclusive territory. Write for details. Manfr., 91-B Summit Ave., Brookline, Mass.

READ "Your Own Mailorder Business." Proven, tested, guaranteed, 25c. E. Merrill, Colebrook Road, Bangor, Maine.

LEARN Invisible reweaving! Reasonable. Harris, P.O. Box 7112, New Orleans, La.

SALTED-In-the-shell peanuts. Learn this unique and interesting process and establish yourself in a lucrative and dependable business with a future. Send \$5.00 for complete details of process and instructions to B. & W. Nut Co., 932 South Wilder St., St. Paul 5, Minn.

SAWDUST. Turn it into cash. Twenty methods. Instructions 50c. Charles Company, 12-DBA, Norwood, Ohio.

TRADE Your spare time for financial independence. Free literature. Earthworm Gardens, 224 West Valley, El Monte, Calif.

YOUR Name on labels and your own catalog insures repeat sales. We sell wholesale to you—28 sanitary chemicals, plus a complete array of janitorial supplies. Write today. Surety Laboratories, 3946 Olive, St. Louis 8, Missouri.

\$10,000 CAN Be in your bank by Sept. 1953 if you jump on the bandwagon now. We have the only automatic, 3-way, lifetime guaranteed, lowest cost, insect killer bulb on the market which is being introduced for the first time now. Write today for full free details, or send \$2.00 for sample and get started this week. Write, wire, phone, Insect Controls, Inc., 20th & Market Sts., Philadelphia 3, Penna. P.S.: This is a terrific mail order and direct selling item.

NEW! Develop profitable business. Convert merchants' electric signs to modern flasher type. Terrific demand! Simple installation. Big profit! Write for details. Stann & Co., 30 W. Washington, Chicago 2, Illinois.

SOIL Analysis—Fascinating new business, every homeowner a customer. Write Soiltest, 307D Woodland, Lake Bluff, Ill.

"FLOATING Henryburger" Systems franchise. Rare opportunity. Small investment. Box 936PM, Wichita, Kansas.

LEARN Metalizing baby shoes, gifts, etc. Bronze, gold, silver. Folio free. Kiktavi, 7217-PM South Broadway, Los Angeles 3.

PATENTED Tree saw which has been marketed long enough to assure practicability. Can be developed into large business with right initiative and sufficient capital. Write, Route 3, Box 1191, Springfield, Mo.

FRANCHISE Available. Parties with \$500. Secured by merchandise. Earnings \$8000 up. Miracle powder stops leak for automobiles, trucks, etc. Sells on dramatic demonstration. Testimonials leading operators. Sample \$8.00. Zunz, 455 Paul Brown Bldg., St. Louis 1, Mo.

\$28,000 PROFIT Using Future-Rich mailorder plan. Folio reveals everything—\$1.00. Particulars free. White's Money-maker, Newark, Ohio.

BUY Thousands articles wholesale. Directory, big mail 25c. Publishers, Box 1486-P5, Detroit 31.

MASTER Electroplating! State licensed correspondence course. Stamp brings details. Joseph Kushner Electroplating School, Stroudsburg 5, Penna.

EARN Money. Make beautiful figurines. Business. Hobby. Free information. Main Plan, Box 166, Bridgeport 2, Conn.

\$200 WEEK Possible! Sensational new hand cleaner. Manufacture, distribute. Easy. Free plan! Keenelo, 2445 Larimer, Denver 2, Colorado.

OPERATE Profitable collection agency. Become co-partner! Interesting details. Write: United States Protective Service, Box 4865, Atlanta 2, Ga.

BOOKKEEPERS — Complete manual. "Eleven Plans For Establishing Successful Bookkeeping and Tax Service," with licenses to operate. Only \$3.00. Commercial Business Service, 411 Fairfield Rd., High Point, N. C.

FRANCHISE Opportunities nationwide! Make no small plans! Secure exclusive distributorship or agency operation. Inquire today. National Franchise Reports, 452 Pure Oil Building, Chicago 1, Illinois.

EARN Money with typewriter, sewing machine! Details free. Edwards, 3915-PM, 12th, Des Moines 13, Iowa.

MAIL Postcards featuring real merchandise. Good earnings. Everything furnished. Write: R. Carroll Enterprises, 23P W. State St., Media, Pennsylvania.

HAVE Home mail business. Big earnings. Everything furnished. Start low as \$150. NMD, Madison, Box 88, Dorchester, 22-A, Mass.

SELL! Buy! Trade! Anything. Thru. "Trading Post Magazine." Details 3c. Thorne's, 575 Dewey, Jackson 15, Mich.

START Your own business with a route of nut, candy or gum vendors. No experience necessary. Full or part time. Send for catalog 100. Rake, 609-S Spring Garden St., Philadelphia 23, Penna.

START Business without capital! Reliance, 15-A, Park Row, New York 38, N.Y.

UNPAINTED Figures. Weaver Products, 840M 17th Street, Altoona, Penna. Catalog.

PERFUMES Direct from factory. \$500.00 profits per gallon on famous brands. Free catalogue. Murat, Inc., Murat Building, 2132 N.W. 11th Avenue, Miami 37, Florida.

50 PLANS For home mail business. Proven money-makers. Personal help assures success. Verdo, R1, Box 37-A, Huntsville, Missouri.

BLUEPRINTS. Inexpensive material makes fast sellers. Sample and list 25c. Walter E. Smith & Associates, Box 117, Florissant, Mo.

PEARL Finishing. New amazing home, full-time business. Free success plan. Pearllette, Box 73136, Los Angeles 3.

BIG Money! Start your own plastic business at home. Spare or full time. (Also valuable liquid marble information.) Free catalog. Write: Bing Products, PM-553, Watertown 72, Mass.

METALLIZED Baby shoes. The fabulous full or part time business that grows and grows with the ever increasing birth-rate. Instructions, equipment and supplies from world's oldest and largest supplier for the industry. Send now for your copy of "Your Guide to Success in the bronze baby shoe business." Plus complete wholesale catalog of equipment, supplies, and biggest selection of metal and onyx mountings. \$1 post paid. Hollywood Bronze Supply, 1624-A East First Street, Los Angeles 33, Calif.

BE Your own boss pioneering new concrete waterproofing your town. You get material wholesale and also make fine profit on contract jobs. All or part time. Rex Aquadry, 5511 W. North Ave., Chicago 39, Ill.

EARN \$2.00 Hour, I do, making sandals. Chas. Youngs, 1308 S. First, Arcadia, California.

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INSTALL Hand railings on stairs, terraces, porches. Unlimited applications. Provides safety. Cast aluminum universal joints lock with set screws. 1½ inch aluminum tubing will not rust. Easy to assemble. Fits any angle or grade. Install in wood, stone, ground or concrete. Profitable. Send for folder. Kloppenberg Aluminum Foundry, Dept. PMC-3, Davenport, Iowa.

400 RADIO Stations active. Free radio advertising. Pay commission only on orders received. Free information. Mishek, 2, Waseca, Minn.

ASSEMBLE Electric fans. Exhaust and circulating for home, attic, kitchens, restaurants, offices, factories. Sells easily. You furnish electric motors; we furnish all fan parts. Send for wholesale parts catalog. Kloppenberg Aluminum Foundry, Dept. PMC-3, Davenport, Iowa.

CASH In your ideas. Complete information now available. Prepared by experienced engineer-inventor. \$1.00. Full refund provision. O. W. Wood, 100 Church Street, Liberty Corner, New Jersey.

CHURCHES. Clubs, organizations, receive \$130, 12 card tables free. Unique Club Plan, Pine Hill, New Jersey.

MAKE Money at home! New folio "Homework as a Profitable Endeavor" tells how. Only 25c (refundable). Opportunities, Folio-A, Box 209, New York 28.

MAKE Money at home mailing literature to new mothers. Terrific possibilities. Information and material furnished. Write: Williams Sales, Burton, Wash.

PROFITABLE Home business. Write Chamberlain's, 87 Arizona Place, Chandler, Arizona.

MAKE Money selling by mail. Famous course teaches how. Free brochure. Manhattan House, Box 51-M, Saint Albans 12, N. Y.

WEAVING—Rugs, drapes, tweeds, etc. at home. Can be profitable and pleasant; part or full-time job. Free catalog. Newcomb Loom Company, Dept. PM, Davenport, Iowa.

DIME Brings our nationally advertised "opportunity packet." Rinehart, 235 Baltimore. Hanover, Penna.

MAKE To \$4.50 hour doing common pen lettering. National Artists, 801½ North Marsalis, A-5, Dallas 3, Texas.

SELL Titania gems; \$9.75 carat wholesale. More brilliant than diamonds. Free catalogue. Diamonte, 1404-M Mitchell, Oakland 1, California.

TIE-Breaker picture puzzles exposed, \$2.00. Wenograd, Box 1495, Philadelphia 5, Penna.

SCHUHMACHER Matmakers. Convert old tires into dollars. Devote full or spare time. S and S Patents, Inc., 1307 North Clark St., Chicago 10, Ill.

50,000 ARTICLES Wholesale. Source directory, dime. Nelko, Box 3462-DR, Chicago 54.

PUBLISH Your own magazine. Hand-some 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Ord, Nebr.

137 PLANS To make money, local mail-order. Details: Elite Co., 220 Grand St., New York 13.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

SPARETIME Profits taking subscriptions, all magazines. Wholesale catalog free. Cassell Agency, Westfield 2, New Jersey.

\$10,800 PROFITS! Your own mailorder business! No capital risk! "Success plan" (worth \$2) free! Write today! Treasury, 709 Webster, New Rochelle PM-11, New York.

BE Independent, be secure, have your own profitable business—Earn \$20.00 and more a day making beautiful, fast-selling lamps at home. No equipment needed. Illustrated course teaches you quickly. Course, parts catalog, wholesale price list—only \$2. Gearon Co., Dept. 200-B-5, 27 S. Desplains, Chicago 6, Ill.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 630-PM Linden, Buffalo, N. Y.

HOBBYISTS! There's profit in hobbies. Investigate. Cramer, 11 Hanna Road, Worcester 2, Mass.

BE Notary public. Rate higher. Details free. Stationers, Helotes, Texas.

FREE Booklet reveals amazing secrets behind 301 new profitable enterprises! Many mailorder! Includes confidential instructions for starting wholesale buying service. Deumant Business Surveys, 83-PM Deumant, Kenmore 23, N. Y.

ADDED Income selling by mail. Roblin Sales, 1001 Curtiss, Downers Grove, Ill.

FREE!—Radio advertising without investment! Jakiela, 2644-PM No. Western, Chicago 47.

EXPERIENCED Roof repairer. Franchise protection. Luster-Kote, 19417 Derby, Detroit, Mich.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

FREE! Your own mailorder business! Everything furnished! No investment! Terrific profits! Write today. California Vitamins, 2910PM, Beverly Boulevard, Los Angeles 4, California.

FREE Details. Buy wholesale thousands items. Write United, Box 87-M, Detroit 2.

WE Pay cash for boxtops, labels, wrappers, coupons, etc.! Particulars free. Box-tops, PM-983 E. Main, Columbus 5, Ohio.

FIGURINES Painted, unpainted. Flock and finishes. Catalogue 25c with new plan. (Refundable). House of Bern, 221 South Ave., Syracuse 4, New York.

\$5.00 PER HOUR assembling driftwood lamps. Sam Patchett, 2187 N.W. 24 Court, Miami, Florida.

CHURCHES. Organizations, receive \$130.00—12 card tables. Unique Gift Plan, Pine Hill, New Jersey.

\$15 HOURLY! Sparetime, without investment! Mailway, Box 198-E1, State College, Penna.

TECHNICAL Writers needed by industry. Learn details, 25c. Mitchell, 22959 Allen, St. Clair Shores, Mich.

SPARE Time homework opportunities. Easy, profitable. Stamped envelope brings details. Alfred Haseman, Beecher, Ill.

MONEY And pleasure. Party favors, big demand. "Beginners Instructions" \$5.00. Marwal, Mp Jefferson, Iowa.

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MILLER'S Modern manufacturing formulas make fast-selling products that get the business and pay. Fifty years supplying the best. Late literature free! Miller, Consulting Chemist, Tampa, Florida.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

FORMULAS; All kinds. Latest, best. Literature free. Kemixal, Park Ridge, Ill.

GENUINE Manufacturing formulas. Latest. Literature free. Nelko, 3462-P Merchandise Mart, Chicago 54.

METALIZE Your baby's shoes. Easy new method, formula \$1.00. Krysto, Felton, Calif.

PRODUCT Analysis, manufacturing formulas, and processes developed. Plastics, Box 1574, Boston 4, Mass.

CHANGE Varnish into luminous paint. Chemicals, formula \$1.00. C. & R. Ceramic Products, Box 6321, Birmingham 7, Ala.

FREE List of 75 money-making formulas and trade secrets. Davis Products, 16 Norwood, Long Branch, N. J.

AMAZING Book! 10,000 Formulas, 900 pages, \$3.98 postpaid. Guaranteed! Paulin, 109PE, Loudonville, Ohio.

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LUCITE, Plexiglas. Any size sheets, masked. Square foot (12 x 12) cost, 1/16", \$1.20; 1/8", \$1.40; 3/16", \$1.75; 1/4", \$2.00. Include 10% postage. Almac Plastics, 600 Broadway, New York City.

PLASTIC, Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

DESIGNING, Manufacturing plastic parts, jigs, signs, letters, etc. Free estimate. Harry Smith Specialties, Box 9378, Akron, Ohio.

PLASTICS—Lucite, Plexiglas, Acetate, Vinylite, Polyester-Fiberglass. Low, low prices. Value-packed, bargain-filled catalog 10c. Airmailed 25c. Gem-O-Lite, Box 6862S, North Hollywood, California.

PLASTICS Home-craft course for men and women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for free booklet. Interstate Training Service, Dept. D3E, Portland 13, Oregon.

PLASTIC Engraving, carving machine—"Dupliscafer." Profits to \$5 hour engraving plastics. Details, sample 25c. Desco Distributors, 6334-R Sepulveda, Van Nuys, Calif.

NEW Liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for Castolite Creations Manual and proved success plan showing how to make money at home. Castolite, Dept. E-101, Woodstock, Ill.

LIQUID Lucite, casting plastics, supplies, where to buy them wholesale, large savings, folio, \$2.00. Castle's Co. Box 2139, Paterson, N. J.

MODELING Plastic. Looks and molds like modeling clay. Bakes in kitchen oven to hard plastic. Make toys, figurines. Kit, 6 colors, \$2.00. Plastibake, Dept. 5M, 700 2nd Ave., San Francisco 18, Calif.

CHEMISTRY

NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 25c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology, 10c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS, Supplies. Catalog 15c. Laboratory Sales, Box 161-T, Brighton, Mass.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

SECOND Printing, improved version, spectacular chemical fireworks manual. Contains complete set-ups, formulas, instructions on thermites, fulminates, explosive powders, etc. Still \$1.00. Free details. Chemi-Tech Laboratories, 568Z Riley, Buffalo 8, New York. Chemical questions answered.

HELP WANTED

WANT To make more money? Have a real career with a lifetime of high salaries? I'll show you how to succeed in the growing automotive-diesel field that needs men. Write Ed-Howes, Chief, Dept. 253, 4000 S. Figueroa St., Los Angeles 37. No obligation.

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HOTTEST Seller ever! Get in on the ground floor! Huge profits await you as our agent selling full or part time new nationally advertised top quality Pennsylvania saw sets. Tempered steel saws for every use—all on one handle. Hacksaw, crosscut, frozen meat and bone saw, pruning saw, keyhole saw, dovetail saw. Tremendous value everyone can use—everyone wants! Sells on sight! Send for free illustrated catalogue. James R. Barnet Co., Dept. PM-4, Box 188, Wellesley Hills, Mass.

AMAZING New hand cleaner. Trial 2 1/2 pound can \$1.00. Bayco, Box 805, Pawtucket, R. I.

FAST Profits—No investment. Plastic aprons, tablecloths, etc., 300 sure-fire items. We guarantee sales. Free information. Halliday Co., Dept. PM, 15 Pennington Ave., Passaic, N. J.

WHOLESALE Catalog. Nationally advertised appliances, cameras, watches, etc. Cam Co., 1717PM—58th St., Brooklyn 4, N. Y.

ABSOLUTELY Free—Sales kit. Yours for the asking. Send postcard today requesting kit showing new line, belt buckles with your name or personal initials, cap badges, choice 3000 different emblems. Write Hook-Fast, Box 1425PM, Providence, R. I.

FREE Samples. Big profits showing amazing "Glow-in-the-dark" specialties. House numbers, pictures, plastic novelties, ashtrays, keyholders, religious and nursery objects, etc. Madison Plastics, 303 Fourth Ave., New York 10, N. Y.

'53 **WHOLESALE** Dealer kit on appliances, typewriters, recorders, cameras, giftware, etc. Free. Write Arrow Distributing, 154-B Nassau Street, New York.

BIG Profits selling sensational engine oil-vuer. Every motorist hot prospect. Details free. Rogers Automotive, Box 23, Station C., Pasadena, California.

SELL Fast—79c Baby necessity. Big repeater. Baby Gay, Beaver Dam 8, Wis.

CALIFORNIA Sweet smelling beads. Sensational sellers. Free particulars. Mission, 2328PM West Pico, Los Angeles 6, Calif.

COSTUME Jewelry will bring you fabulous profits, easy sales! Our terrific line includes popular-priced Coronation jewelry! Send for catalog and wholesale prices—for re-sale only! Penn Jewelry Co., Dept. P, 826 W. Lacka, Ave., Scranton, Penna.

NEW Car given as bonus. Make money spare time. Unusual nylon guaranteed to wear definite time or replaced free! Rush name and hose size. Lowell Wilkin, 1735 Wash., Greenfield, Ohio.

YOUR Own business—Used suits \$1.50, overcoats 65c, mackinaws 35c, shoes 12 1/2c, ladies coats 30c, dresses 15c. Enormous profits. Catalog free. Moro, 558-AA Roosevelt, Chicago 7.

AGENTS: Stamping names on key protectors. Sample 25c. Stamping outfits, checks, social security and name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-D North Clark, Chicago.

BUY Wholesale thousands nationally advertised products at big discount. Free wholesale plan. American Buyers, 629-PM Linden, Buffalo, N. Y.

GOLD Lacquered and silver sign letters. Windows, doors, trucks. Standard sizes. Penny and up samples. Atlas-P, 544 West 79th, Chicago 20.

BUY Wholesale. 25,000 items. Catalogue 25c. Matthews, 1472-B-7 Broadway, New York City 36.

MEXICAN Feather pictures. Sell on sight; 200% profit! Free details. Sample 20c stamps. (No coins). Sylviap, Apartado 9036, Mexico City.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

WANT A big share of Real Silk's millions? Just help fill growing demand for our top quality nylon hosiery, other apparel. Start spare time if desired. Sample outfit free. Write Real Silk Hosiery Mills, Inc., Dept. PM-5, Indianapolis 6, Indiana.

MAKE Money introducing world's cutest children's dresses. Big selection adorable styles. Low prices. Complete display free. Rush name. Harford, Dept. J-6341, Cincinnati 25, Ohio.

SELL Big money maker to men and women. Easy handwork makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Massachusetts.

JOKESTER'S Printed novelties. Fifty—\$1.00. Sebastian, 10934-X Hamlin, North Hollywood, California.

FREE Cosmetic sample kit. Bigger commissions. Complete, fast selling, high quality line sells itself. Mme. Rubinoff Cosmetics, Dept. PM-4, St. Louis 5, Mo.

NEED Extra money. Sell name plates this summer. Details free. Box 374, Milford, Conn.

BUSINESS Cards \$1.70, 1,000. Samples. Signal, Box 927E, Los Altos, Calif.

PAINTS—All kinds. 65c gallon up. Private label. Big profits. Certified Products, Louisville, Ky.

HAND Cleaners and other specialties. Sell industrial plants, institutions, etc. Liberal commissions. Dytex Chemical, India Street, Providence, R. I.

BUY Wholesale from nationally advertised manufacturers, distributors. Literature free. Carter Publications, Box 6011-G, Chicago 80.

GREATEST Selling sensation. \$5.00 hour profit easy. Tydorf, Whitesboro, New York.

BE A money maker. Use your home as magazine headquarters. Liberal commissions. No experience. No capital needed. Everything furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500A, Mount Morris, Ill.

PRINTING, Salesbooks, envelopes. Free illustrated catalog. Ersco, Dept. PM, Bronx 72, New York.

COUNTY Agency. Power mowers; \$31.20 net. Prepaid. Guaranteed sales plan. Rotacut, PM, Excelsior Springs, Mo.

BALL Pens \$10.00 gross, d.e. s.e. blades \$4.20 M. novelty flashlights with battery \$2.25 dozen. Lutzker, 871-P East 170th, New York City 59.

REPEAT Business and high commissions raising dwarf trees for pleasure and profit. This field practically untouched by salesmen. Handle our growing kits with complete instructions on what until recently was an oriental secret. Write today for free sales plan. Don Pedro Farms, Dept. 10, Rte. 2, Box 1007, Stockton, Calif.

\$50 WEEKLY Selling finest razor blades, other items. Free details. Edisans, Box 274, Far Rockaway, N. Y.

FOR Opportunity of lifetime see Staminate advt. Business Opportunities column.

MEXICAN Feather pictures. High profit! Fast sellers! Adelphi, Box 57-B, Bellerose 26, N. Y.

AGENTS—Salesmen: Sell beautiful hand colored plastic enlargements and sensational new personalized photo compacts, rings, bracelets, lockets, etc. Experience unnecessary. 40% advance commissions. We deliver, collect. Wonderful sideline—Better full time. Free sample outfit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

KILL Flies, insects (all kinds) instantly. For homes, restaurants, hotels, hospitals. Amazing (low priced) invention. Whirlwind seller. Tremendous profits. Waiko Industries, Dept. 53-C, Highland Park, Ill.

MAKE Money selling photostamps. 300% profit! Send photo/negative (returned unharmed). \$1 for 100 photostamps, sales details. National Photostamp, Dept. 2, 654 Broadway, New York City 12.

MEN'S Dress hose \$1.25 dozen. Free catalog. Gainer, 760 Book Bldg., Detroit, Michigan.

BUY Wholesale! Big profits! Name brand—Appliances, watches, gifts, silverware, etc. Free catalog. Bergen Novelty Sales Co., 59 S. Dean St., Englewood, New Jersey.

\$50.00 MADE Selling occasional cards. Two dollar boxes, \$1.35. Diehl's, Buffalo 5, New York.

WHY Ordinary things? New Swiss tool. Thousands demanded. Big profits. Steen's, 811 Broadway, Long Branch, N. J.

SELL New all-purpose silver polish and plating liquids. (Cloth applied). 10 products. Up to 1400%. NuSilver, 508-PM5, Aurora, Illinois.

SELL Harmar's French fried popcorn to stores and taverns. Fast repeater. Harmar Products Co., Hammondsport, N. Y.

GET Into toys! Big money. Show free toy-gift line full or spare time. Take orders. Pocket juicy profits. Styleco, Dept. E378, Cincinnati 10, Ohio.

BUY Wholesale million articles supply directory. Literature free. United Buyers Service, 3400 Selma, Knoxville, Tenn.

BIG Profits selling ties (\$2.00 values). \$6.50 dozen. Free catalog. Empire Cravats, 648 Broadway, New York 12.

SALESMEN—DISTRIBUTORS

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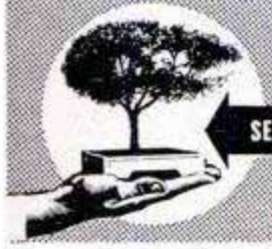
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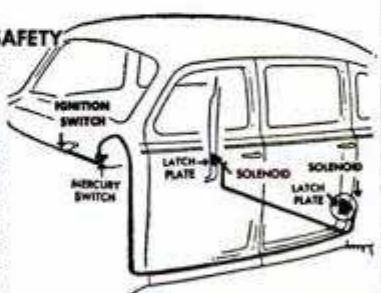
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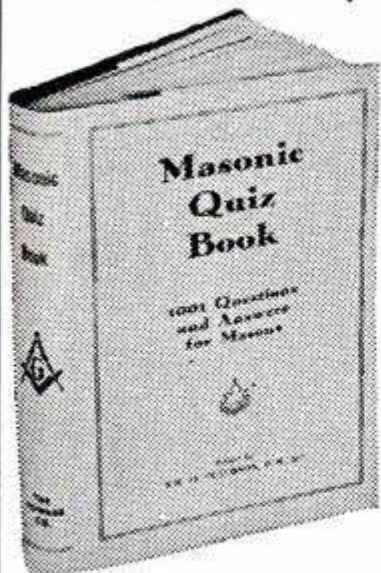
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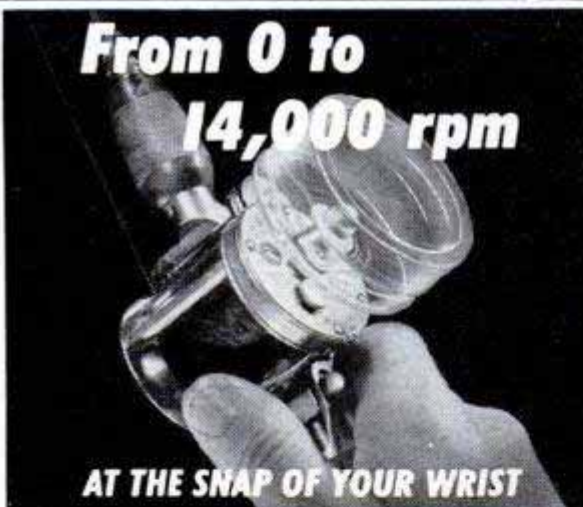
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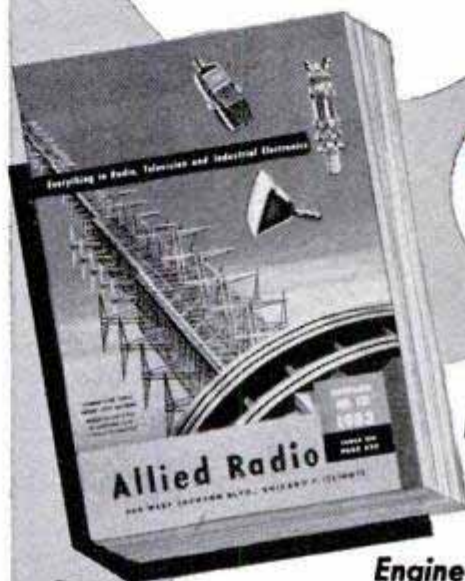
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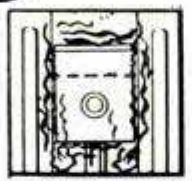
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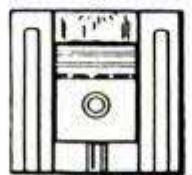
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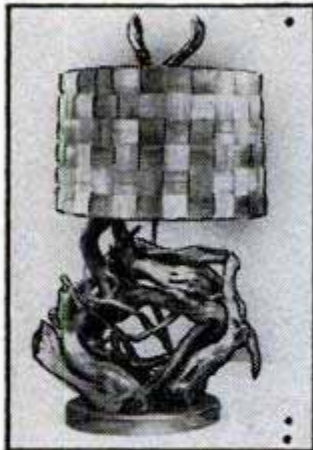


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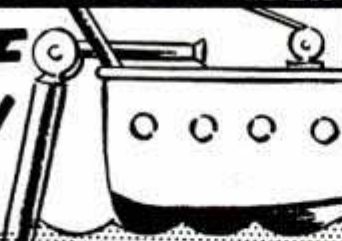
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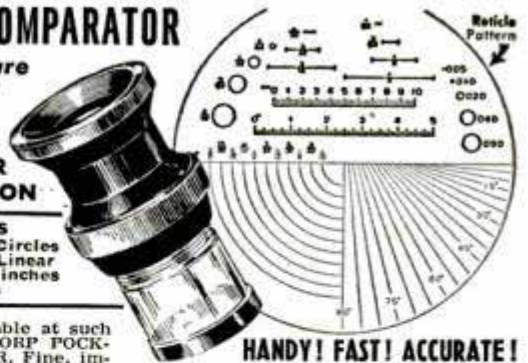
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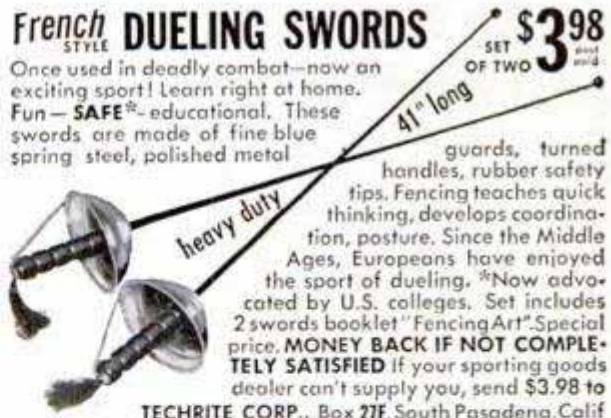
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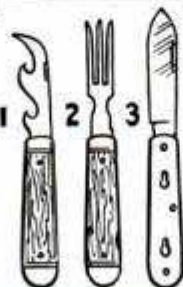
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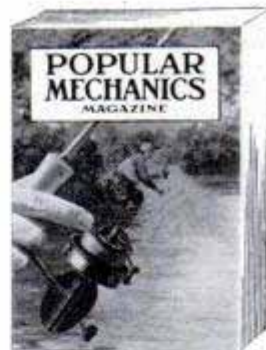
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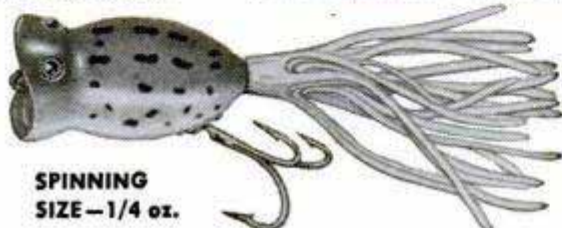
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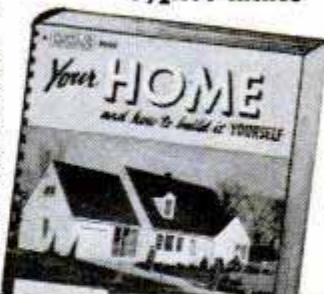
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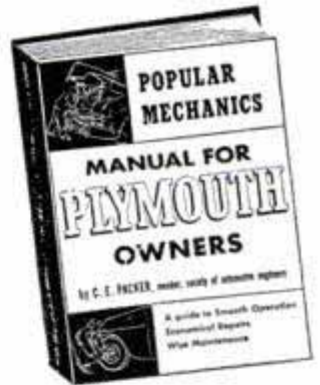
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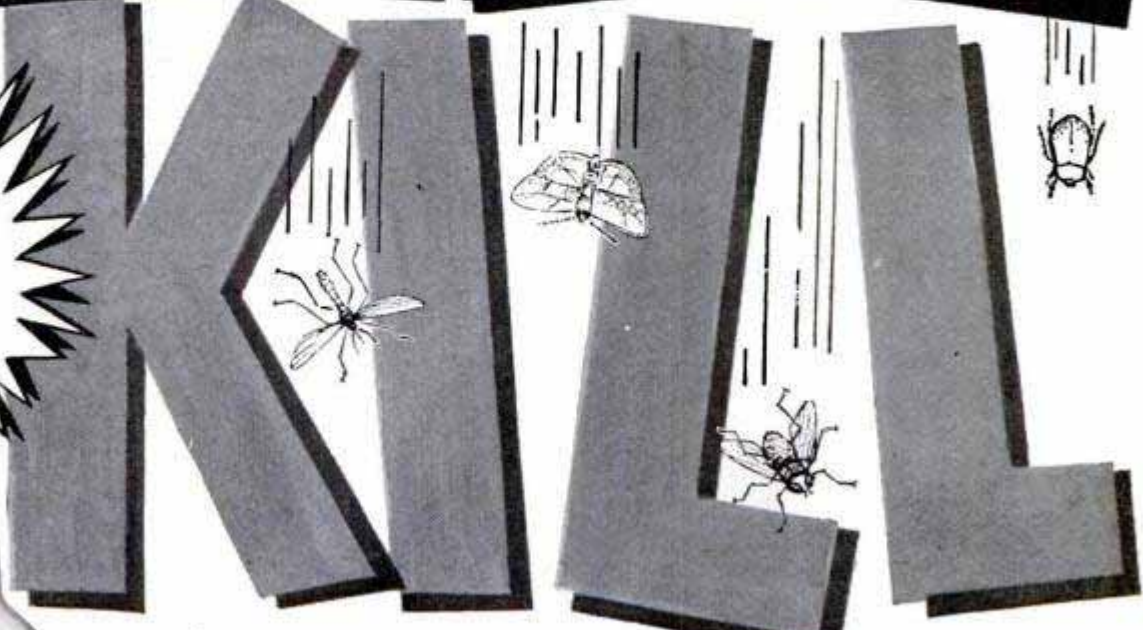
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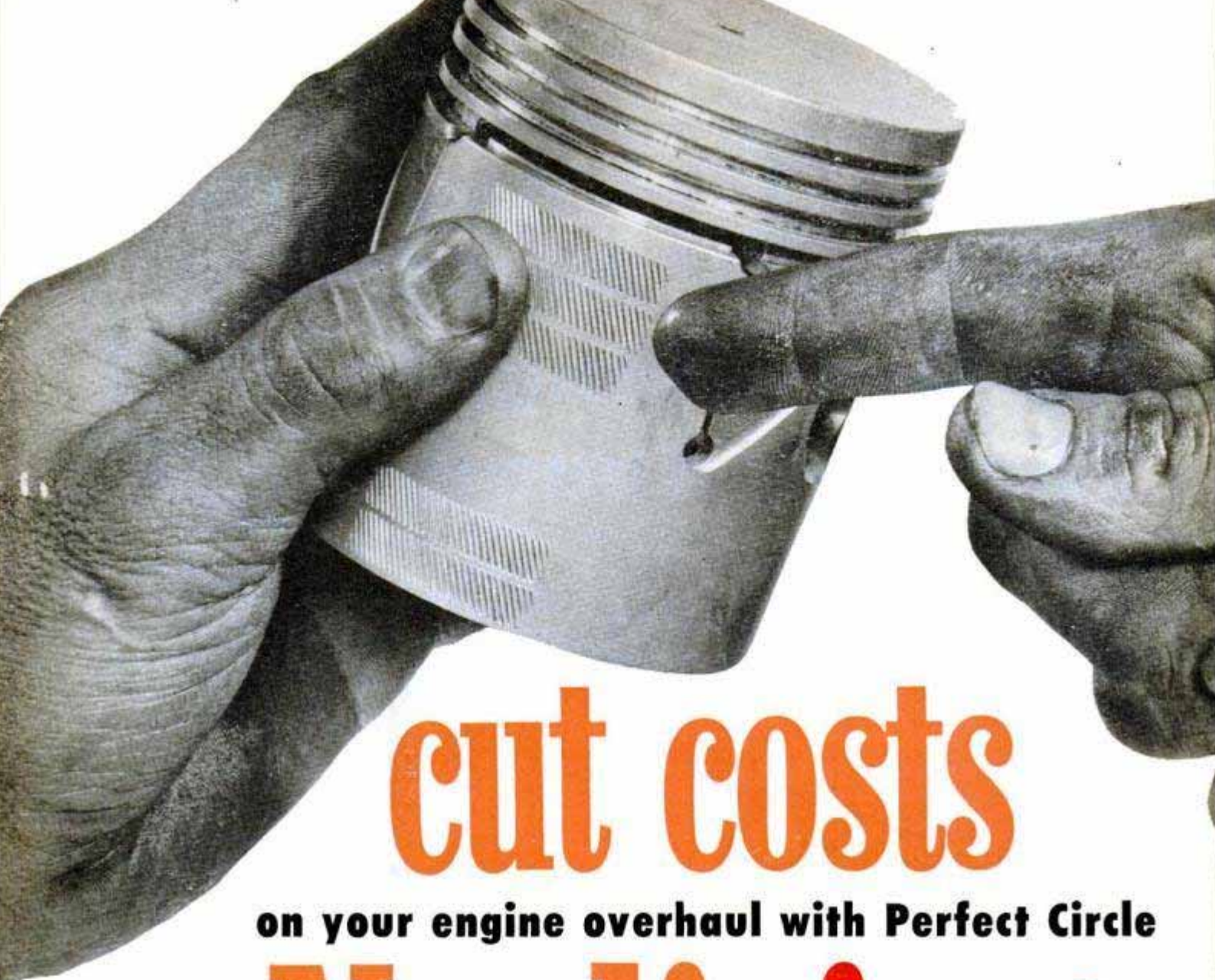
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Neville Duke is a British war hero who couldn't quit flying. His is the dangerous job of testing Britain's new supersonic jets, and frightening it is for the folks below when

POPULAR MECHANICS

MAY
1953

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 99 NO. 5

He Goes Banging Through Sound

NEVILLE DUKE is a British test pilot who flies faster than sound as casually and nearly as often as the average person drives a car 50 miles per hour. To most people, this is spectacular, frightening and dangerous. To Duke, chief test pilot of Hawker Aircraft, Ltd., it is "interesting."

Duke has become, much against his wishes, a hero to the English, because just as a hero creates publicity, publicity creates a hero. In Duke's case, it boils down to the supersonic frontier, a relatively new phenomenon in the relatively new age of jet aviation.

Supersonics—that is, speed faster than sound—first made its appearance shortly after World War II. An American Air Force captain, Charles Yeager, flying a Bell X-1, in October 1947, became the first man to fly through the sonic barrier. In England supersonics and Duke now are becoming increasingly well known, partly because of last fall's Farnborough air show and partly because of Duke's incessant banging through the sound barrier around the English countryside.

On the sixth day of the Farnborough show, John Derry, a close friend of Duke and the first Britisher to exceed the speed of sound, was killed along with 29 others when his de Havilland 110 jet fighter disintegrated in mid-air. Parts of it were sprayed on spectators lining the show's grounds in one of the greatest disasters in jet history.



By Norman Runnion

Within moments, however, Duke took off in his own plane, a Hawker Hunter, and dove through the sound barrier while far below him the wreckage of Derry's plane was still smoking. Ever since, he has been making headlines in the British press, still for his supersonic feats, but for a slightly different aspect of them—the "bang."

The bang of a jet going past the speed of sound is loud and if you've never heard

Neville Duke, in flying clothes, squeezes into the cockpit of a Hawker Hunter, shown in flight above

British Information Services photo



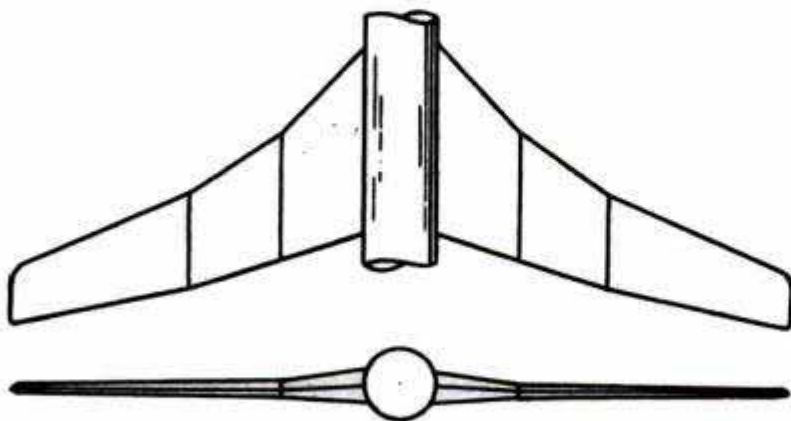


Duke makes as many as five flights a day in a Hunter, some supersonic, in attempting to push the swept-wing jet fighter to its maximum speed

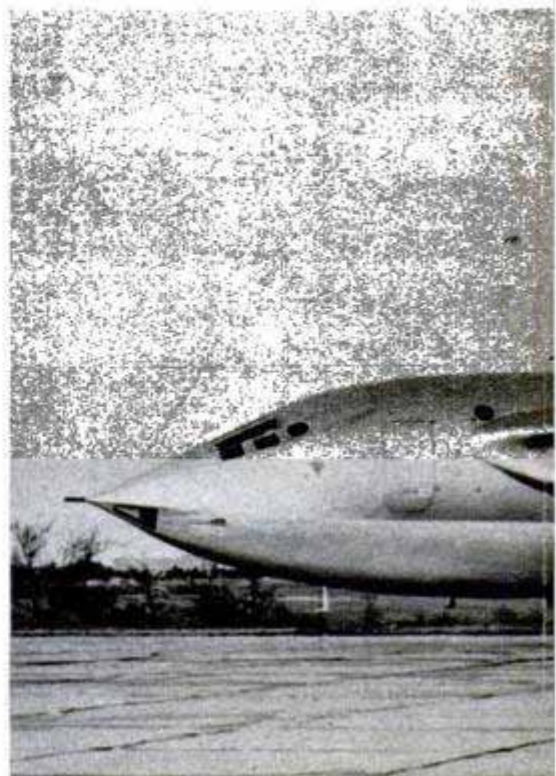
it before, frightening. It has been interpreted variously as an earthquake, a building exploding, a thunderclap and even as the jet itself coming apart. Each time Duke bangs near a crowded area, newspapers, the police and various other officials are besieged with phone calls from indignant and worried citizens wanting to know when the war started again. To avoid all this as much as possible, Duke tries to distribute his bangs around the whole south coast. "They don't like me around here," he grins.

The bang is one of the mysteries of supersonic flight. No one is really positive of its cause, but ever since Farnborough, when it was heard so often, there have been many attempts to explain it.

One theory is that it is an acoustic effect due to an accumulation of noise coming from the aircraft. Another links it to shock waves formed when an aircraft flies at supersonic speeds; and a third, that it is caused by aerodynamic disturbances due to the aircraft. These disturbances, so goes the latter theory, enhance rather than cancel themselves as a plane moves at the speed of sound and be-



Front and overhead views, above, of swept-back, crescent-shaped wing of new Handley Page 80 bomber. Shown at right, four Sapphire jet engines give it more power than 25 modern express locomotives





Duke, right, climbs up to give tips on the Hunter to Lt. Col. Richard L. Johnson, U. S. Air Force test ace

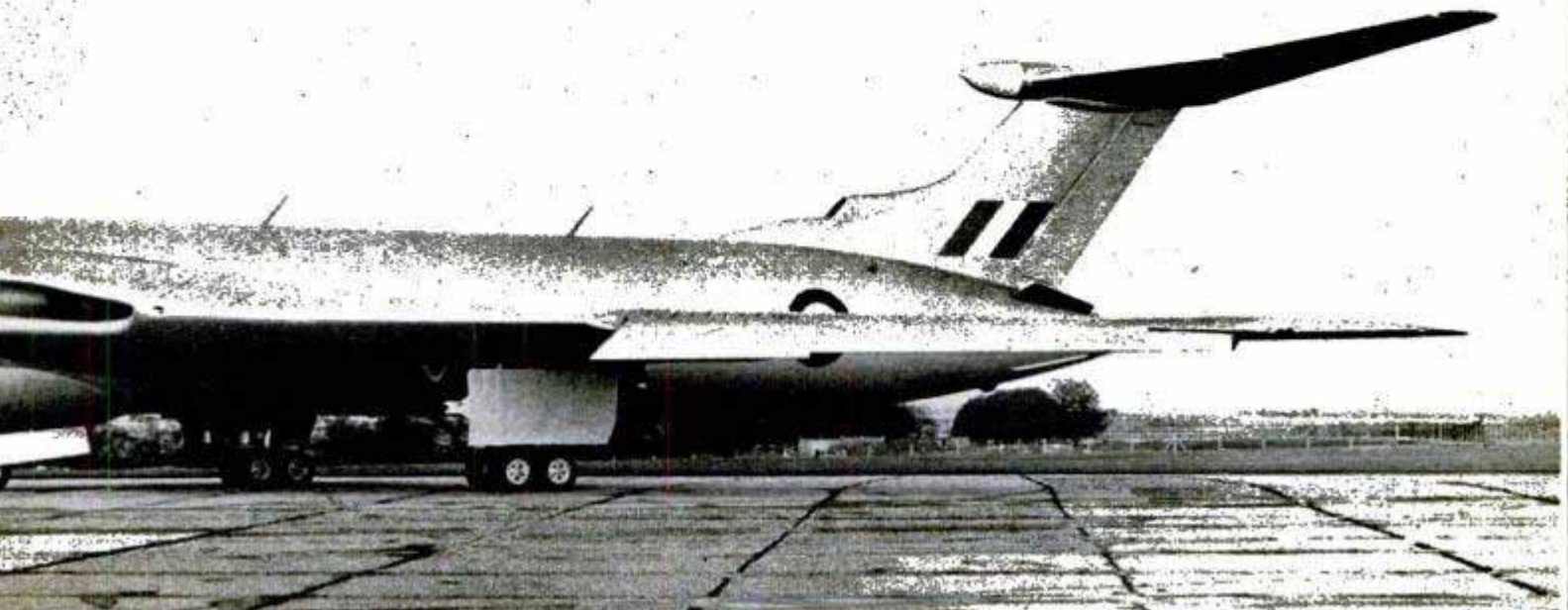
come a bang as the aircraft approaches the observer.

Although it frightens them if they're not expecting it, the bang is treated as somewhat of a novelty by the aviation-minded British. They order it like you would ask for a piece of cake. When an air demonstration is being held someplace, Duke is called and asked to bang, if he will, please, for the amusement of everyone present. Recently the Hunter was shown off to the Prime Minister of Turkey and, to the delight of those assembled, Duke banged quite satisfactorily.

The bang, of course, is just one aspect of

supersonic flight, but being one of the most obvious it is one of the most interesting. Duke himself can't hear it, partly because he already has passed it. Besides, even if he could, he would be too busy.

On every flight, for example, he has to record carefully everything that happens to himself and the airplane. He does this with a wire recorder. All he says—about instruments, the weather, the plane's behavior or even the pretty clouds—is recorded by wire. On the ground it is played back and his secretary takes it down in shorthand, transcribes it and gives it to Duke, who then writes his report.



Duke is well equipped to be a test pilot. Now 30 years old, he was a wartime fighter pilot with 28 "kills" to his credit and holds the Distinguished Service Order, the Distinguished Flying Cross with two bars and the Air Force Cross. Early in the war he was a member of a Spitfire squadron stationed in England and later flew in the western African desert. He then was sent to Italy to command a squadron.

When the fighting was over, he went to the Empire Test Pilot School and, until 1948, served as a Royal Air Force test pilot. That year he joined Hawker as an experimental test pilot, becoming chief test pilot in 1951. Speed is nothing new to Duke. In 1949 he established a London-Rome-Karachi speed record in a Hawker Fury, and he still holds the London-Karachi record with an elapsed time of 15 hours.

Duke now is taking the kinks out of the Hunter, a sleek, swept-wing, single-seat interceptor that is in superpriority production for the R.A.F. Such a job is not simple. The Hunter has been flying for more than a year and still the testing continues. In early flights Duke looked for apparent troubles. Other flights tested stability measurements and performance rates, such as climb and speed. Now, he and the Hawker experts are trying to get the plane up to maximum speed.

In addition, the testing of the supersonic zone goes on and on. Duke sometimes makes as many as five flights a day, some supersonic, some subsonic, but all of which add more to the increasing knowledge of the sound barrier and what lies beyond.

One of the most important elements in this new frontier is the "why." There are, of course, practical reasons for flying faster than sound—that is, it's a nice thing to be able to do in a dogfight at 30,000 feet, and

John Derry was flying a D.H.110, below, when it fell apart at Farnborough show, killing him and 29 others

it may mean that in the future people can have breakfast in New York, lunch in London, and dinner in, say, Chicago. But to Duke there is something else.

"It's just there," he says.

That, simply, is it—man has overcome flight, so now man has to overcome speed. The sound barrier itself—a mass of turbulent air hit by an airplane flying fast as sound waves—now has been conquered in the sense that it has been surpassed. What lies ahead is to transform today's uncertainty into tomorrow's reality.

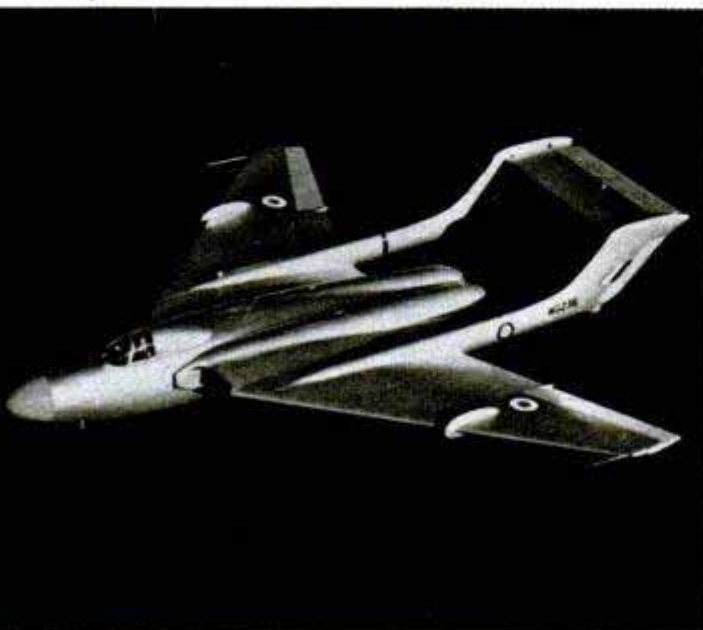
What faster-than-sound flight means to the public is easy to guess. For example, Roland Falk, chief test pilot of A. V. Roe and Co., Ltd., believes that within 50 years there will be a two-hour "commuter" service between London and New York. This will be done, he predicts, in a nuclear-powered aircraft, probably a delta shape, which will carry more than 100 passengers at speeds of around 2000 miles an hour and at heights 10 to 12 miles above the earth. The plane will make 10 trips a day and will land only when it needs servicing. Passengers, cargo and fuel will be carried to it by air taxis seating 25 people. Passengers will transfer between the two planes by means of a pressurized passageway.

The main plane, Falk contends, will not have windows because of the huge difference between atmospheric pressure inside and outside the cabin which would make window installation difficult. However, the passengers wouldn't have to be upset about this, because at a height of 10 miles they couldn't see much anyway.

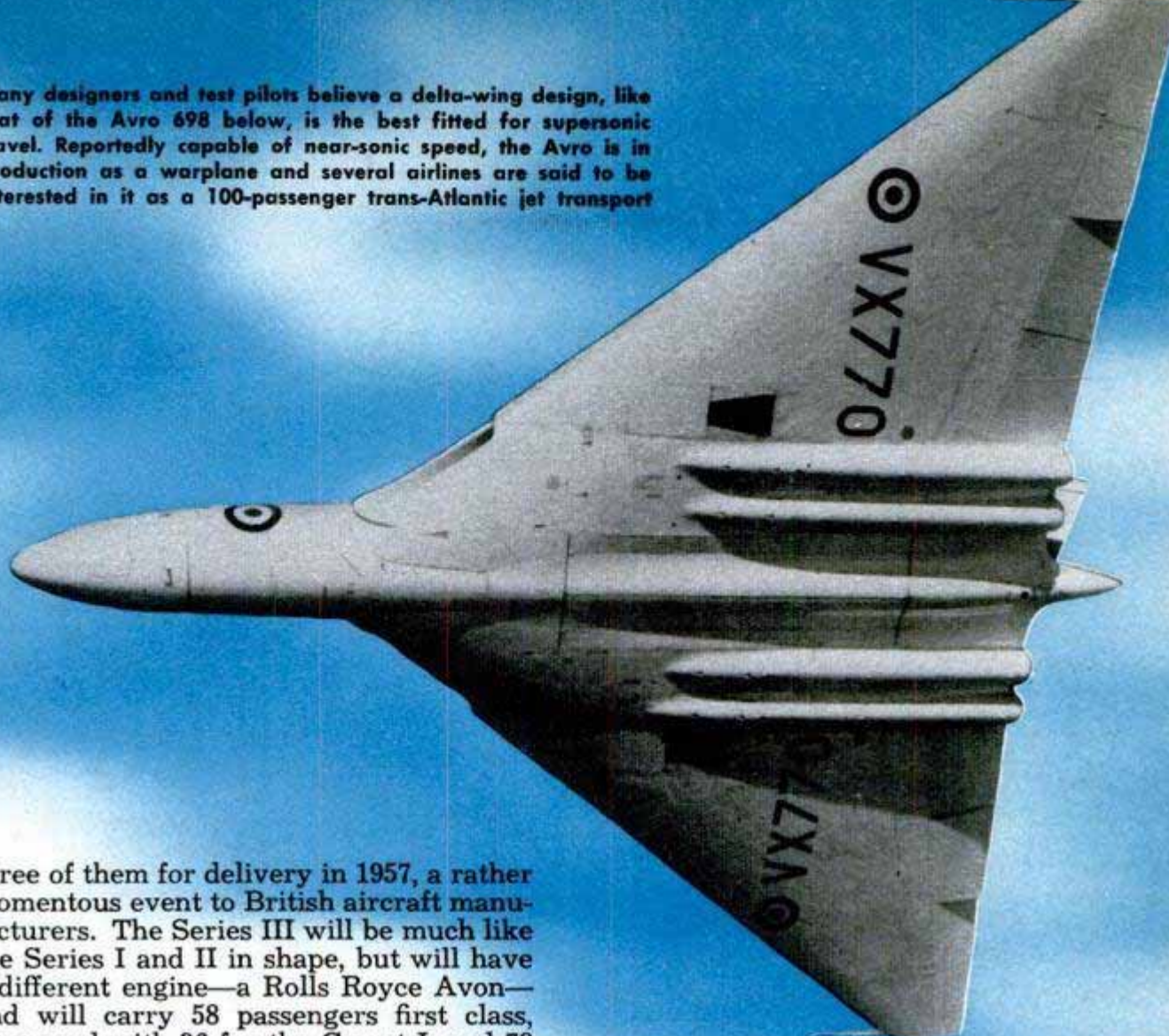
The delta, Duke and others maintain, is the aircraft design of the near future because it is so adept at high speed. To travel into and in the supersonic zone, a plane needs a thin wing in relation to its over-all body to reduce drag. The delta, being practically a flying wing, has this. Other features which adapt it to high speed are easy controllability, easy construction and a large wing area with low wing loading.

Britain now has the Avro 698, a four-engine delta bomber which first flew last August. Its details are so top secret that not even the length is known. Already, however, plans are under way to convert it into a commercial transport, and British Overseas Airways Corporation and others have expressed interest in its possibilities. The 698 would seat more than 100 passengers, and would operate at long ranges and great speed.

So far England is leading the world in the development of jet transports. The de Havilland Comet, the world's first jet airliner, is operating on three world routes. Interest now is centered on the Comet III, and Pan American Airways has ordered



Many designers and test pilots believe a delta-wing design, like that of the Avro 698 below, is the best fitted for supersonic travel. Reportedly capable of near-sonic speed, the Avro is in production as a warplane and several airlines are said to be interested in it as a 100-passenger trans-Atlantic jet transport

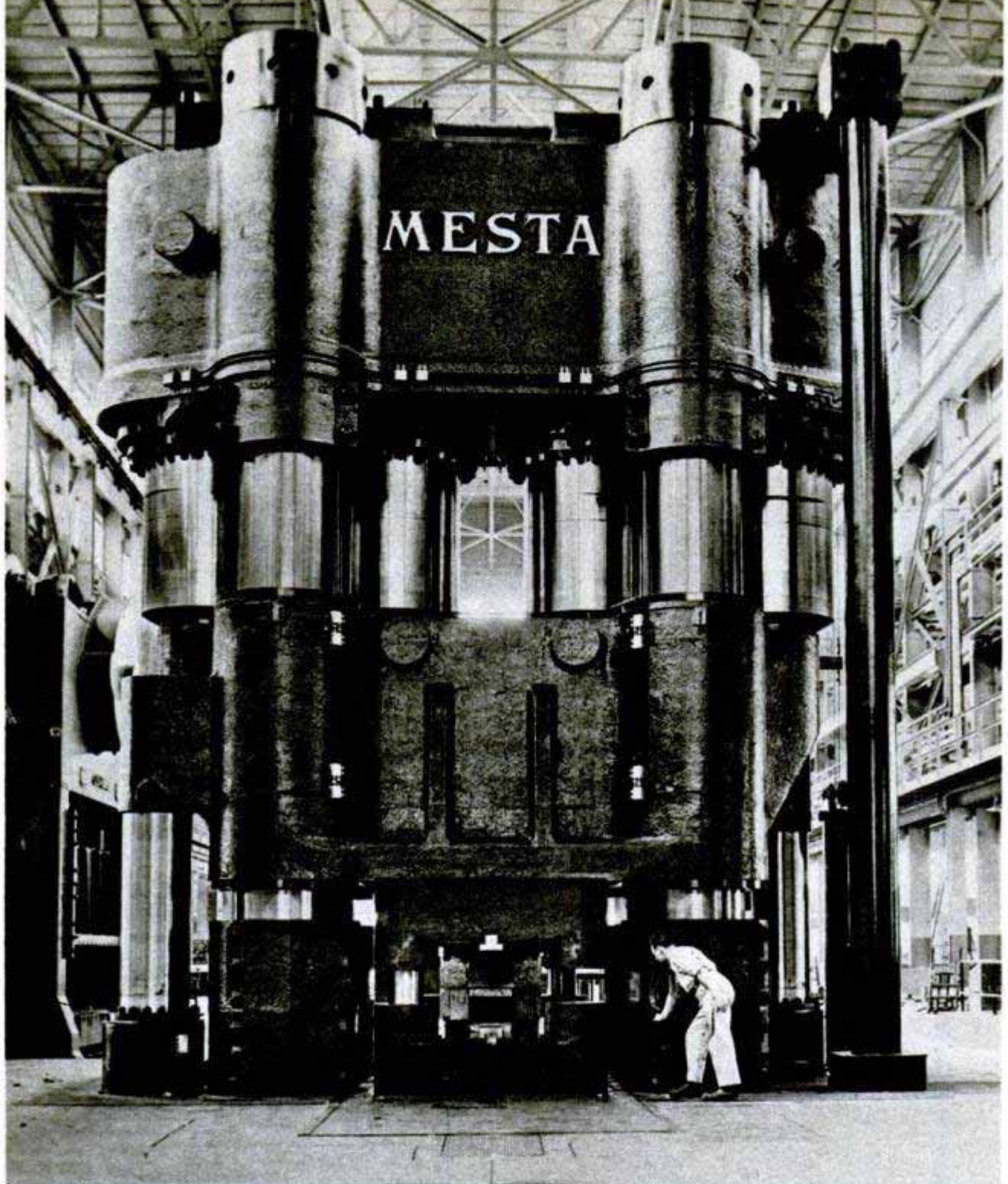


three of them for delivery in 1957, a rather momentous event to British aircraft manufacturers. The Series III will be much like the Series I and II in shape, but will have a different engine—a Rolls Royce Avon—and will carry 58 passengers first class, compared with 36 for the Comet I, and 78 tourist class. Without refueling, it will fly about 2800 miles, against 1750 for the Series I.

The Britannia with jet engines driving its propellers, was first flown last August and B.O.A.C. has ordered 25 for delivery next year. It will seat 90 passengers tourist rate and 60 on standard, and will be able to cross the Atlantic at around 360 miles per hour.

The Comet and the Britannia are, of course, the present. Recently a stewardess on the Comet was discussing its 500 mile-per-hour speed. "That's pretty slow for you, isn't it?" she asked Duke. He grinned, and agreed. And that, as well as anything else, is an indication of the future. ★ ★ ★





"Old Smoky" Forging Press Forerunner of Bigger Machines

"Old Smoky," said to be the largest die-forging press in the Western Hemisphere, packs a punch of 18,000 tons as it squeezes hot metal into huge dies. The squatting, black behemoth rises 32 feet above the floor of the Wyman-Gordon factory in Massachusetts and rests on bedrock 15 feet below

ground level. It's only a preview, however, of a giant die-forging press soon to be installed in the plant under the Air Force expansion program. The new machine will exert a force of 50,000 tons, will stand 48 feet above the floor and rest on a foundation 66 feet below the surface.

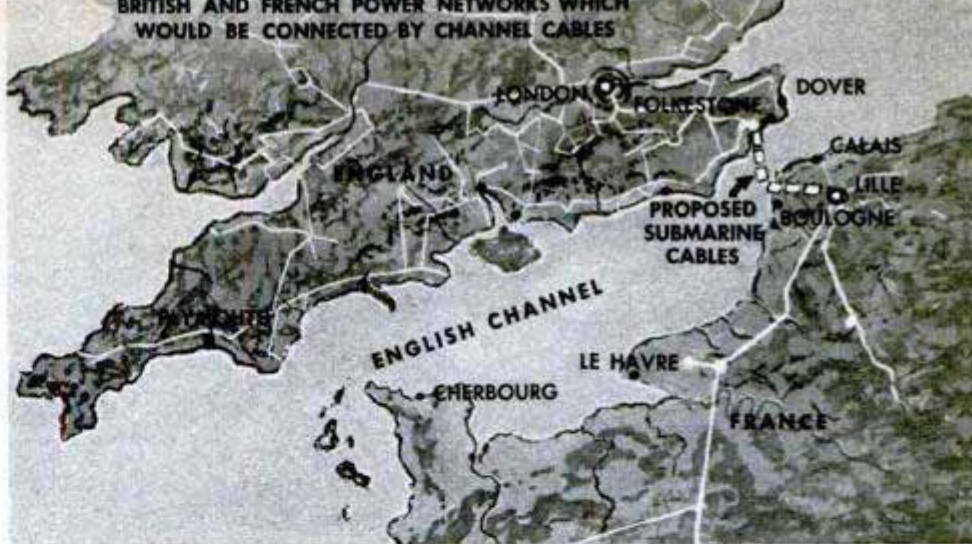
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Two-Nation Power Pool

Electric power may soon cross the English Channel between France and Britain to balance the peak loads of both countries' systems. Four single-phase undersea cables would span the 25 miles which separate the two coasts at the northern neck of the Channel. English electricity would help light French homes, and vice versa, as demands change. The "power shuttle" would smooth out the peaks of both systems and save electricity. In the event of a drought in France, causing hydroelectric power to shrink, or a power shortage in England, one nation could aid the other

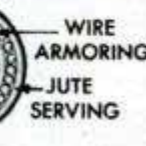
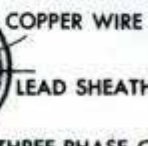
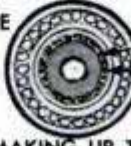
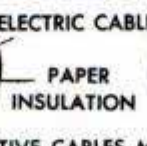
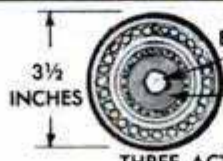


Planned cable would cross the Channel from near Folkestone in England to a point near Calais in France



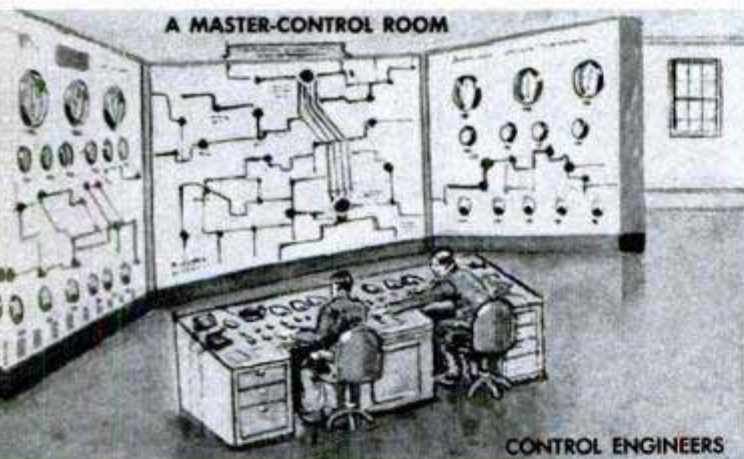
RESERVE CABLE

FOUR CABLES TO BE LAID WOULD INCLUDE ONE RESERVE LINE



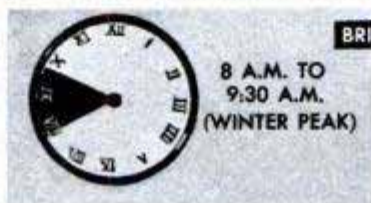
3 1/2 INCHES

THREE ACTIVE CABLES MAKING UP THREE-PHASE CONNECTION

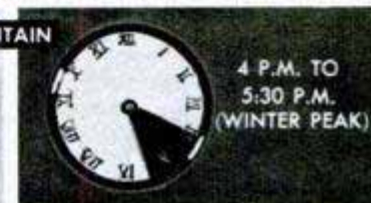


A MASTER-CONTROL ROOM

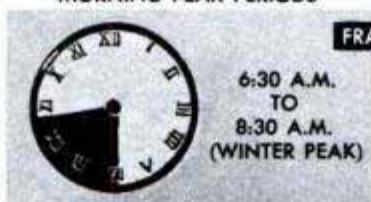
CONTROL ENGINEERS



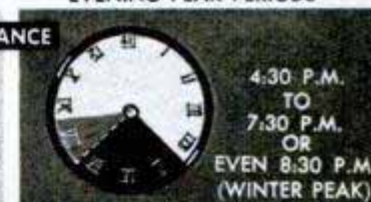
MORNING PEAK PERIODS



EVENING PEAK PERIODS



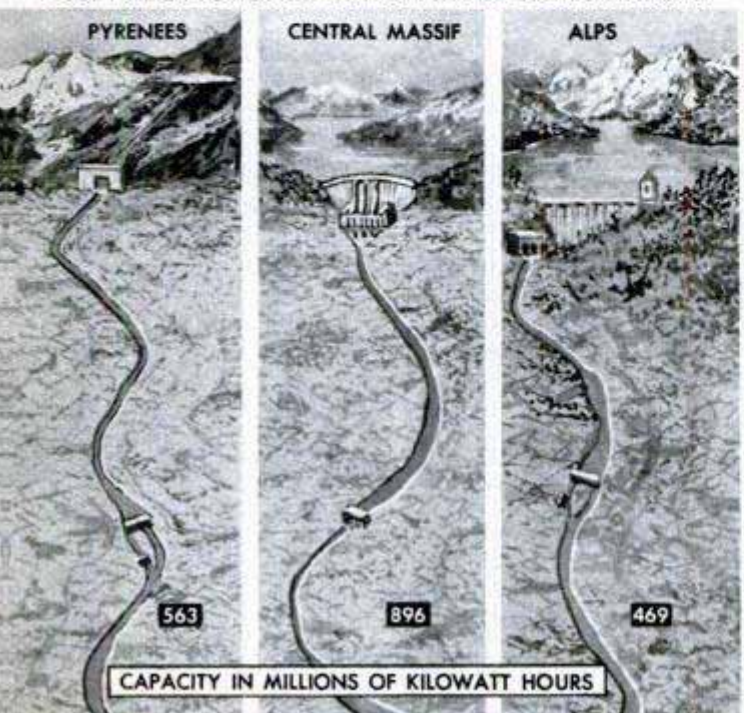
(WINTER PEAK)



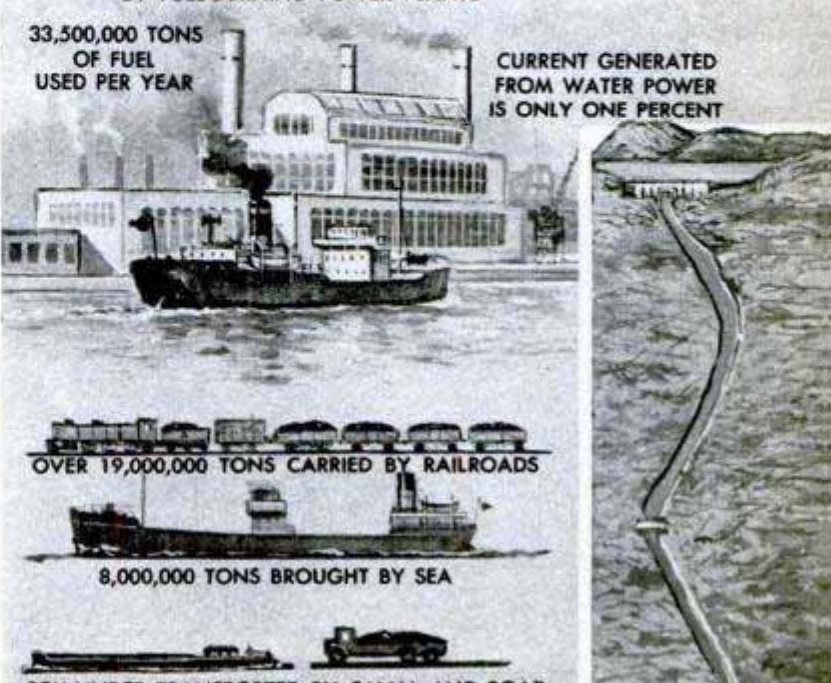
(WINTER PEAK)

Engineers in master-control room maintain constant watch to regulate voltage as demand ebbs and flows. British and French peaks differ because the English arise later and eat evening meal earlier than the French

MOST FRENCH POWER COMES FROM HYDROELECTRIC STATIONS



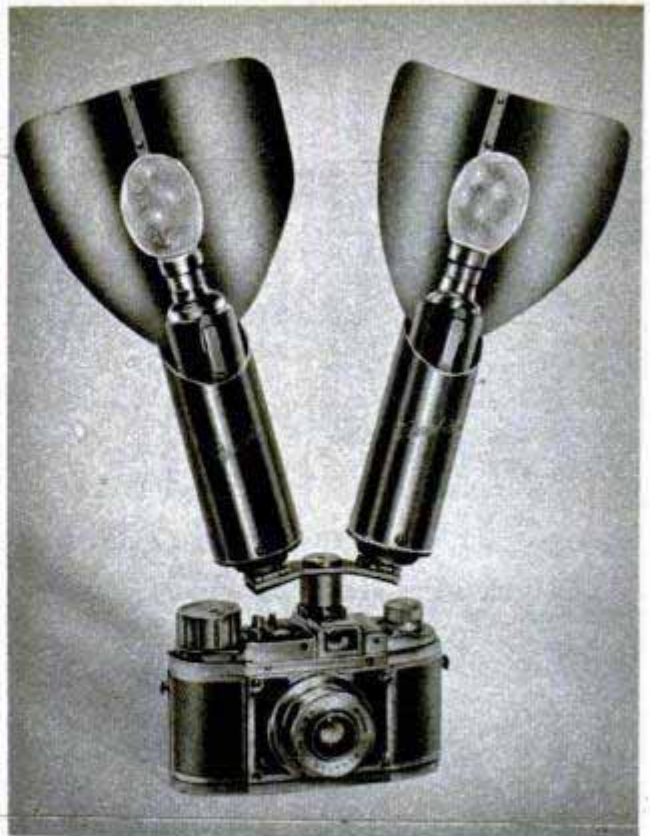
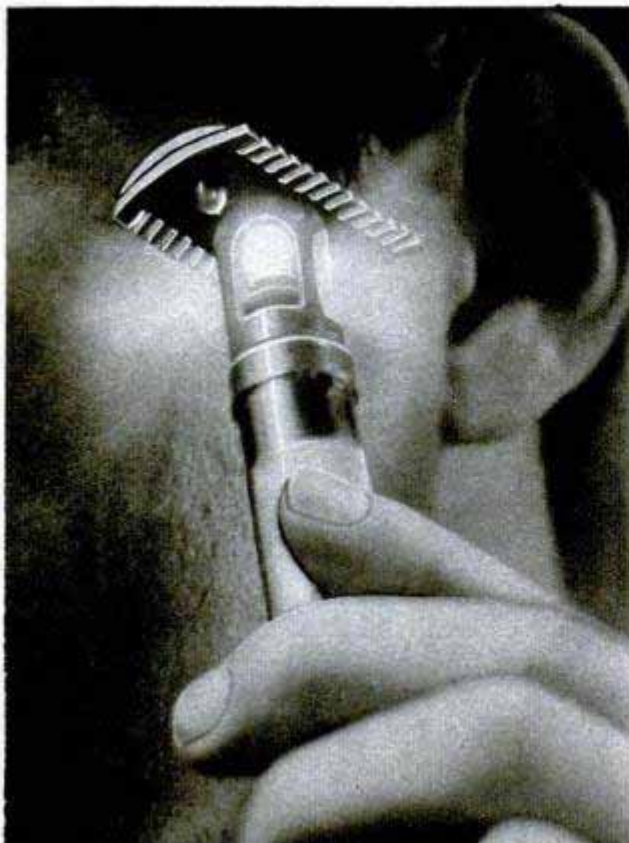
PRACTICALLY ALL BRITISH ELECTRICITY IS GENERATED BY FUEL-BURNING POWER PLANTS





Bulb Planter Cuts and Removes Dirt Core

Stooping and hand-digging are eliminated by a bulb planter that cuts neat, round holes and extracts the dirt core. The gardener simply grasps the handle of the tool and steps down on a projection near the base. The tool insures that all bulbs are planted at the same depth.



Dual Flash Unit From One Contact

With a new flash unit developed in Germany, two bulbs can be set off simultaneously even though there is only one contact. A contact shoe slips onto the camera and a two-unit bow is connected to it. The two flash guns then are fastened to the bow. The dual flash unit has a condenser with an ordinary 22½-volt battery. No wires are required to connect the unit to most cameras. The battery and condenser circuit is closed only when a bulb is in the holder. Thus there is no unnecessary load on the battery, increasing its service life.

Self-Illuminated Razor

Contained just below the head of a Japanese safety razor is a miniature lamp which illuminates the shaving area. Dry batteries in the razor's handle supply current for the tiny bulb. Designed for the traveler who has to struggle along with dimly lighted mirrors, the razor also serves as a flashlight once the head is removed.

Bags Sprayed on Jet Engines

Plastic bags are being sprayed on new jet engines to protect them during overseas shipment. A Zipper is laid over the engine and a quick-drying plastic sprayed on. The plastic forms a tough but pliable airtight coating over the engine's irregular contours and over the Zipper.



Homemade "Snorkel"

After escaping from a prison labor battalion, a 22-year-old Czech decided to attempt an escape from his homeland by swimming the Morava River. While in hiding he came across a German gas mask, fitted a rubber to it and camouflaged the end of the tube with glued-on twigs. After a 15-minute swim, part of it underwater with the aid of his homemade "snorkel," he came up in Austria, his escape a success.



Lock of Many Combinations

Four trillion different combinations — more if desired—are possible with a new lock designed by Swedish meteorologist Fabian Nilsson. No two locks will open with the same key. The standard keyhole is replaced by a thin slit; the key itself resembles a nail file and has a hole instead of notches. One drawback is the fact that you'd probably have to be a bit of a marksman to find the keyhole on a dark night.

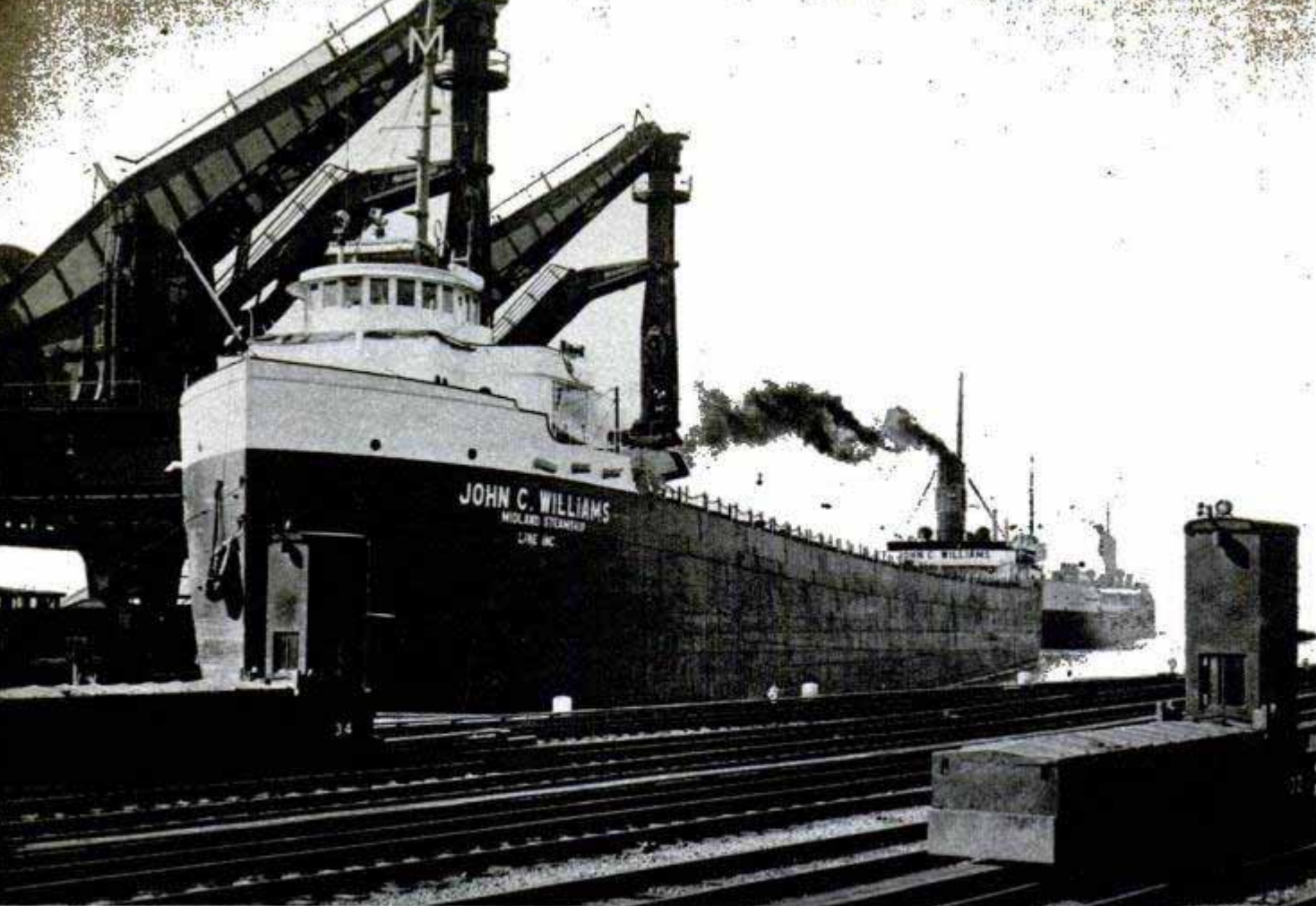
Motorless Sweeper Speeds Cleaning

One worker can sweep 15,000 to 22,000 square feet of space in an hour with a motorless industrial sweeper that operates like carpet models. Using a push-broom, it would take him 2½ hours to cover the same area. The 48-pound sweeper picks up all kinds of debris — wet and dry paper, metal scraps, dirt and trash. A side brush attachment permits sweeping close to walls.

Quicker Stop for Jets?

Reversing the thrust of a jet engine has been proposed as a means of bringing planes to a quicker halt. When flaps devised by Swedish inventor Bo Klas Oskar Lundberg close over the rear of a jet, other flaps open and the blast exits in reverse.





Huge unloaders dip endlessly into holds to scoop out "red gold." Last year they unloaded 75,000,000 tons

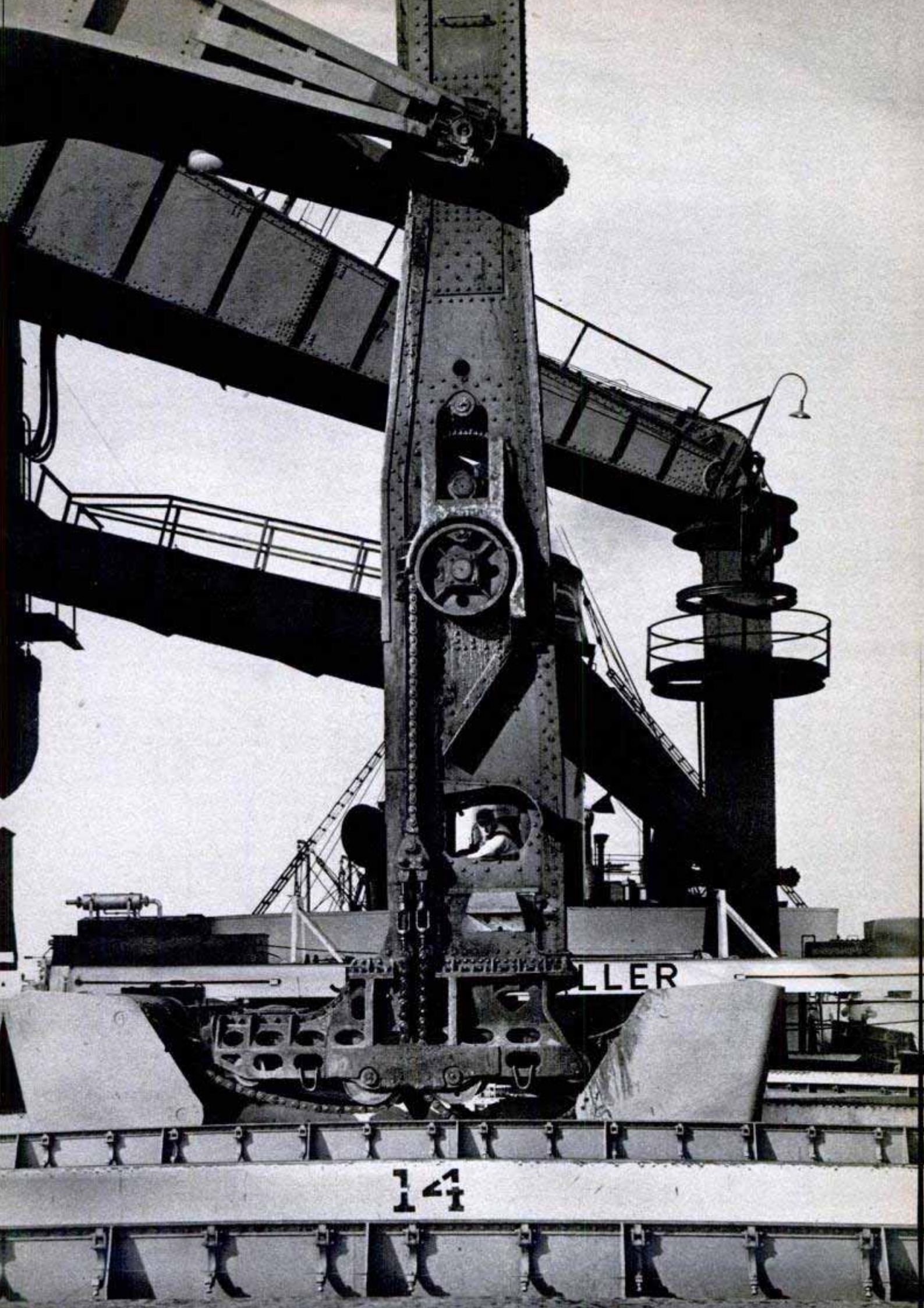
GIANT JAWS UNLOAD ORE SHIP

"Leg" man lowers bulldozer to scoop up last scraps of ore

By Dwight Boyer

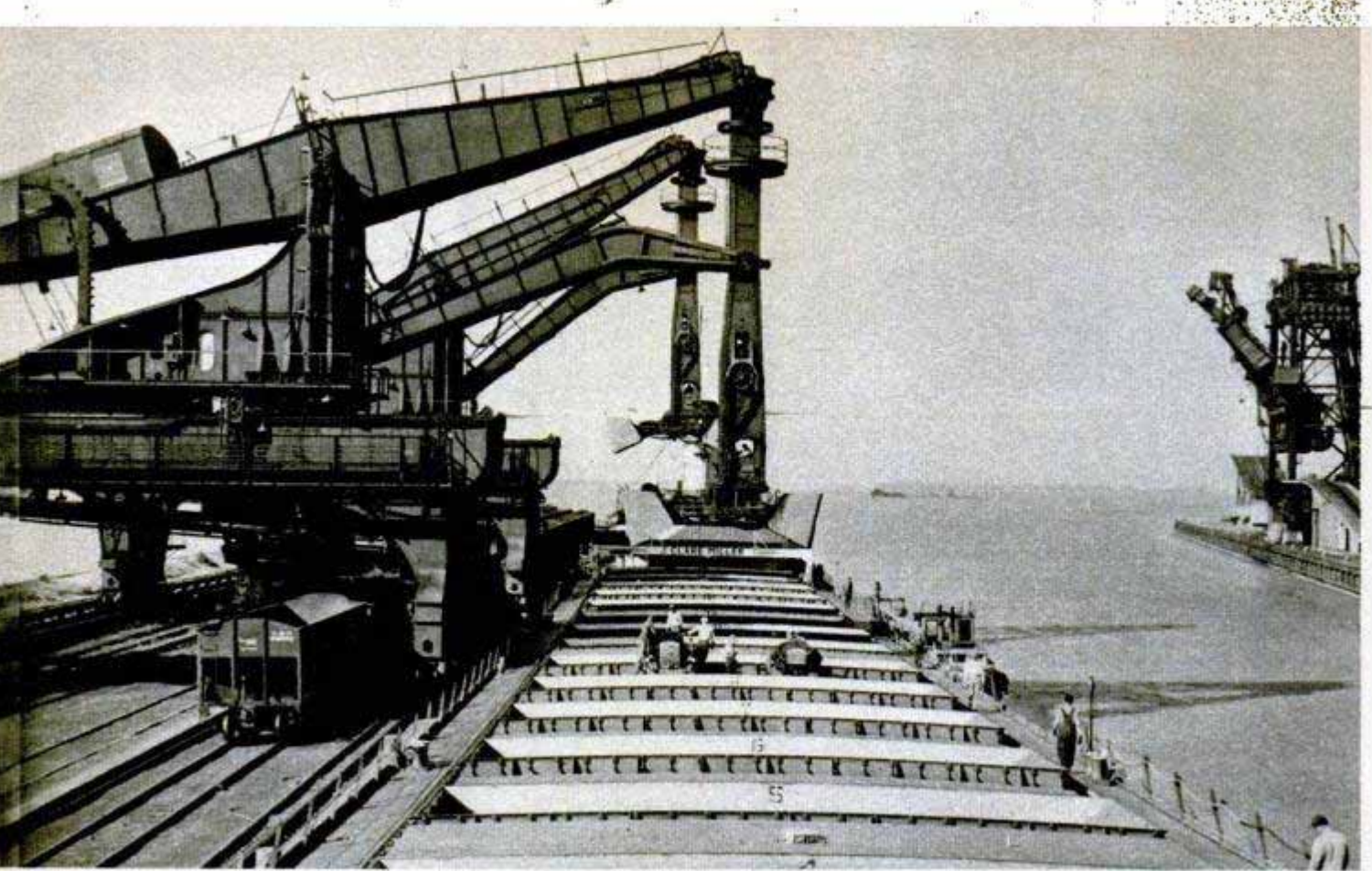
FROM SPRING TO FALL, in a dozen Great Lakes ports, weird machines and brawny men dip constantly into the holds of the big freighters to scoop out more muscle for America.

Ever hear of "ore hogs"? The ore hog is a man whose clothes take on a rust-red hue and who finds iron ore in his shoes, hair, pockets and lunch box. A typical ore hog is a well muscled, high-speed, rough-and-tough individual who, with the help of his buddies and the assistance of a fantastic rig known as a Hulett unloader, performs an important and herculean task. He works hundreds of miles from the iron-ore mines in a noisy bedlam of grinding machinery, scraping shovels, roaring bulldozers and a weird screaming of whistles. Out of this come long trains of iron ore—food for hungry blast furnaces. Last year 75,000,000 tons moved across the Great Lakes.



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MILLER

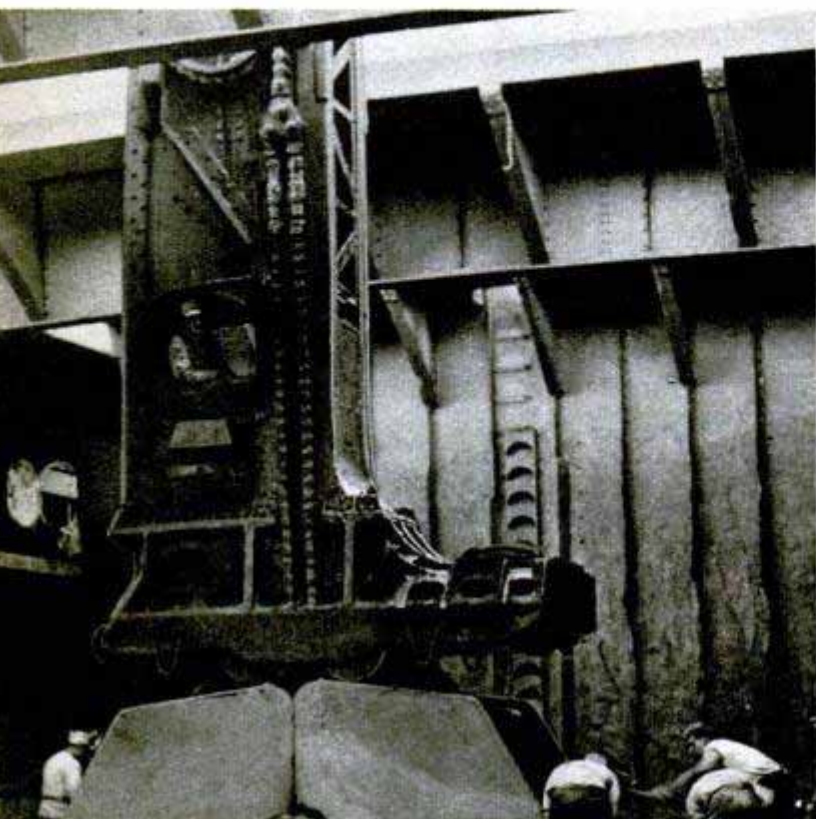


Here's a view aft of leg men unloading the cargo. Some lake ships are quite long; one measures 714 feet

During the nine-month Great Lakes shipping season, the ore hogs—shovelers, “larry” car weighers, bulldozer operators, car pushers and “leg” men—unite in this miracle of supply that stock-piles enough iron ore to last through the winter.

The leg man on a Hulett iron-ore unloader must possess a special blend of brawn, brains and a “go for broke” attitude.

Sweepers and shovelers glean last pound of ore from huge cargo hold. They must work under descending leg



He must also be conscious of the safety of fellow workers below him as he deftly maneuvers a 75-ton vertical ramrod and iron-jawed grab bucket.

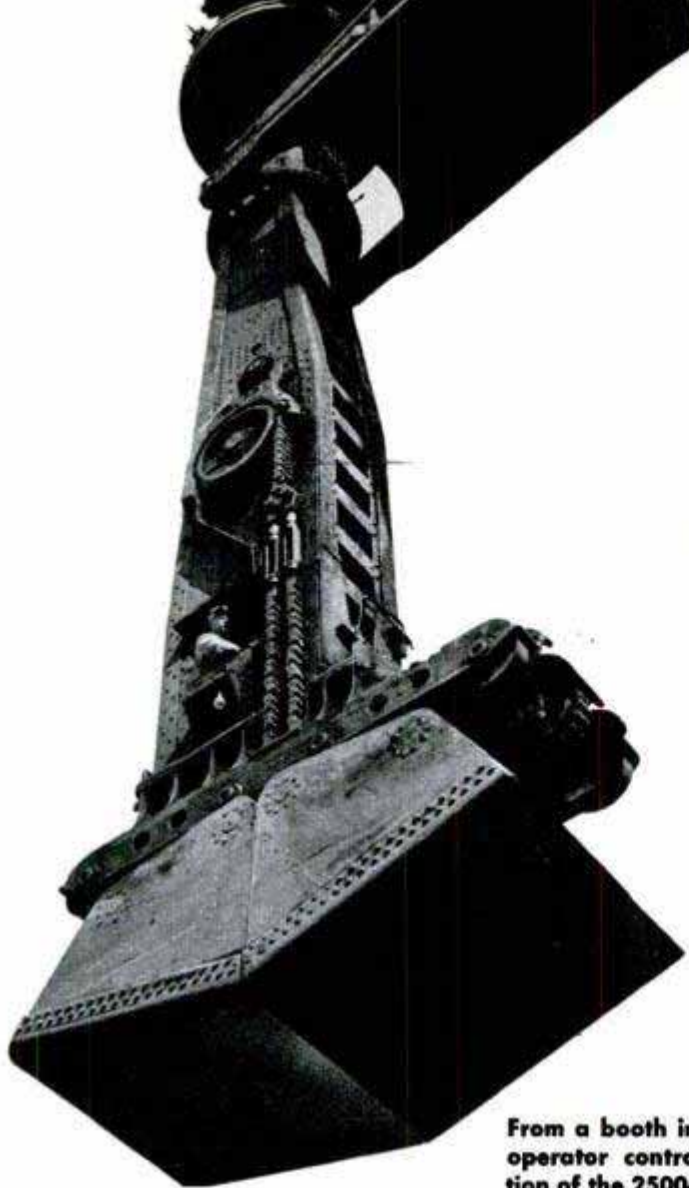
The Hulett iron-ore unloaders, ingenious creation of the late George H. Hulett, resemble clusters of potbellied vultures squatting along the waterfront while indulging in a feast. Sliding sideways on steel rails, moving from hatch to hatch, they dip deep into the holds of the long freighters. They are monsters of steel with the balance and precision of fine instruments, guided by the leg man whose control booth is inside the 60-foot leg.

It's a hazardous job at best. A steamer once broke her lines and toppled an entire 2500-ton Hulett machine over on the ship with fatal results. On another occasion the whole 75-ton leg broke away from its coupling and crashed down into the open hatch.

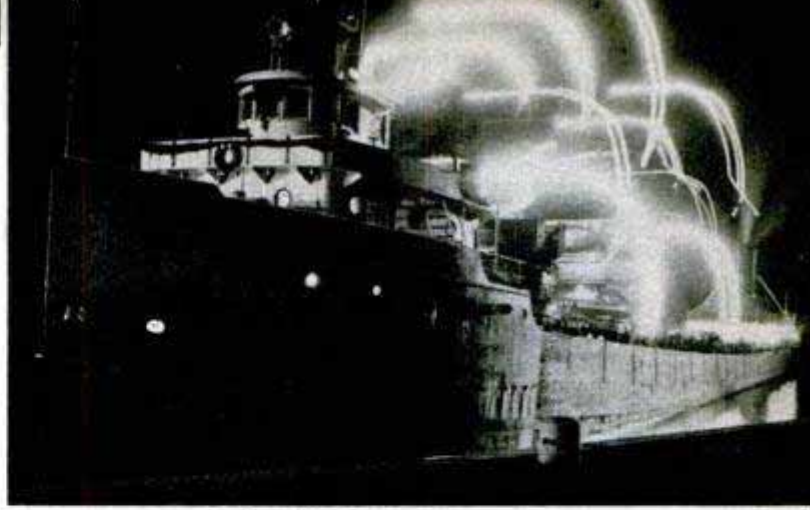
The leg man somehow avoids collisions with bulldozers, ship's gear and other ore hogs. Down on the floor of the hold work the shovelers—men who get the last pound of ore from corners, and bulldozers that scoop the ore from between hatch areas.

A little over a half century ago, ore was emptied by hordes of sweating shovelers and mule-powered hoists. It took days to unload a small schooner in the 1890s.

Today George Hulett's vultures snatch 18 tons of ore at a bit and, biting once per minute, they empty a freighter with a 16,000-ton capacity in eight hours. ★ ★ ★



From a booth inside the leg, operator controls each motion of the 2500-ton unloader



Unloaders work night and day to finish before lakes freeze. Time exposure shows machines' movements

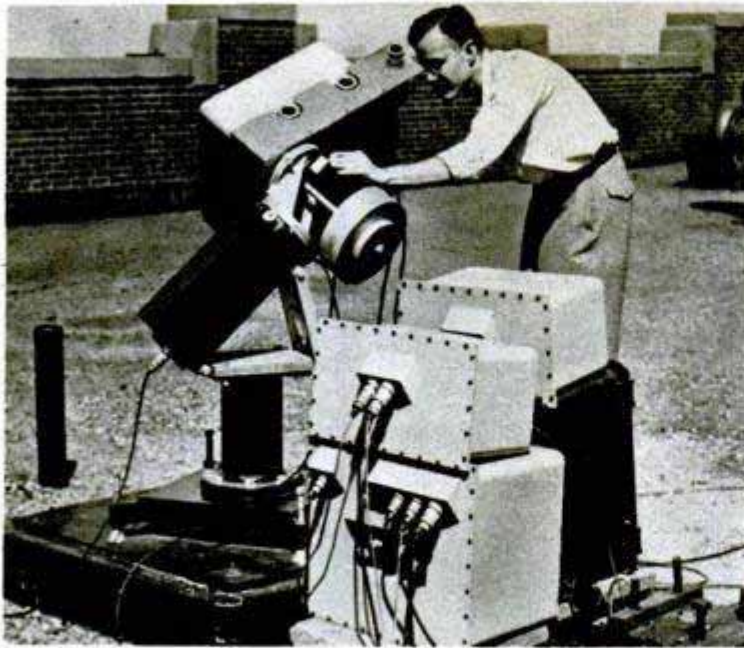


Leg man is highly skilled worker. Most operators spend a year on job before fully mastering the machine

Below, working at night, bulldozer operator scoops ore from the area between hatches into reach of the unloader's jaws. Other "ore hogs" stand by to sweep up last of the ore, then ride leg up to the dock



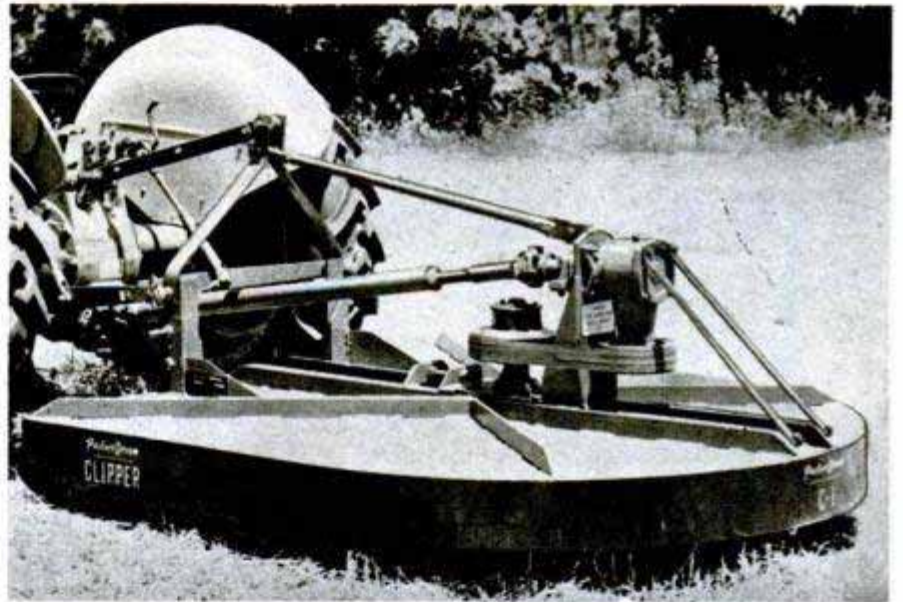
"Sun Gazing" Machine Measures Solar Energy for Paint Research



Mounted on apparatus which keeps it pointing at the sun, a spectroheliometer keeps careful track of the sun's rays. It measures distribution of the sun's energy, the variation of energy with time of day and season of year, and the intensity of rays from different parts of the sun's spectrum. Automatically recorded, the information is correlated with the weathering of automobile-paint samples in outdoor exposure racks. GM researchers will use the data to determine which parts of the sun's rays are most injurious to finishes. Findings from the study will enable them to develop more durable automobile paints by spotting the basic weaknesses of paints now in use.

Rotary Mower Cuts 60-Inch Swath

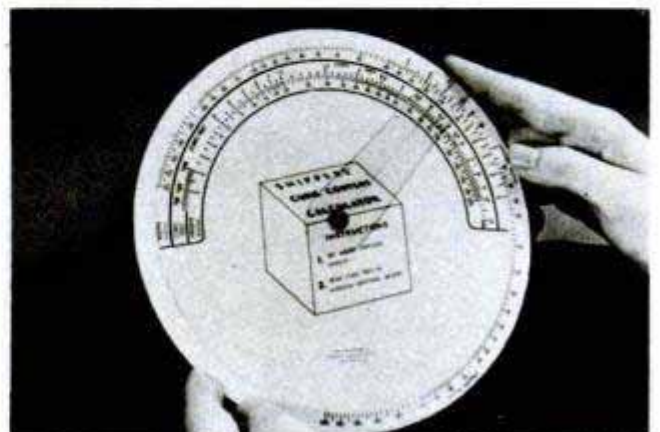
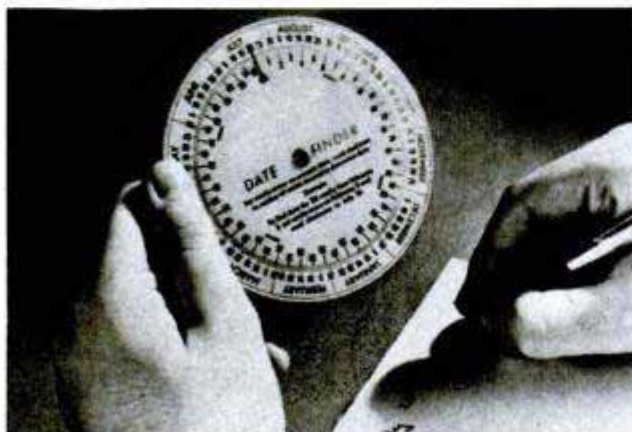
Hugging the ground closely, a tractor-drawn rotary-cutting device efficiently and economically mows pasture lands. It cuts a 60-inch swath with a single, revolving blade. The cutting height can be quickly adjusted. A double spring-loaded disk clutch, mounted on the main blade shaft, prevents shock impact on the power take off and eliminates the need of shear pins or field replacements.



Circular "Slide Rule" Calculates Dates Weeks in Advance

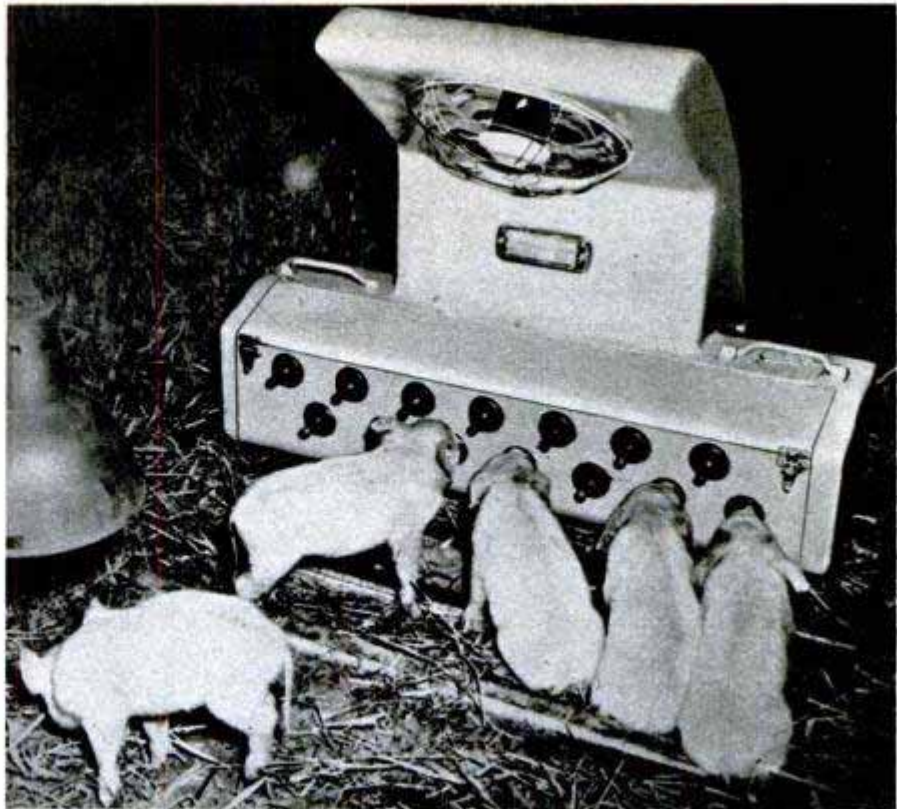
Determining future dates and computing cubic volume are functions of plastic calculators made in three models. A four-inch disk tells the date any given number of weeks in advance. A larger eight-inch cal-

culator determines the date a certain number of days away. The cubic-content calculator provides a quick means of determining the cubic feet of space required for a package from length, width and height in inches.



Synthetic Sow Warms and Feeds Young Pig Brood

Big news in the swine world is a mechanical mother for progressive piglets—an English invention which warms and feeds up to 14 young porkers. Taken from their real mothers when only a few days old, the pigs soon learn to extract the cow's milk supplied by two rows of nipples at the base of the device. An overhead infrared lamp provides warmth, promotes their appetites and protects their health. And there's no danger of being crushed or eaten by a thoughtless mother, a common occurrence in the average hog house. Experts claim that the new pig rearer boosts meat production by 50 percent.



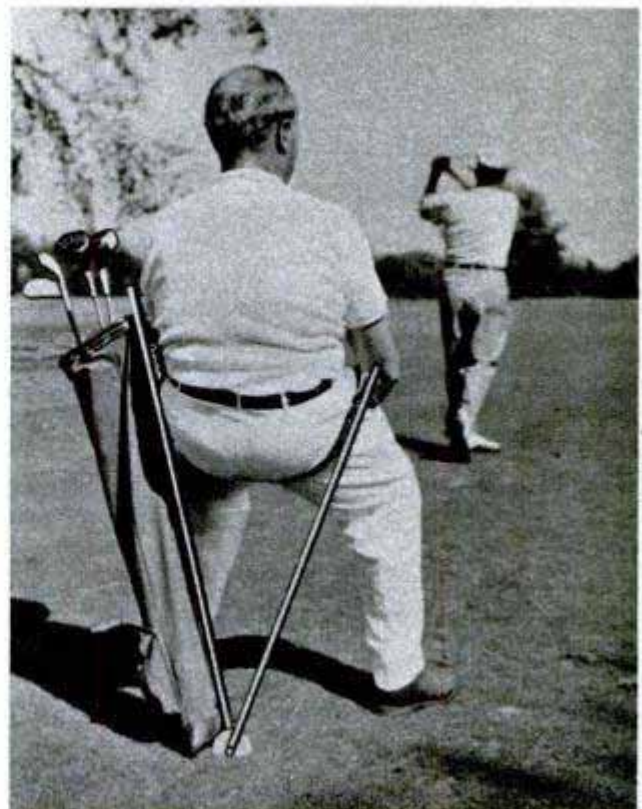
French Four-in-One Musical Instrument Has Sounding Board

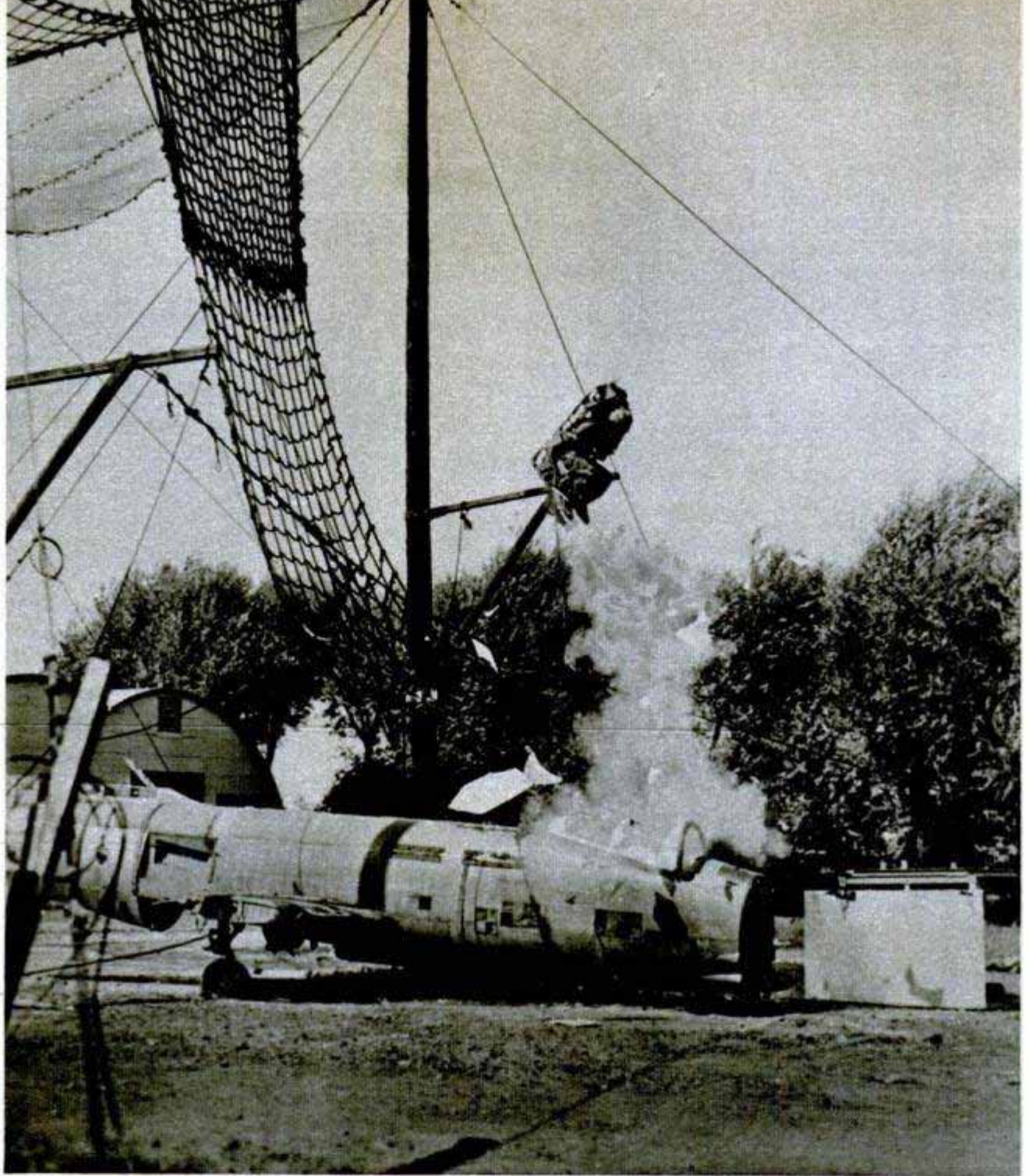


For the versatile musician who changes instruments to suit his moods, a combination violin, mandolin, Hawaiian guitar and alto banjo offers a wide range of media. Shown at a Paris exhibition, the contrivance has a common sounding board for four sets of strings. The amount of music produced is limited only by the number of hands and the sensitivity of the player.

Lightweight Golf Bag Mounts Folding Seat

Weary golfers can rest between shots in a portable seat attached at one side to a lightweight golf bag. Two hardwood supports swing out to form a vee when in use. A wide padded strap connecting the sticks at the top provides a hammock seat which will support a 300-pound man. His feet complete a three-point support. The seat becomes a comfortable shoulder strap for carrying the bag between tees; a slide on the strap adjusts for sitting or carrying position.

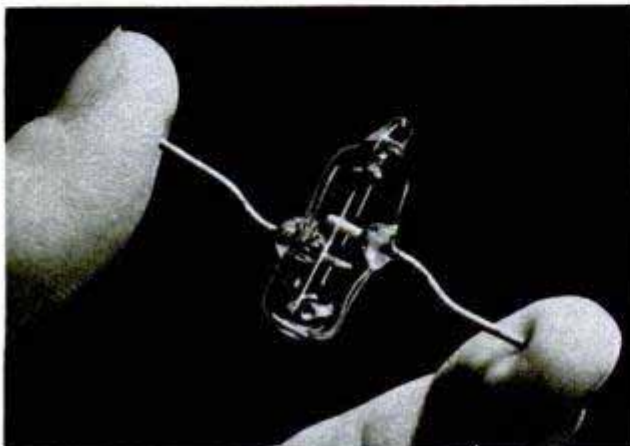




Test Firing Pilot and Seat Through Jammed Airplane Canopy


To help pilots escape when their canopy is jammed closed, the United States Navy is testing the feasibility of firing both the

pilot and his ejection seat through the canopy. In the experiments they use a dummy and a net to catch it.



Tiny Mercury Pulse Switch

Able to open and close electric circuits instantly with little power and practically no friction, a mercury pulse switch provides a variety of useful functions. Mounted on a shaft powered by a small electric motor, a tiny tube containing two electrodes and a mercury droplet rotates at a determined speed. As the tube rotates, the mercury droplet rolls from one end to the other, each time passing between the electrodes and momentarily allowing the current to pass by acting as a conductor.



They Call It Spin Fishing

By Joe Godfrey
*Prominent Outdoor Writer,
Secretary, the Sportsman's
Club of America*

A NGLERS ALL around the world are being teased and tempted by a way of fishing that's brand new to most of them. Once they nibble at the bait they're as good as landed, for this new technique is so versatile and exciting it has an appeal the average angler can't resist.

They call it spin fishing, and experts who have been watching sportsmen rise to the bait say that within 10 years Americans will be a nation of spin fishermen, bar a few die-hards who refuse to try anything new.

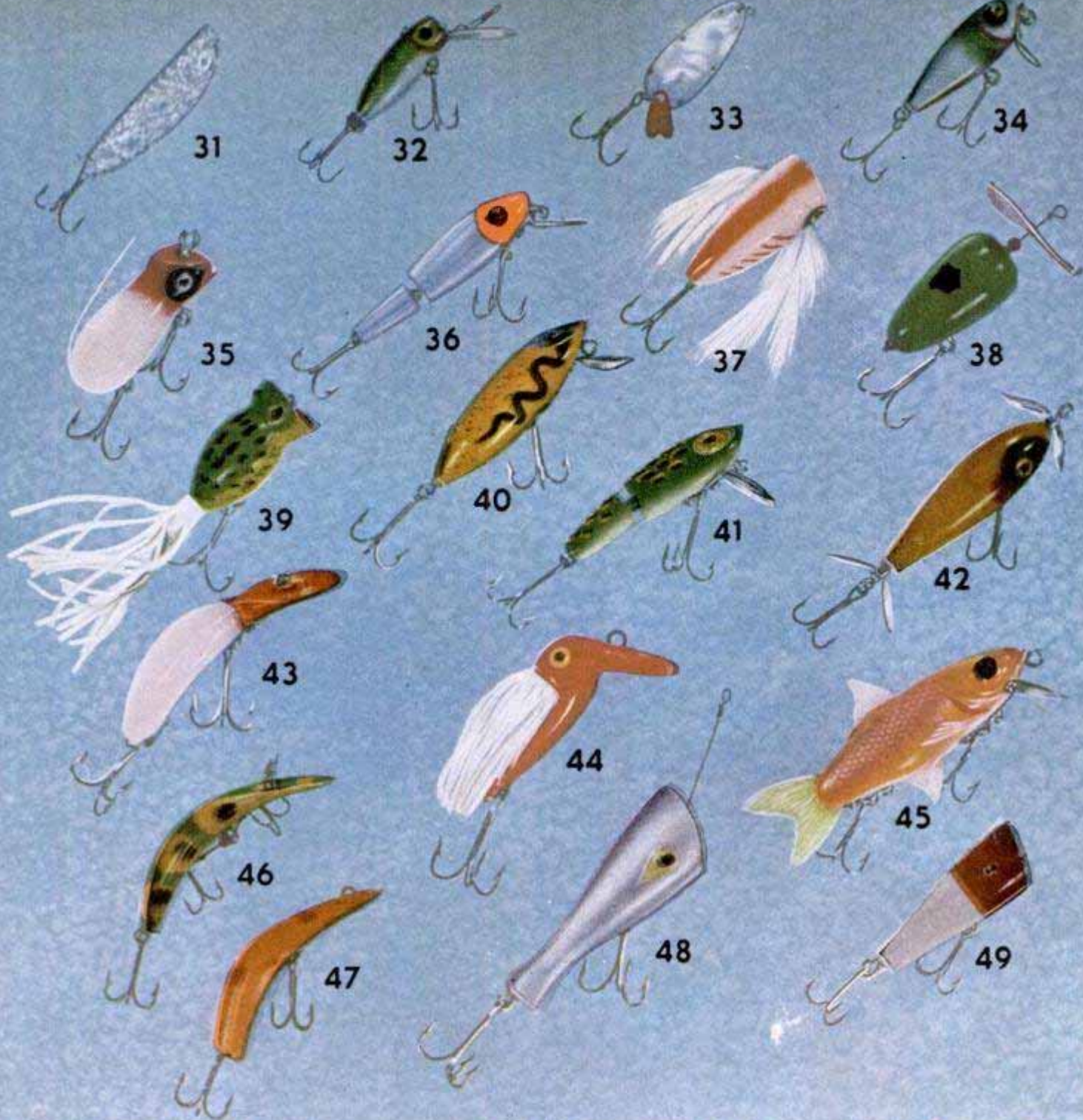
What has made spin fishing (or just plain spinning) dart ahead in popularity during the past few years?

It completely licks the backlash bogey—you just

Portrait of the author spin fishing was painted by Robert Korta, staff illustrator

Korta





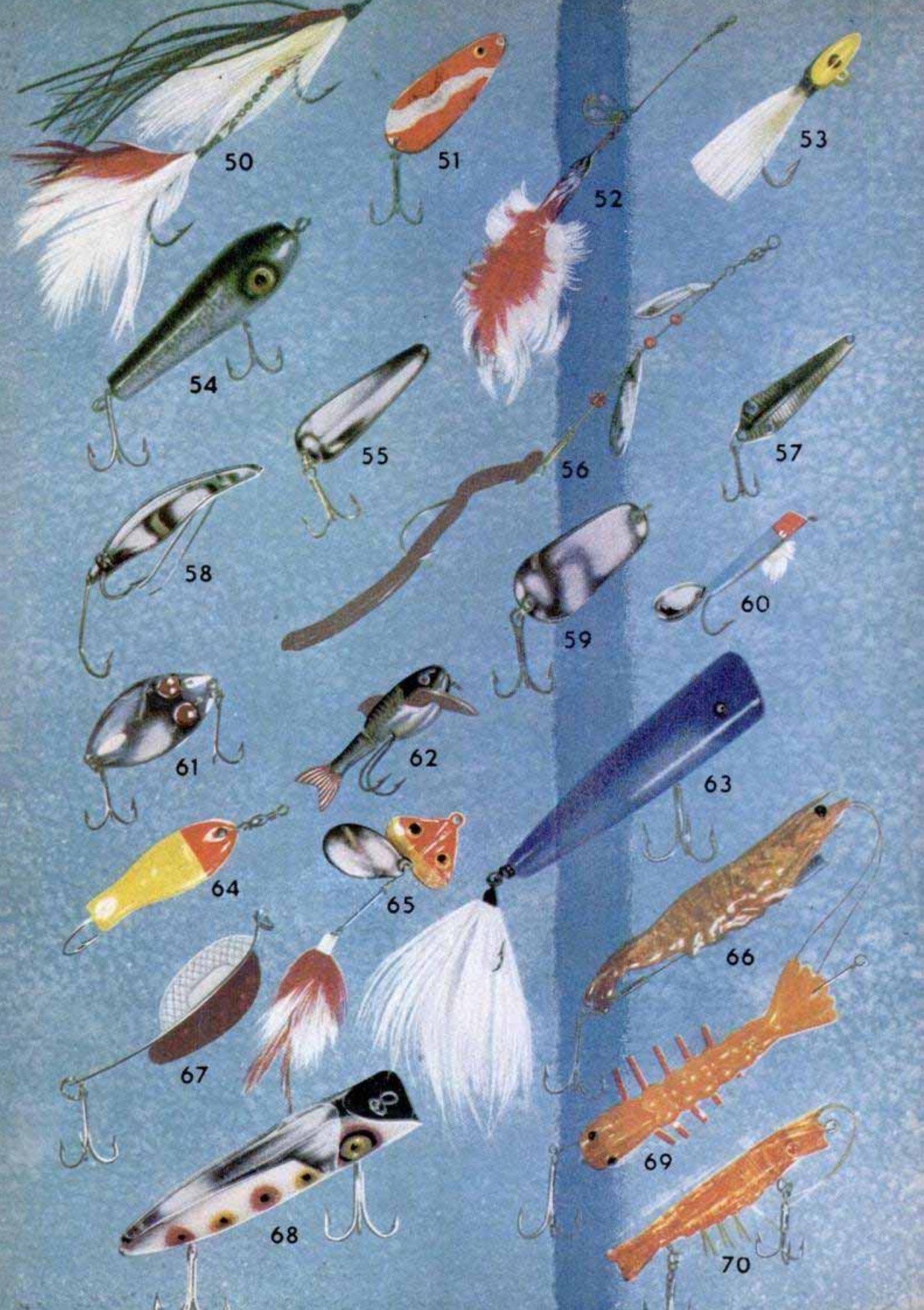
For identification of the numbered spin-fishing lures on these pages and the following page, see page 85

can't backlash or overrun a spinning reel. It enables a fly fisherman to stand on the bank and flip a weighted trout fly far out into a mountain stream. It enables the surf caster to reach out beyond the heavy surf. It enables the sportsman to use the lightest possible tackle in taking the largest possible fish. And any man, using just one rod and reel, can bait cast, fly fish, surf cast, troll, mooch, drift or still fish, using any type of lure from wet or dry flies to plugs, spoons, spinners and live or cut baits.

The fun of spin fishing is the lightness of the line against the pull of a big fish, and the heart of spin fishing is the reel. Essentially all fishing reels are spools, similar to a spool of thread. Ordinarily when you pull thread off a spool, the spool itself re-

volves. This is the principle of a conventional bait-casting reel. But if you hold a spool at one end and pull the thread directly off the other, the thread spirals out quickly and easily with the spool remaining stationary. This is the principle of a spin-fishing reel.

Because friction is virtually eliminated in a spinning reel, the angler can make extremely long casts with miniature lures. They can be weighted flies, streamers, small plugs or spoons and a great variety of new spinning, wobbling, limping and popping lures that are imported from France, Switzerland, England, Belgium, Sweden and Germany. By attaching a plastic float to the line near his lure, the spin fisherman can float his fly long distances



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Domestic



DOMESTIC REELS, left to right: Waltco Ny-O-Lite, Good-All Star DeLuxe, Fre-Line, Heddon Spinpal, Shakespeare Spinning Reel, Langley Spinlite, H-I Bradco and Whirlaway. Some domestics are open-face, others closed

SPIN-FISHING LURES: 1—T-Dolly. 2—T-Fish. 3—Diver. 4—T-Fling Long. 5—B. & H. Spinner. 6—Butterfly. 7—Niftee-Spin. 8—Spinning Limpy. 9—Colored Spinner. 10—Itzaduzy. 11—Tail-Lite. 12—Abu Reflex. 13—Crippled Shad. 14—Spincaster. 15—Pixie. 16—Slim Jim. 17—Weaver. 18—Hot Shot. 19—Popit. 20—Rangelēy Minnow. 21—Voo-Doo. 22—Jitterbug. 23—Ubangi. 24—Fin Dingo. 25—Silver Minnow. 26—Miracle Minnow. 27—Reflecto. 28—Chum Spoon. 29—Highland Fling. 30—Sunrise Special. 31—Flat-Tail. 32—Deep-R-Doodle. 33—Pearl and Copper Spoon. 34—Super Midget. 35—Swimming Mouse. 36—Mirr-O-Lure. 37—Spin Popper. 38—Spinning Barney. 39—Hula Popper. 40—Fish-Obite. 41—Miracle Minnow. 42—Spin-I-Diddee. 43—Tad Polly Spook. 44—Lucky Bunny. 45—Strikee. 46—Flatfish. 47—Lazy Ike-2. 48—Walkie Talkie. 49—Spinning Plunker. 50—Bead-Buck Tandem Fly. 51—Gypsy King. 52—Baby Jig Feather. 53—Nylure. 54—BeBop. 55—Flasher Minnow. 56—Night Crawler. 57—Chelly. 58—Dipp-E-Minnow. 59—Wob-L-Rite. 60—Quilby Minnow. 61—Red Eye Wiggler. 62—Plucky. 63—C. C. Surf Spinner. 64—Duro Flash Spoon. 65—Shady Lady. 66—Actual Shrimp. 67—Multi-Wag. 68—King Andy. 69—Martin Shrimp. 70—Tasty Shrimp.

participating in the establishment of a new major outdoor sport. So many millions of just plain folks have gone in for spin fishing that the demand for spinning rods, reels, lines and lures has far exceeded the supply. There are at least 50 spinning reels now made in this country, Canada, Australia, England, France, Italy, Switzerland, Belgium, Sweden, Germany and Japan. Spin-fishing rods, from six to nine feet long, are made of hollow glass, bamboo, solid glass and tubular steel. Most of them have extremely large guides to decrease friction as the line whispers out. The lines themselves are mostly nylon monofilament, braided nylon and imported platyl monofilament.

Though fishermen in most parts of this country are just waking up to spin fishing, it isn't exactly a new sport. The English and French started spin fishing about 1905. There was an early French model of a spinning reel, but the most famous of the early fixed-spool reels was the Illingsworth which was made in England.

from shore or boat and cover water that would be impossible to reach with a fly rod.

In spin fishing, the lightest lines from two to ten-pound test are used without much fear of breakage, even by large fish, because the reel gives off line as fast as the fish jerks or pulls it. It's no surprise today to hear of an extremely large white marlin being taken on a 10-pound test monofilament line, or three-foot rainbows and 40-pound Chinook salmon brought in on six-pound test braided nylon.

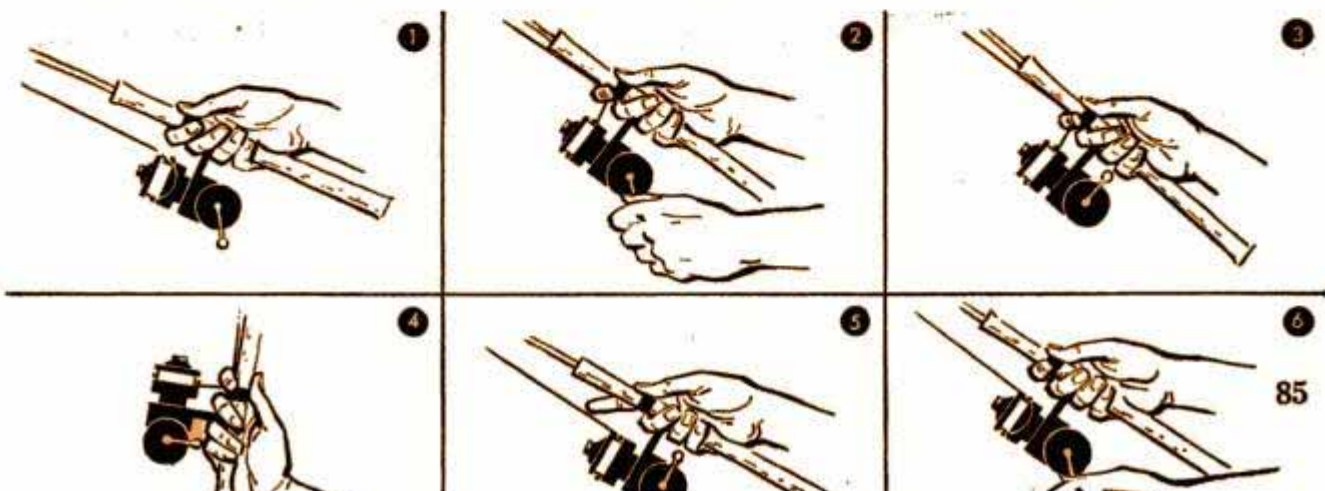
The fishermen of North America are

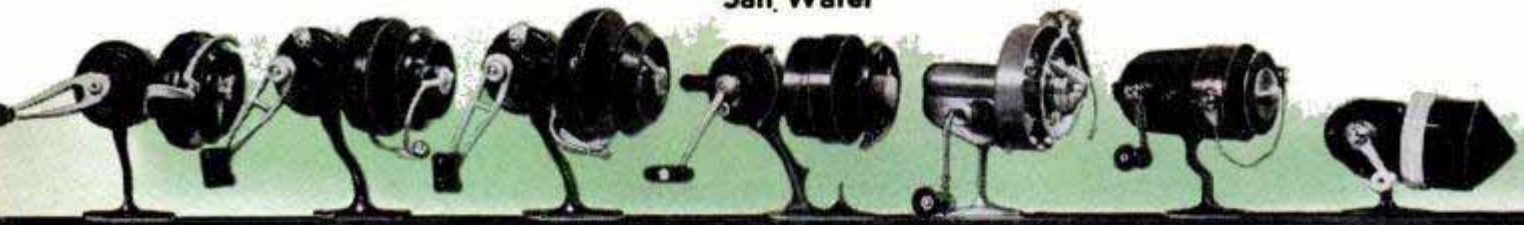
In 1933 I had the pleasure of casting a Hardy Altex, an English reel, and at that time there were few sportsmen in America who had even heard of spin fishing. The reel was amazingly easy to use. A quick flip of the wrist sent out a beautiful and sparkling little invitation to a fish 120 feet across the bay.

In spinning, the line is wound around a fixed spool. The axis of the spool is parallel to the rod. When the handle of the open-face reel is turned after a cast, a mechanical finger (pickup bail) automatically picks up the line to rewind it on the spool. To

HOW TO CAST AN OPEN-FACE REEL: 1—Hold rod with two fingers on each side of reel stem, with the lure about a foot from tip of rod. 2—Hold line against rod with forefinger, turn reel to casting position.

3—With bail pickup disengaged, prepare to cast. 4—Bring rod to vertical position in a sweeping motion. 5—Flick wrist forward and point finger at target to release line. 6—Start your retrieve





SALT-WATER REELS, left to right: Ru-Sport, Ru-Mer 50, Ru-Mer Atlantic, and Booth Centaure. Remaining reels, the Silent Spin-Flyte, Quick and South Bend Spincast, can be used either for fresh or salt-water spinning

prepare for the next cast, the bail merely is pushed out of the way so the line can spiral off the spool freely.

When a fish strikes, an automatic and adjustable clutch permits it to run line off the reel. Thus, if the angler is reeling in a fish and it decides to make a long run, the line spirals off under tension, despite the fact that the angler may still be retrieving. Thus, for the first time in fishing, there's a real balance between the fish and the tackle.

Though the theory of spin fishing hasn't changed much since the early days, the rods and reels, lines and lures are being made of new materials. One of the latest reels is made exclusively of nylon and glass fiber, weighs only four ounces, operates smoothly, requires no lubrication for the life of the reel and is impervious to salt-water. There's nothing in it to rust or corrode.

The best spinning rods are similar in action to a good rod designed for dry-fly fishing, but with more power in the midsection and the butt, and plenty of action in the tip. It's a rod that is between a bait-casting rod and a fly rod in length, being stiffer than a fly rod and much lighter in action than most bait-casting rods. Don't buy a rod with small guides for an open-face spinning reel. Big guides are essential because the line whirls off the spool at a terrific speed and small guides can't pass it that fast.

In selecting a spin-fishing reel, choose the one that suits your own type of fishing.

Ardent spin fisherman proudly shows off trout taken from a Washington stream on four-pound Monofilament

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Don't send a boy to do a man's job; buy a larger reel if you plan to do heavy salt-water fishing. It's possible, though, to do some salt-water fishing with fresh-water spinning tackle, now so popular in all of the protected waters of Florida.

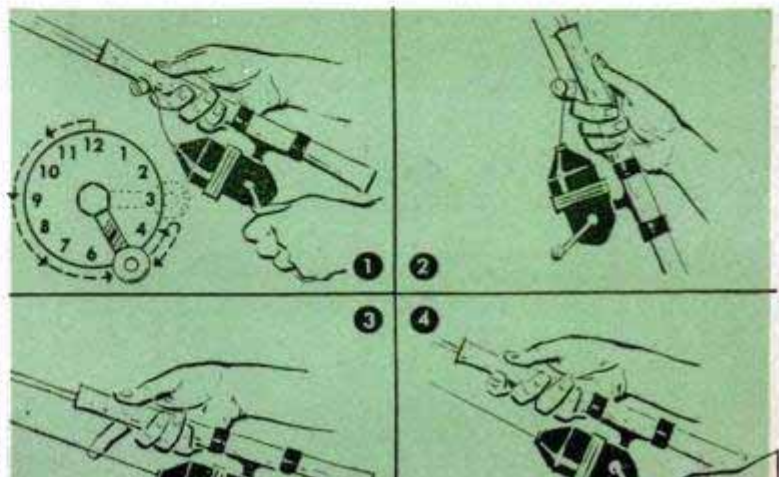
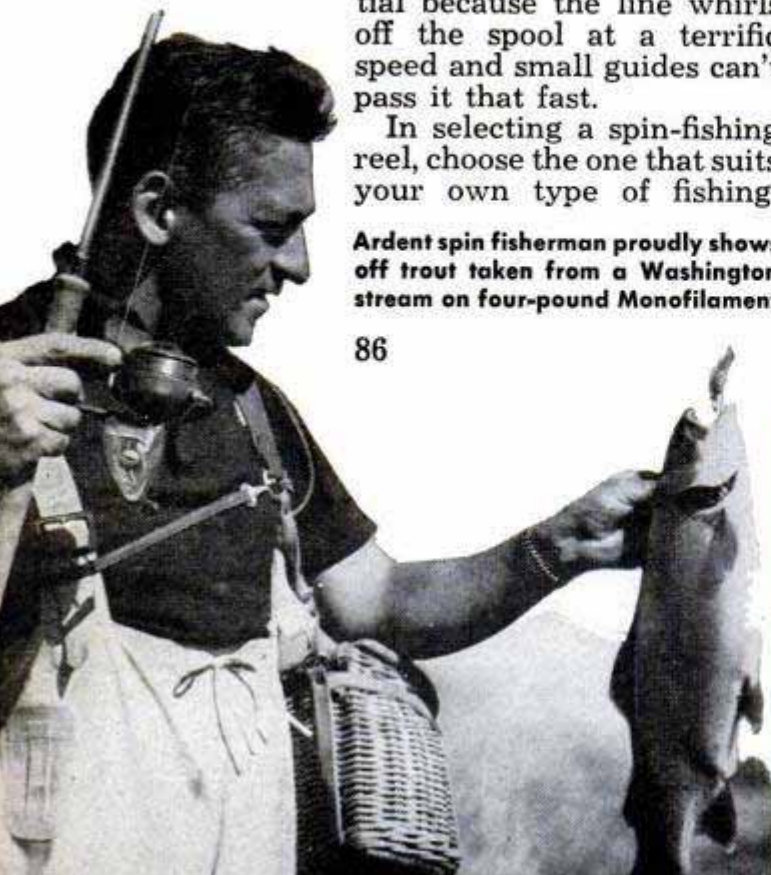
Most of the imported reels are open-face; that is, the spool has no cover. Some of the popular American and Canadian-made reels are covered, three of them with a cone-shaped casing.

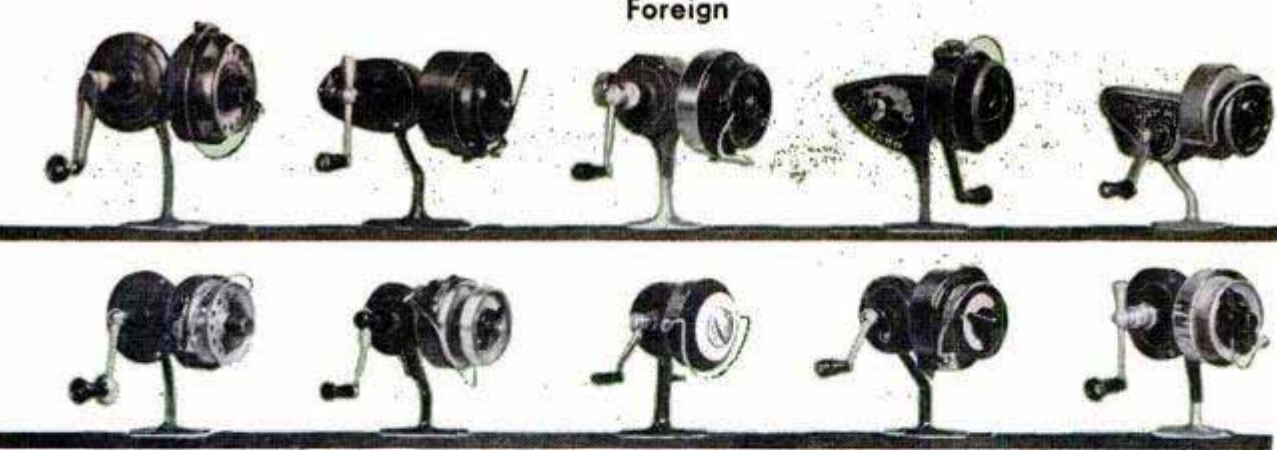
Right-hand and left-hand reels are somewhat confusing. A right-handed person normally will buy a right-hand reel which, oddly enough, is so constructed that he or she turns the handle with the left hand. This is so the fish can be played with the stronger right hand on the rod while reeling in with the left. Sometimes a die-hard bait caster will deliberately buy a left-hand reel, merely because he can't overcome the habit of reeling with the right hand. One reel, the Ambidex, is so constructed that the handle can be installed on either side. And many reels are available with either a left or right-hand crank to suit the angler.

It's far easier to master a spinning outfit than a bait-casting outfit because there's no chance of backlash. When you're ready for your initial cast with an open-face reel, first check the drag adjustment. It should be set under the test strength of the line so if you get an unexpected strike your line won't snap. On the other hand, the drag should be firm enough to hook a fish.

Learn the overhand cast first. The lure should be about a foot from the tip of the rod. Now hold the rod in your right hand

HOW TO CAST A CLOSED-FACE REEL: 1—Hold line with forefinger, release nonreverse, turn crank to three o'clock position, then back to five o'clock. 2—Swing rod toward vertical position. 3—Whip rod forward and release the line. 4—Begin your retrieve





FOREIGN REELS: top row, left to right, the Luxor Supreme, Garcia Mitchell, Record Reel, Orvis 101 (Pelican) and Ambidex; bottom row, Luxor-Luxe, Pecos-Luxe, Swiss Whiz, C. A. P. and the Airex Mastereel

(assuming you are right-handed) with the reel hanging under the handle of the rod. Two fingers should be on each side of the stem that supports the reel. Next, press the line against the rod with your forefinger and disengage the bail pickup. This leaves the line free to spin off the reel as soon as you release it by straightening your finger as you finish the forward cast.

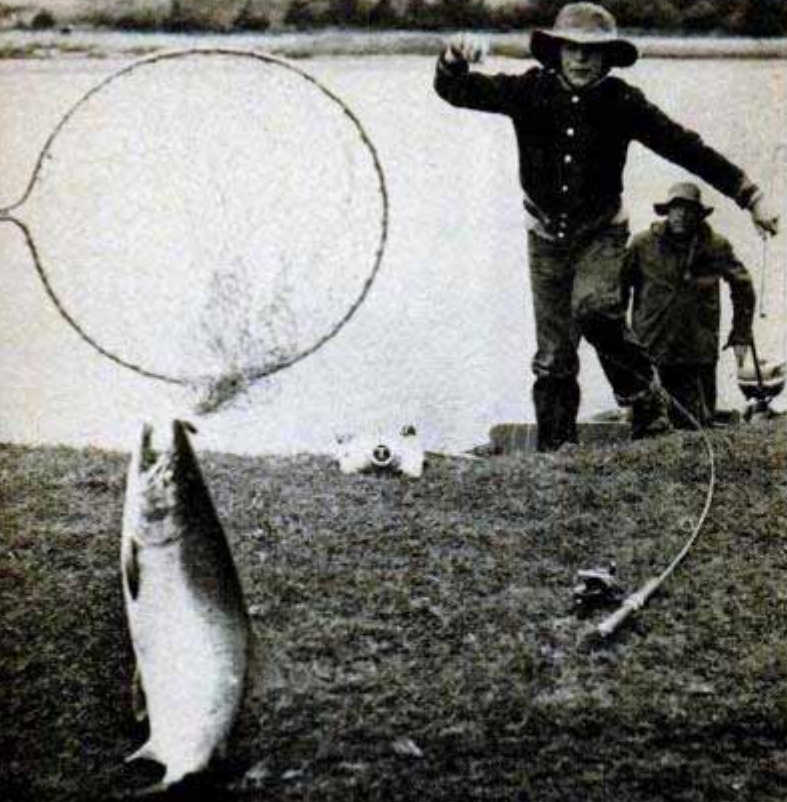
Bring the rod straight up to the 12 o'clock position with a sweeping, but quick, motion, and then flick the wrist forward until the rod is at a 45-degree angle. Point your finger at the target, which releases the line and permits the lure to shoot out. You'll be amazed at the distance you get with your first cast. The lure can be slowed down or stopped on the target by touching your forefinger to the reel spool.

When the bait has reached the water, reel in the slack line and drop the rod tip to a horizontal position preparatory to hooking a fish. If you get a strike, jerk the rod very gently. Most fish will run off the line and the drag of the reel will slow them down. Don't crank the handle while the fish is taking out line—wait until he tires or you'll put extra twists in your line.

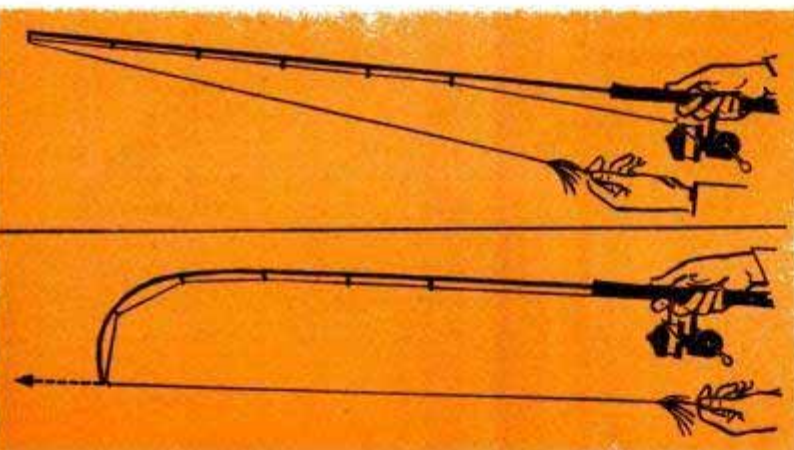
A side cast will give you good distance if you have proper timing. In this cast, swing

Even the old-timers are switching to spin fishing. This experienced angler has new tackle box with plastic front for quick location of lures. Suspended from his shoulders is a two-tray, aluminum spin-fishing box



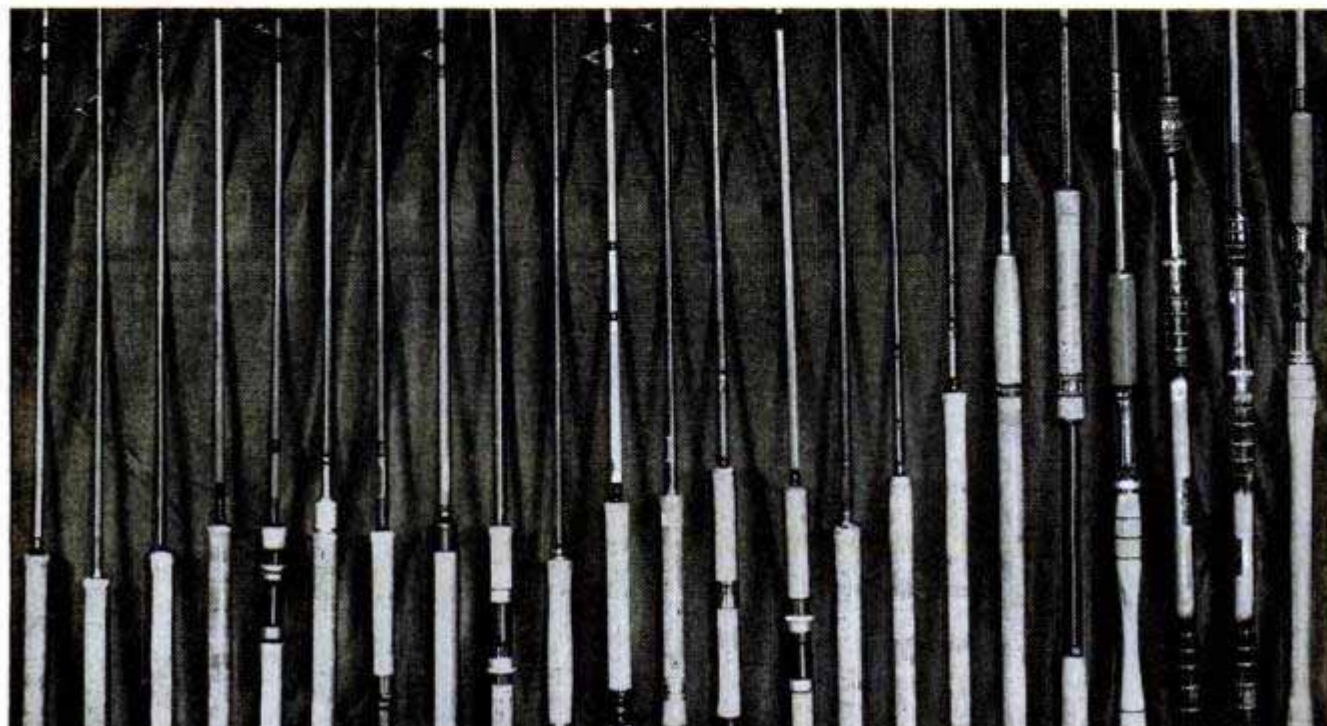


Young spin fisherman was so excited at landing a 15-pound silver salmon from a river bay that he tossed rod and reel, net and fish up on the bank



BOW-AND-ARROW CAST (see cover): Hold lure by curve of hooks, flex rod, release lure first, then line

Large-guide spinning rods are available in hollow and solid glass, steel and bamboo, from six to nine feet long



your rod tip out and up like a plane taking off, and when your rod tip has reached its maximum speed release the line. Raise the rod tip as the lure hits the water.

The underhand cast is used when shrubbery or trees prevent a conventional cast. Lower the tip of the rod and allow the lure to hang two feet from the rod tip. Start swinging the lure back and forth and then flip it out with a quick wrist motion.

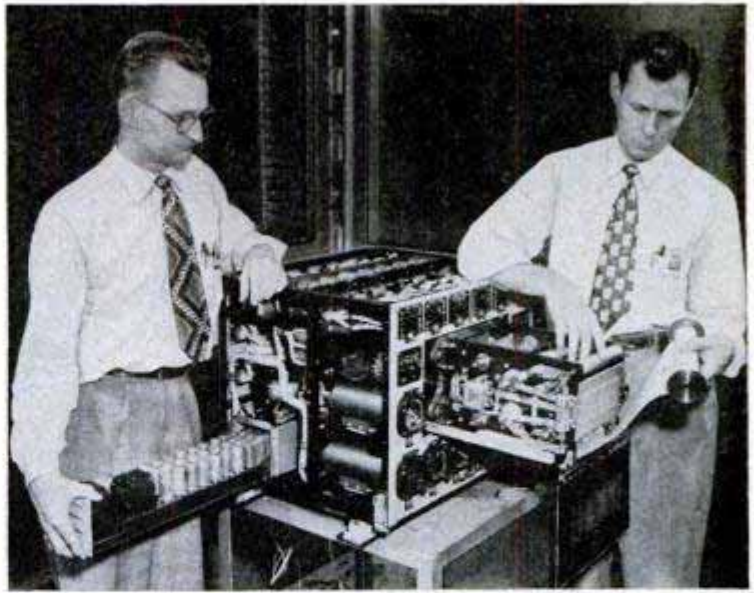
In the lariat cast, the lure is twirled at the end of the rod until you can flip it. At that moment the rod tip must be pointed straight out.

If you really want to pop the eyes of your bait-casting friends, try the bow-and-arrow cast. Hold the lure carefully by the bend of the hook or hooks and pull it back beside the reel so the rod is flexed. Release it suddenly and the lure will shoot far out across the water powered by the snap of the rod.

There are a few basic differences in casting the closed-face reel. This type of reel eliminates line flapping and loss of line on a windy day. It also can be fitted to a fly rod, as the line pays out from one point and big guides aren't necessary. This permits the angler to pack a fly rod, a fly reel and a spinning reel for fishing variety on the same trip.

The nonreverse on some closed reels is operated by a knurled ring located between the crank and the cover plate. You adjust the drag on this type of reel by stripping off line with the crank in reverse. A clicking sound means the pickup is revolving although the crank is stationary. Set the drag just tight enough to retrieve your lure. Just before you cast, release the non-reversing crank. To find the casting position, turn crank forward to the position

(Continued to page 228)



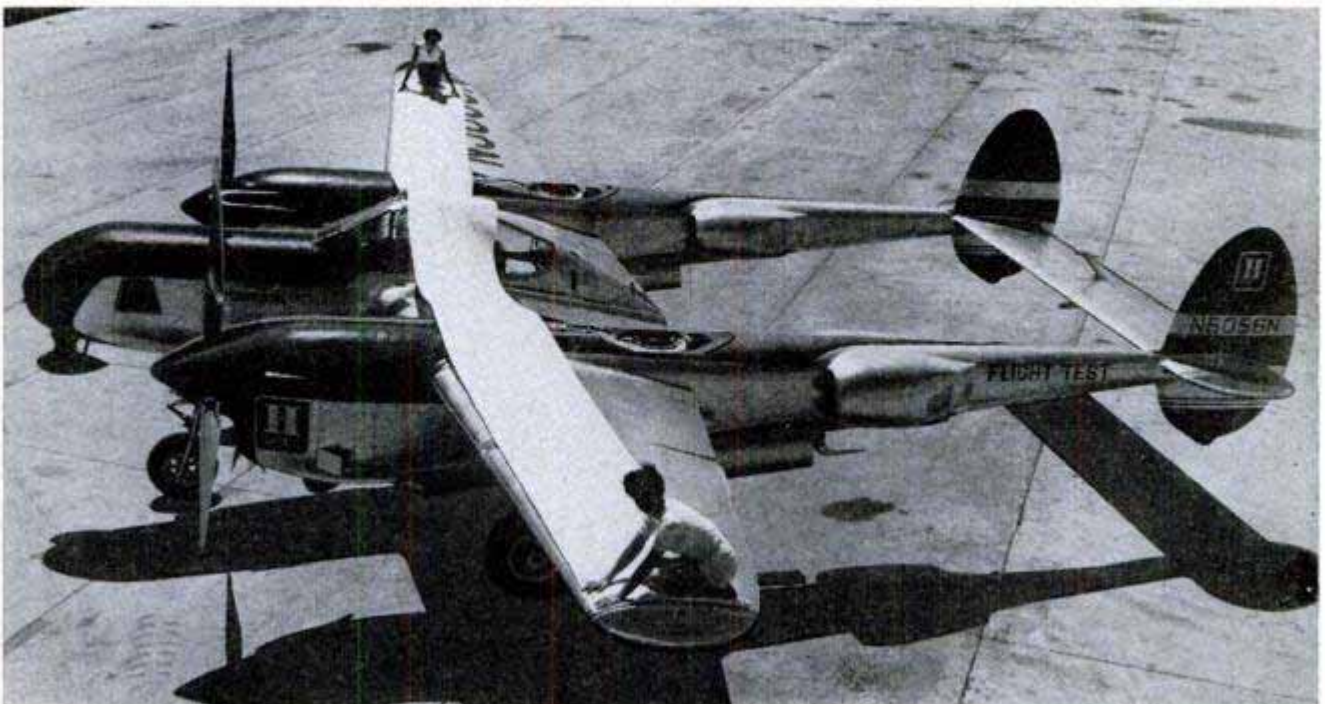
Punching flight plan into a tape. Man at right points to 430 sensing pins which detect data holes on tape

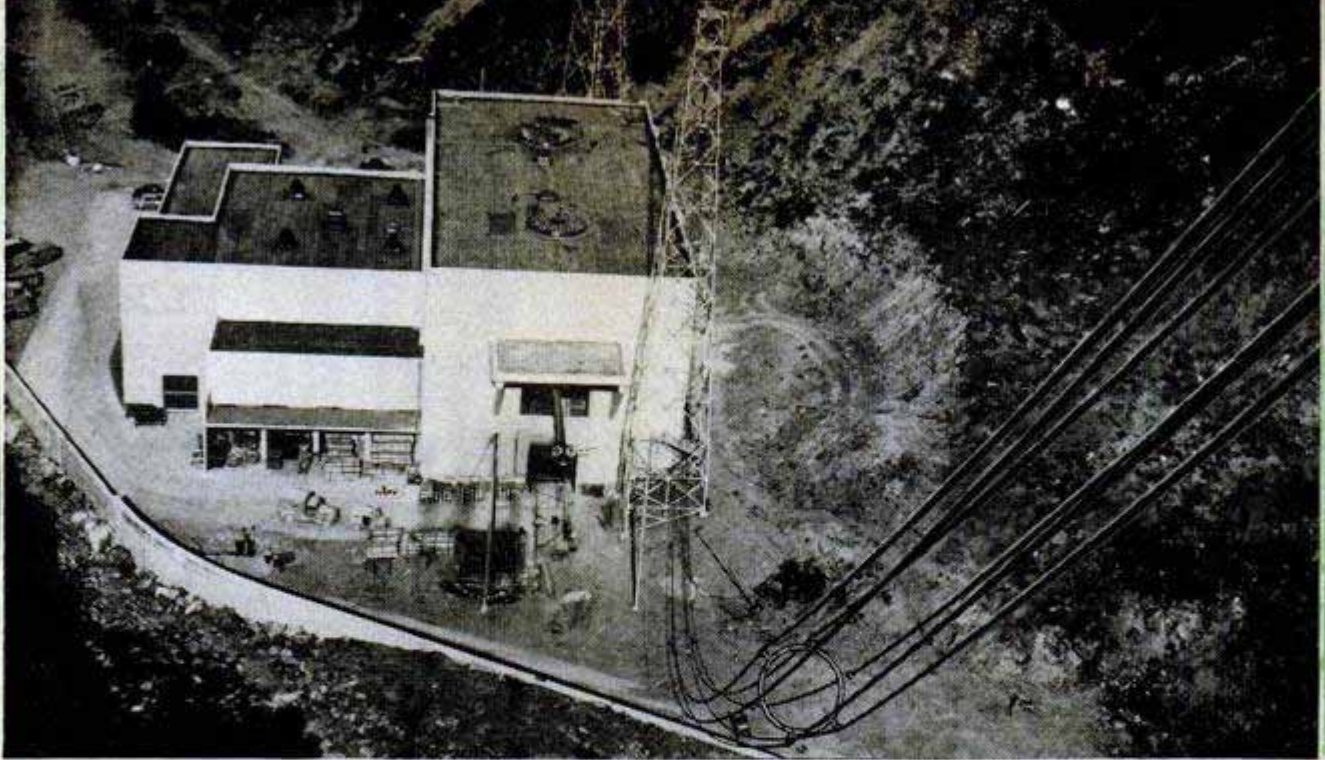
Punched Tape Controls Airplane in Flight

PUNCHED TAPE can now fly an airplane from coast to coast. It does the job while moving through an electrical "brain" in much the same manner that music rolls were run through the old-fashioned player piano. The device, developed by the Minneapolis-Honeywell Regulator Company and the Wright Air Development Center, is called an Automatic Master Sequence Selector. Here's how the robot works: A flight plan is made out in advance and divided into sequences. One sequence controls taxiing down the runway, another the take-off, a third directs the climbing and others handle the flight phases that follow. This flight plan is then punched into tape. As the tape moves through the selector, which has 430

metal pins among its 1000 parts, pins drop down on it and, like the fingers of a blind person, "interpret" the sequence of holes. The pins make electrical contacts where there are holes and these are converted into signals that operate the plane's controls. The purpose of the device is to eliminate the routine from flight operation, freeing the human pilot for over-all supervision of the trip. In any emergency, such as mechanical failure or an unforeseen obstacle in the flight path, the pilot can take over manual control instantly. While lighter and less complex than the equipment used for the first automatic flight in 1947, the new device can control a practically unlimited number of sequences.

Wiring diagram for electronic sequence selector was long enough to stretch from wing tip to wing tip of an F-38



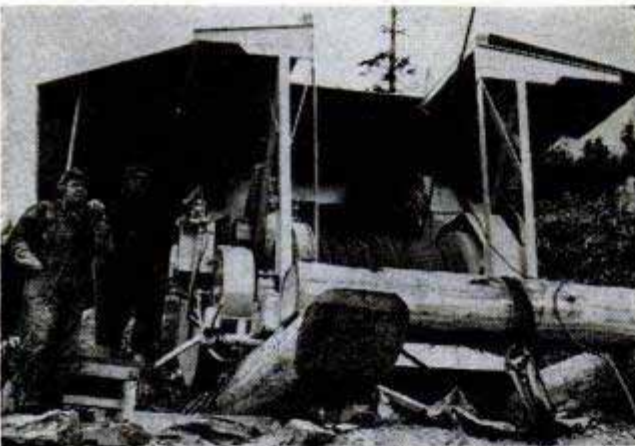


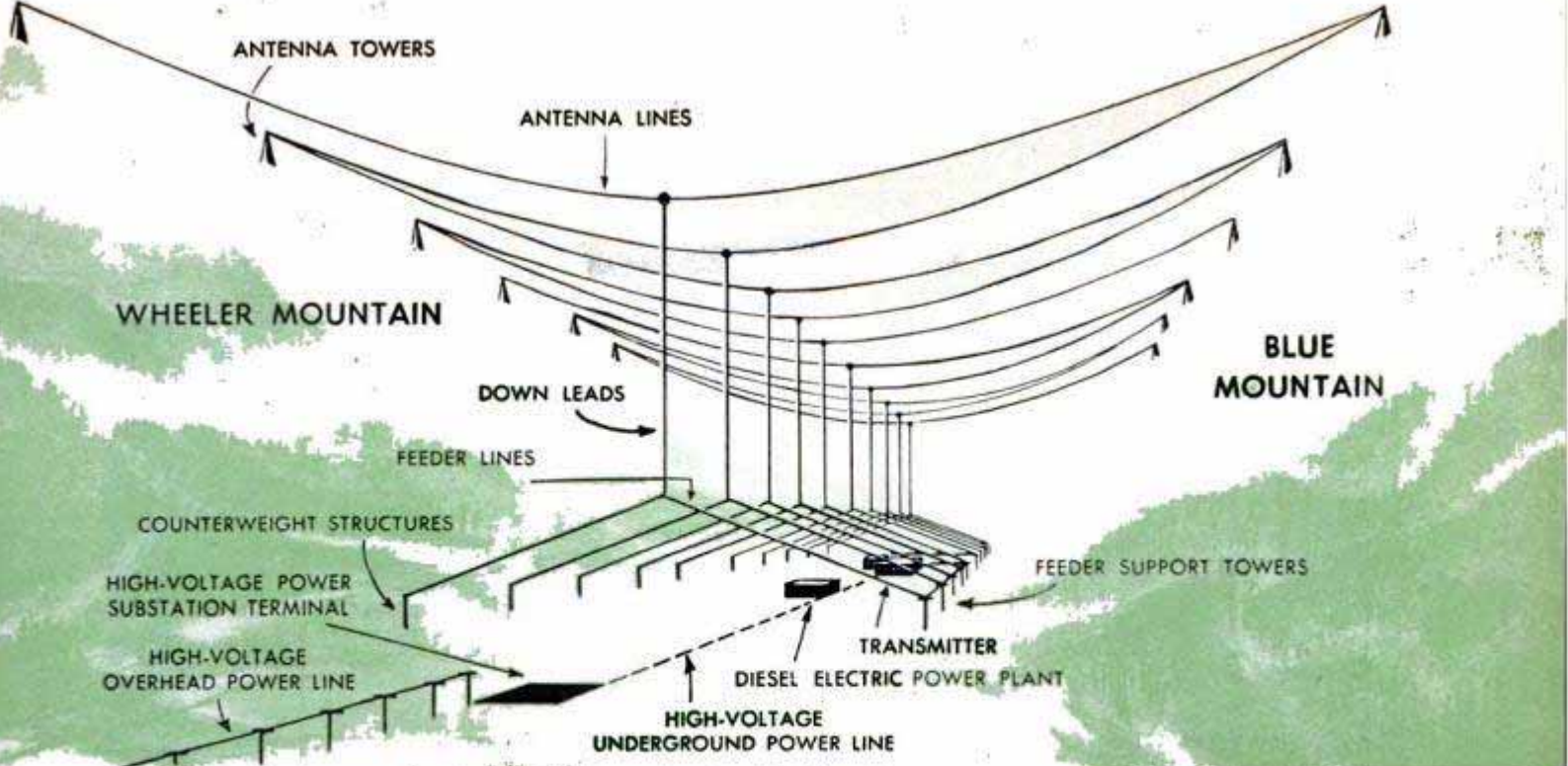
Transmitter building is reinforced concrete, copper-lined and copper-roofed. Half of antenna enters each side

Riggers unroll cable for cross-valley span. Three towers seen in lower picture support feeder lines

THE VOICE

BEAMING MESSAGES to ships in the farthest reaches of the Pacific Ocean, a new Navy radio station at Jim Creek Valley, Wash., will soon go on the air. One million watts will power the station to make it the most potent in the world, according to the Navy, which hopes to maintain constant contact with Navy vessels by means of a low-frequency, high-power wave. Before





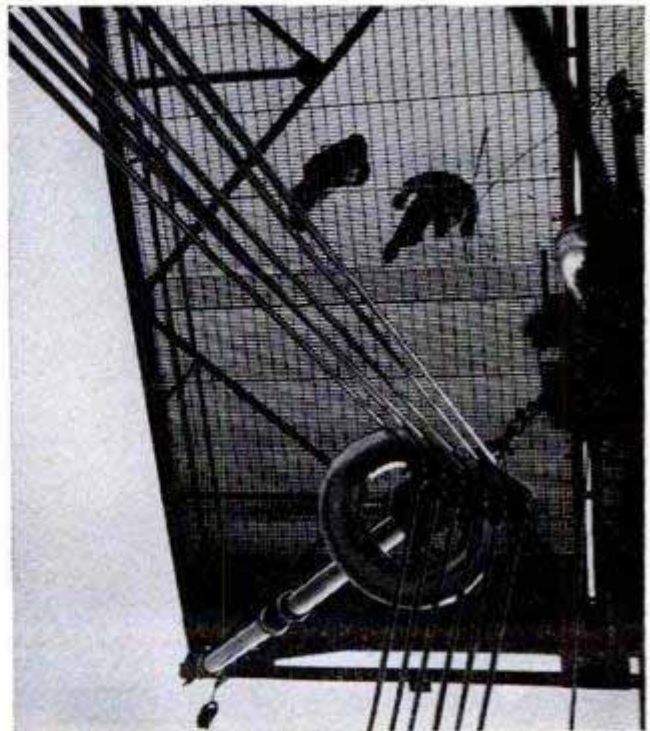
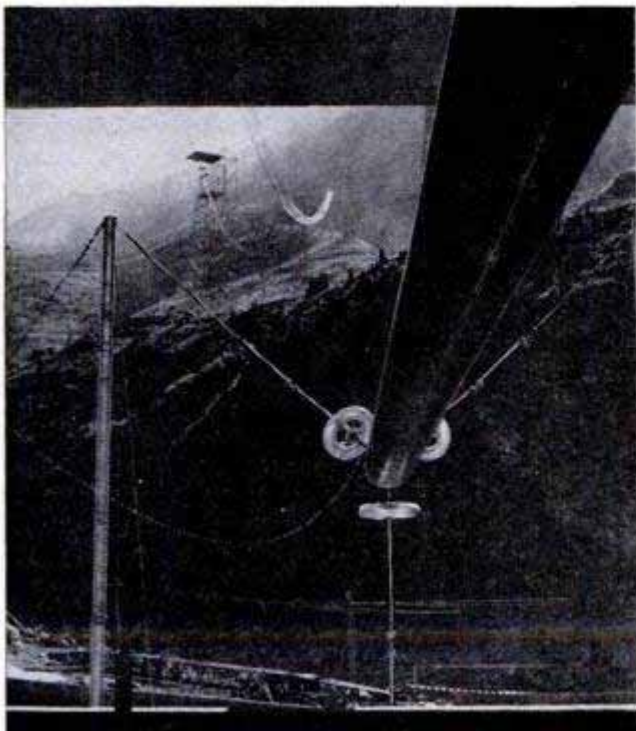
Antenna installation stretches for a mile down Jim Creek Valley. Antenna spans range from 7000 to 9000 feet

THAT CROSSES THE PACIFIC

the station was built, the rugged valley sides of two 3000-foot mountains were bulldozed clear of timber and the valley creek was re-routed to make way for the transmitter and an emergency diesel-electric power plant. Six 200-foot antenna towers were erected along the crest of each mountain ridge to support the 30 miles of antenna cable which would cross and recross the 1½-mile valley span. Vertical down-leads drop 900 feet from the center point of each span to feeder lines. The transmitter building is situated

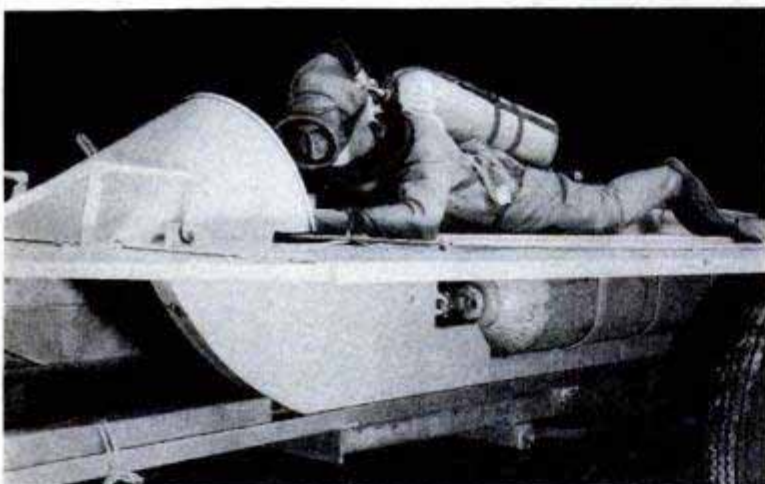
in the middle of the installation, one half mile down the valley. Cables lead into each side of the building which is grounded by a circular web composed of 130 miles of copper wire. Radio waves from the transmitter travel along a transmission trunk supported by thirteen 145-foot towers on the side of Blue Mountain and are carried to the down-leads by diagonal feeder lines. Guy wires anchored to counterweight structures on facing Wheeler Mountain prevent damage by high winds and icing. ★★★

"Doughnuts" around antenna lead-in trunk prevent corona discharge. Right, ant's-eye view of transmitter tower

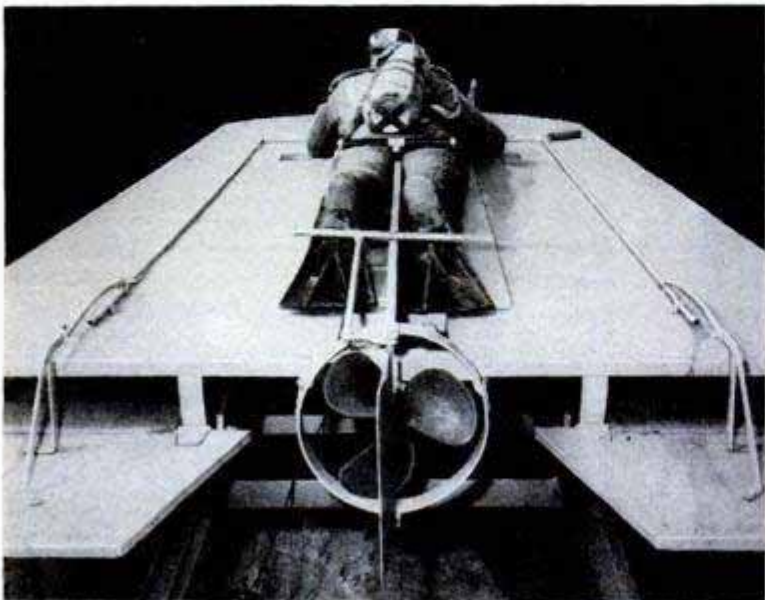




Diver gains speed just before plunging toward bottom. Inset at right is *Popular Mechanics* cover that inspired the sub

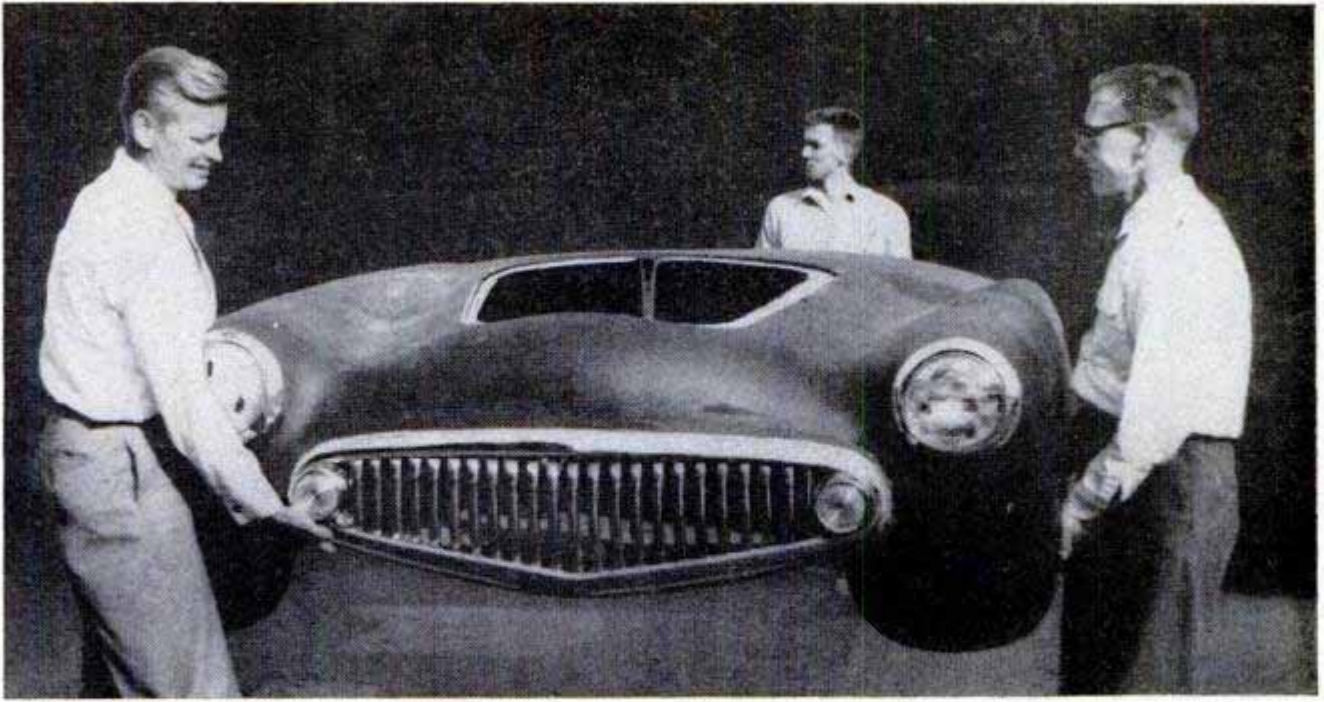


Twin compressed-air tanks are built into the runners. Frame of the submarine sled is made of wood covered with a skin of aluminum. Below, forward and aft diving planes are controlled by hands and feet. Holes near elbows give access to air valves



Submarine Sled

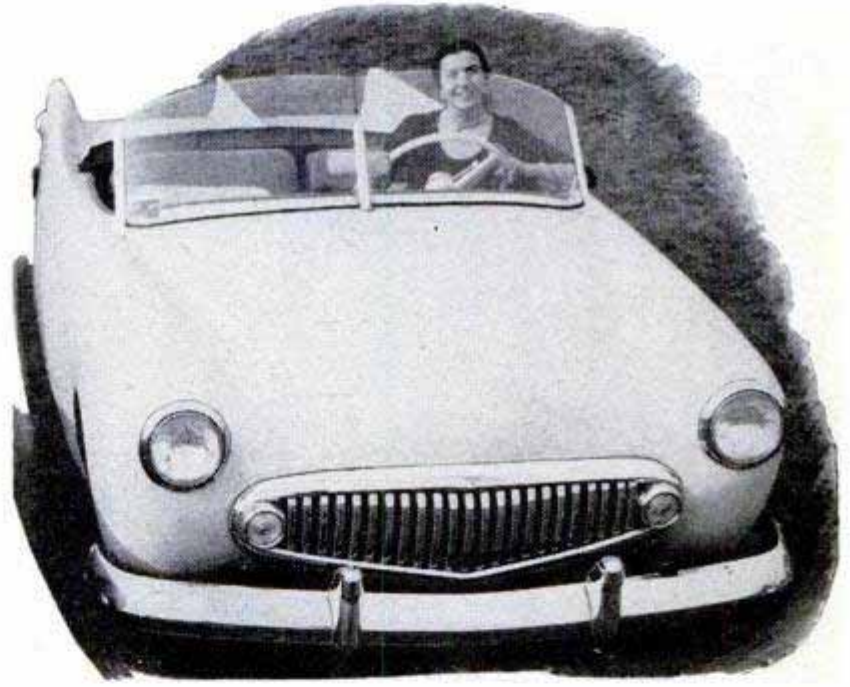
REMEMBER the article that ran in our October 1952 issue about the underwater glider that is towed by a speedboat? West Coast skin divers are using this glider as the model for one-man submarines driven by compressed air. The diver who pilots the sledlike craft shown here can descend several hundred feet and cruise the bottom for more than an hour. The craft was designed by J. R. Monroe of Bakersfield, Calif., and tested by Richard Anderson of the U. S. Divers Company of West Los Angeles. Two large tanks set into the runners below deck carry air at 2000 pounds' pressure, which drives a small air motor to spin the 12-inch propeller. The diver carries his own cylinder of air for breathing. He operates the submarine with leg and arm controls. The craft, made of wood and aluminum, is 13 feet long, 7 feet wide and weighs about 700 pounds.



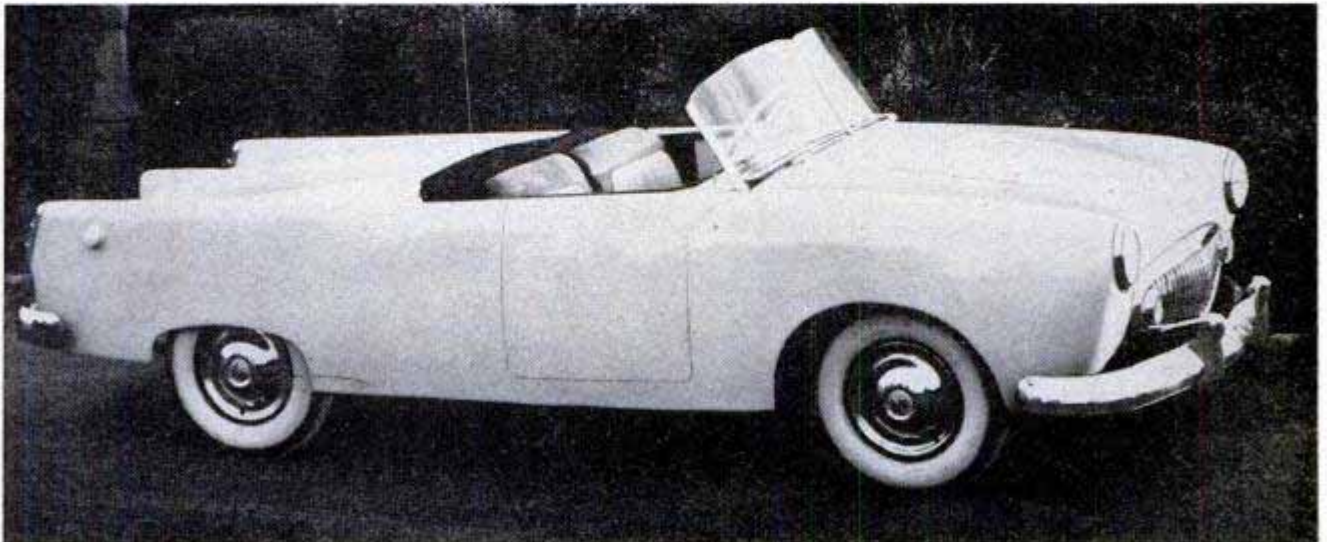
Three men easily carry the light, plastic body. Hood and door openings were cut after body was finished

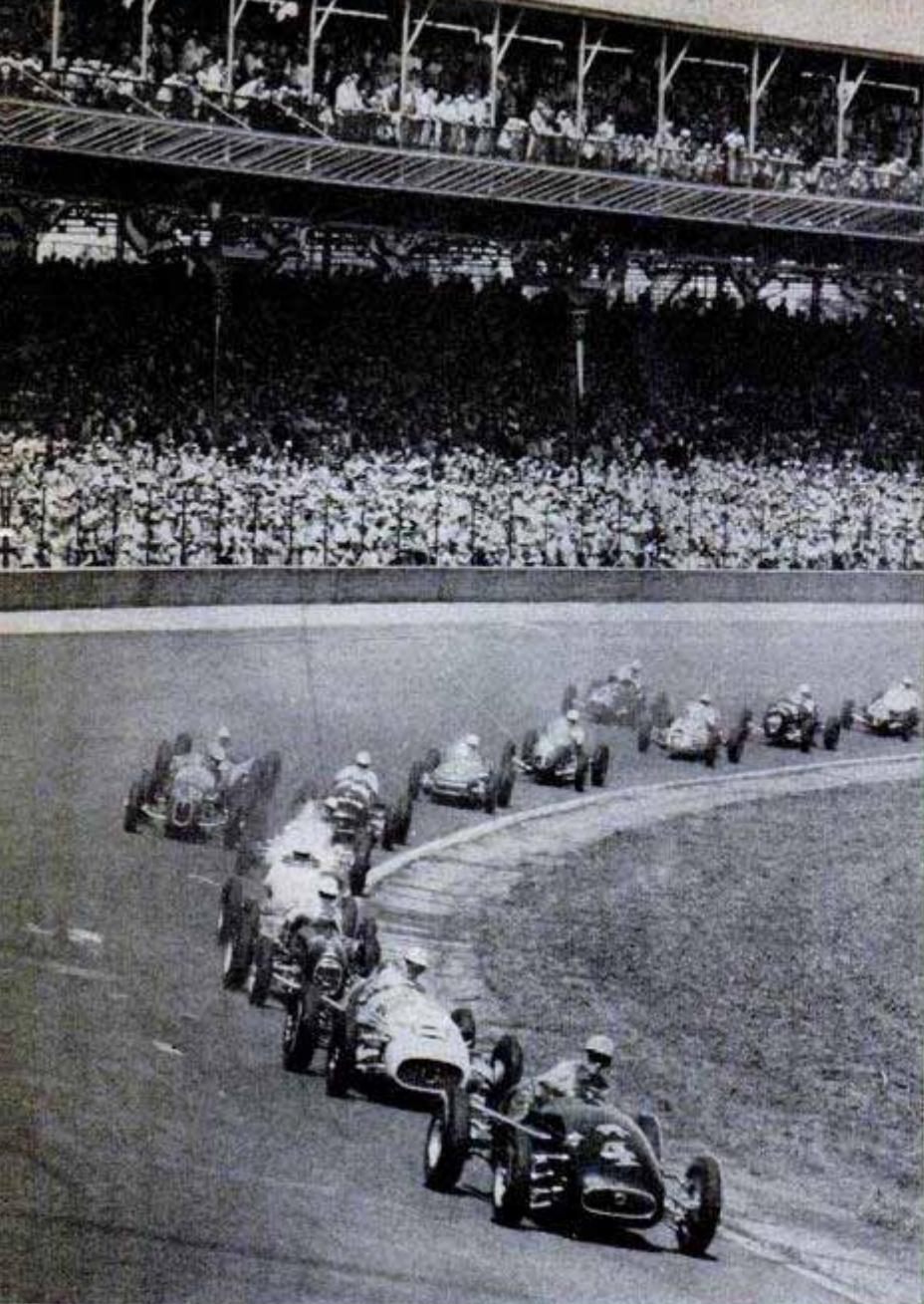
Custom Sports Body Fits Henry J Chassis

Built for a Henry J chassis, a plastic sports body emphasizes trim, clean lines. The complete car weighs less than 1800 pounds. Over-all length is 174 inches and height is 54 inches. Tom Masano, Reading, Pa., automobile dealer who built the body, says that a plastic mockup was made on a Henry J chassis. Four layers of glass fiber and resin-impregnated mat were laid over the mockup and the mold was sawed in half for removal from the plaster. The doors and hood were cut out after the body was mounted on the chassis.



Front and side views show off the rakish yet uncluttered design

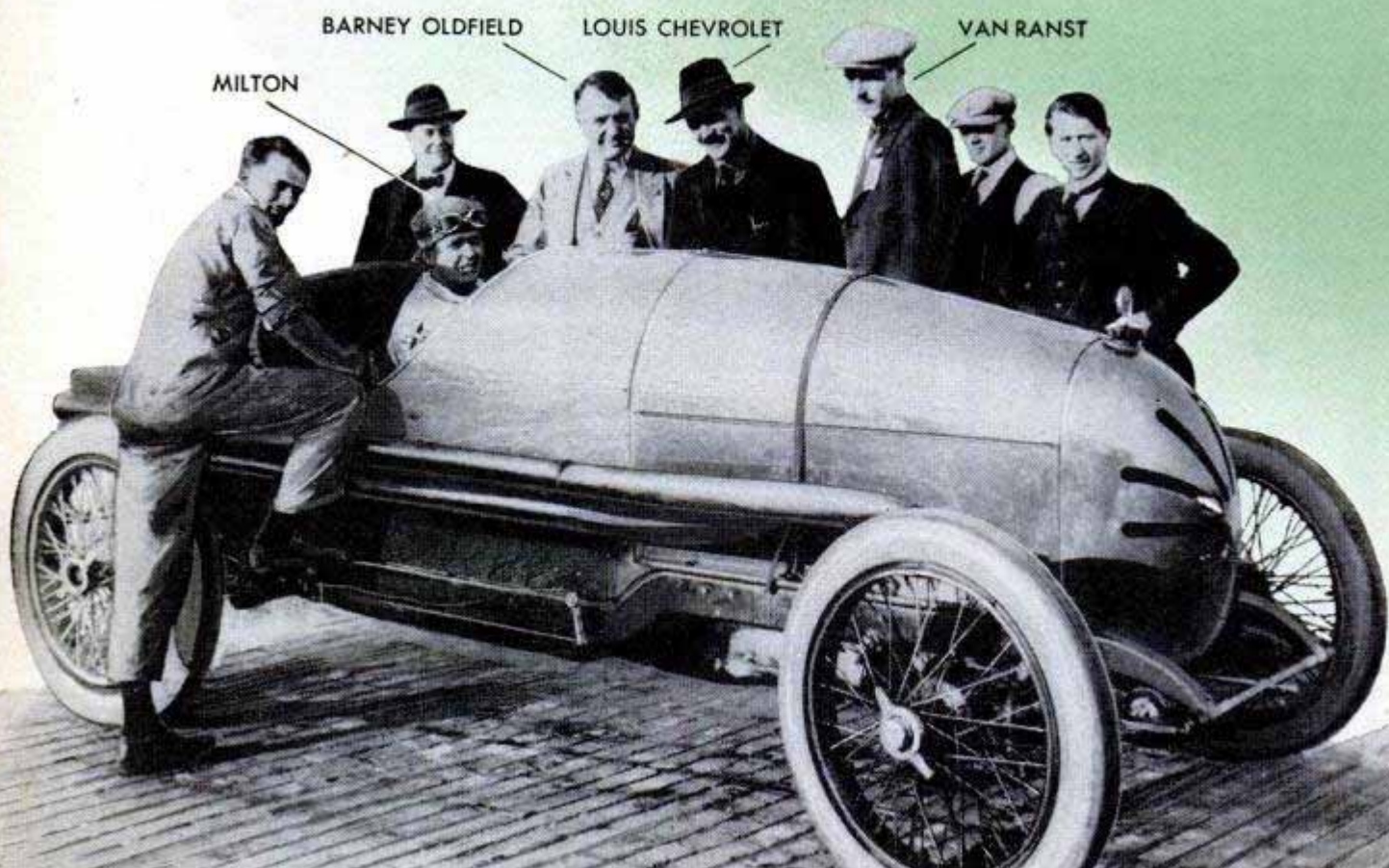




Is the Speedway classic headed for a slowdown? Every year fans jam the highways to Indianapolis for the Memorial Day race. As a preview of the '53 event, *Popular Mechanics* interviewed two famed Speedway personalities: Tommy Milton, two-time winner and former chief steward, and his associate, C. W. VanRanst, designer of Milton's first 500 winner. They bring you

THE 500

Left, McGrath leads the pack on the first turn in 1952. Below, VanRanst designed and Tommy Milton drove the Frontenac which won the 1921 classic
Chas. J. Bell photo





VanRanst, left, and Milton, both experts on the Indianapolis race, believe there may be a slowdown this year

AS THE EXPERTS SEE IT

QUESTION: What will be the biggest news story at Indianapolis this year?

MILTON: One interesting aspect will be the performance of modified passenger-car engines. I understand there are to be two or three race-car chassis fitted with Chrysler V8 engines which have been reduced in displacement to the limit allowable at Indianapolis. They are putting in a shorter-throw crank or reducing the bore to bring them to 270, the unblown-engine limit.

Another point that may make headlines is the use of so-called nitro fuel.

Q: Is there a rule against such fuel?

MILTON: There probably will be this year. I don't know how many cars used it last year. Reportedly, Vukovich had it in his car. So did Ruttman and Rathman and how many others I don't know, but these drivers were running one, two, three.

Q: What is this nitro?

MILTON: In most cases, I understand, the additive is nitromethane and alcohol is the base fuel. But there are several other forms of nitro which possibly could be used including nitrobenzene and nitropropane.

Q: Are these fuels dangerous?

MILTON: Yes. The bravest guy will win. Loosely, the driver who is willing to put the highest percentage of nitro in his fuel will go the fastest until the engine flies apart—too much will push the top off or the sides out or something.

Q: Are they going to eliminate nitro?

MILTON: They want to, but since the

entry blank made no provision, they are having to write each entrant and solicit his approval of the ban on nitro. But even so they are going to have a job trying to police the ban. I suspect that some of those fellows will come up with a method of adding it—at least for qualification and possibly for the race, to give them a burst of speed when it might count. You see they are all down there to win and that race is like the income tax. No matter how they change the rules, the minute the rules are out, everybody goes to work to find out how to beat them.

Q: Will there be any European cars in the race?

MILTON: There will be some European cars, but probably not from Europe. Some of the American-sponsored Ferraris may be back.

Q: Will the Ferrari be a threat?

MILTON: I don't think so. Friction is roughly proportional to the number of cylinders and a competitive car down there requires, above all else, acceleration, which is more a matter of torque than horsepower. In racing terminology, coming off the corners you have to be able to accelerate but quick. That is one of the reasons the four-cylinder jobs have done well. Their net torque—under certain conditions—is higher than that of a multiple-cylinder engine of the same displacement. The Ferraris last year had gearboxes that could be shifted at high speed, and Ascari and Johnny Parsons and others tried it, but it didn't work

out. On a straightaway they would probably run away from the four-cylinder jobs.

Q: In other words, if you take 270 cubic inches and spread them over 12 cylinders, you get three times as much friction as in a four-cylinder?

VANRANST: That is roughly the problem and it is almost proportional.

MILTON: Of course, we are oversimplifying it. In the four-cylinder jobs, the reciprocating weights are large. The boys who try to get the maximum out of their engines and "rev" them up a little too high actually stretch connecting rods. But to get back to this nitro thing, I am told that an Offenhauser four-cylinder 270-cubic-inch engine with the best possible combination they have been able to work out, exclusive of nitro, will develop 340 horsepower. When they add nitro, perhaps 10 or 12 percent, it immediately goes to 440, and if they put in additional amounts it jumps again. Another danger is that if the car catches fire, there isn't any way to put the stuff out.

Q: Is nitro simply mixed with fuel?

MILTON: Yes, I believe so. I have never used it. It is much after my time, of course, but I am told you just mix it with the fuel and, as the saying goes, "Away we go!"

Q: Every year the average speed goes up two or three miles. Will that continue?

MILTON: I don't think so. If you go through the records, you will find they go up for a while and then drop back before going up again. We have had an era of ascending averages, but if the elimination of nitro occurs this year, it will probably cause a drop in the average speed.

Q: You feel that if it is possible to police the nitro matter the winner's speed will be lower than in 1952?



Milton: "You just mix it with the fuel and, as the saying goes, 'Away we go!'"

MILTON: I think that is a reasonable estimate, unless someone comes along with some other development that we don't yet know about in terms of car handling or something else.

Q: What do you think will beat the four-cylinder engine at Indianapolis?

MILTON: I think a V8 might not be too bad a compromise or perhaps a V6 or flat six. The flat six would get the center of gravity down. But, of course, these four-cylinder jobs have been in the picture quite a while. They have gone through years of development and the boys like them.

Q: It looks as though Indianapolis is becoming a race of one type of car whereas ideally it would involve many different kinds of cars, wouldn't it?

MILTON: I think that observation is more or less sound. Actually, it isn't quite that, as witness the fact that Welch built the Novi V8s. And there are the Cummins diesel and the Ferraris.

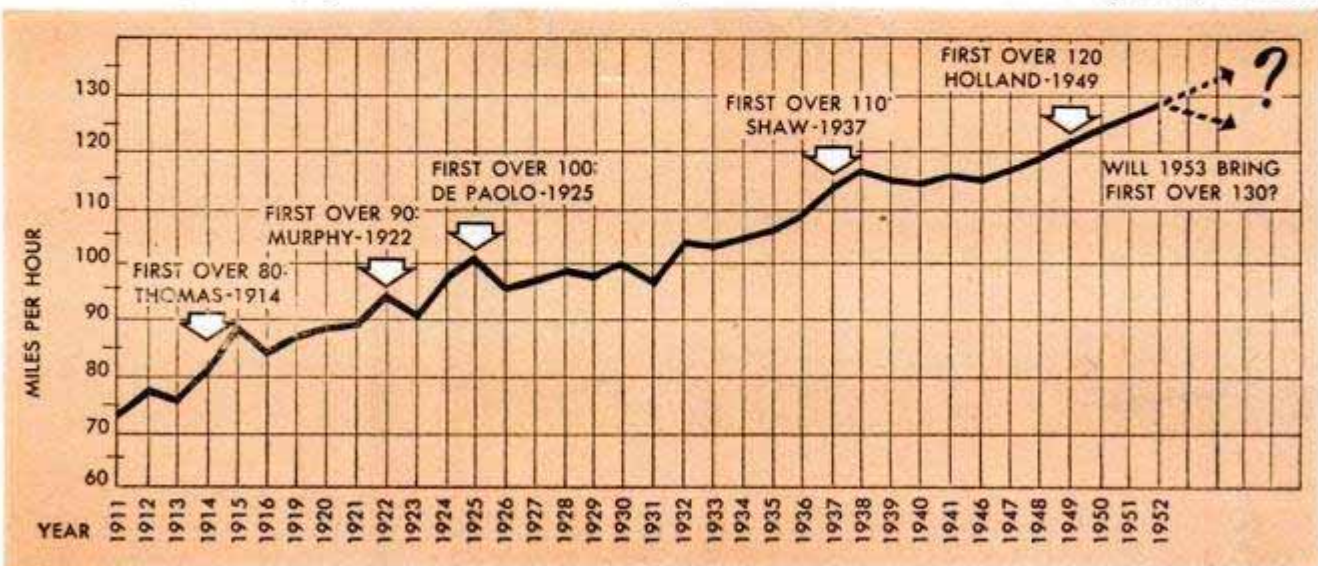
Q: Will the diesel be in there this year?

MILTON: I think not. Cummins feels they need more than a year for further development. I am told that he voluntarily subscribed to a reduction in piston displacement. He felt that they no longer need 400 inches. But he said it would be two years or possibly three before they are ready to try again. They were about as fast as the fastest, which is mighty good performance. They had a turbo supercharger and what put them out of the race was that the turbo was so located that all the dirt from the track got into it and loaded it so it wasn't pumping sufficient air.

Q: If that had not happened, do you think the diesel might have won?

MILTON: Well, the car was pretty heavy

Chart of average winning speeds. There has been a steady climb since 1946. Will 1953's average be up or down?



and what would have happened relative to tires, I don't know.

Q: What are the requirements of a racing tire?

MILTON: Of course, the first requirement is that it doesn't blow out! In the early days they used to blow out all the time. I am not a tire expert, but to get a tire that won't blow, one of the problems is heat dissipation. So they put no rubber on the side walls at all or virtually none so as to give better heat radiation. Tread design is unbelievably important. If you look at a new racing tire, you wouldn't believe it was a new tire, you would think it was one that had been on a car where the toe or camber or something else was off. It looks half worn out. Another problem is to get a tread compound with maximum resistance to wear.

Q: What is normal now—two tire changes during a race?

MILTON: For most cars, I think so. Some get by with one.

Q: Would you say that the speed is determined as much by tires as by the engine?

MILTON: That might not be too far afield, but it is also related to another factor



VanRanst: "Few would make good road racers . . . inadequate brakes, gearboxes"

and that is fuel. Every fellow down there—perhaps not every fellow, but the better drivers—and there are never too many good ones—(I have always kind of harbored the notion that in any given year there are not more than six who are really top flight, the rest are more or less scenery) knows to a nicety how fast and how far he can run on a set of tires. He also knows how far

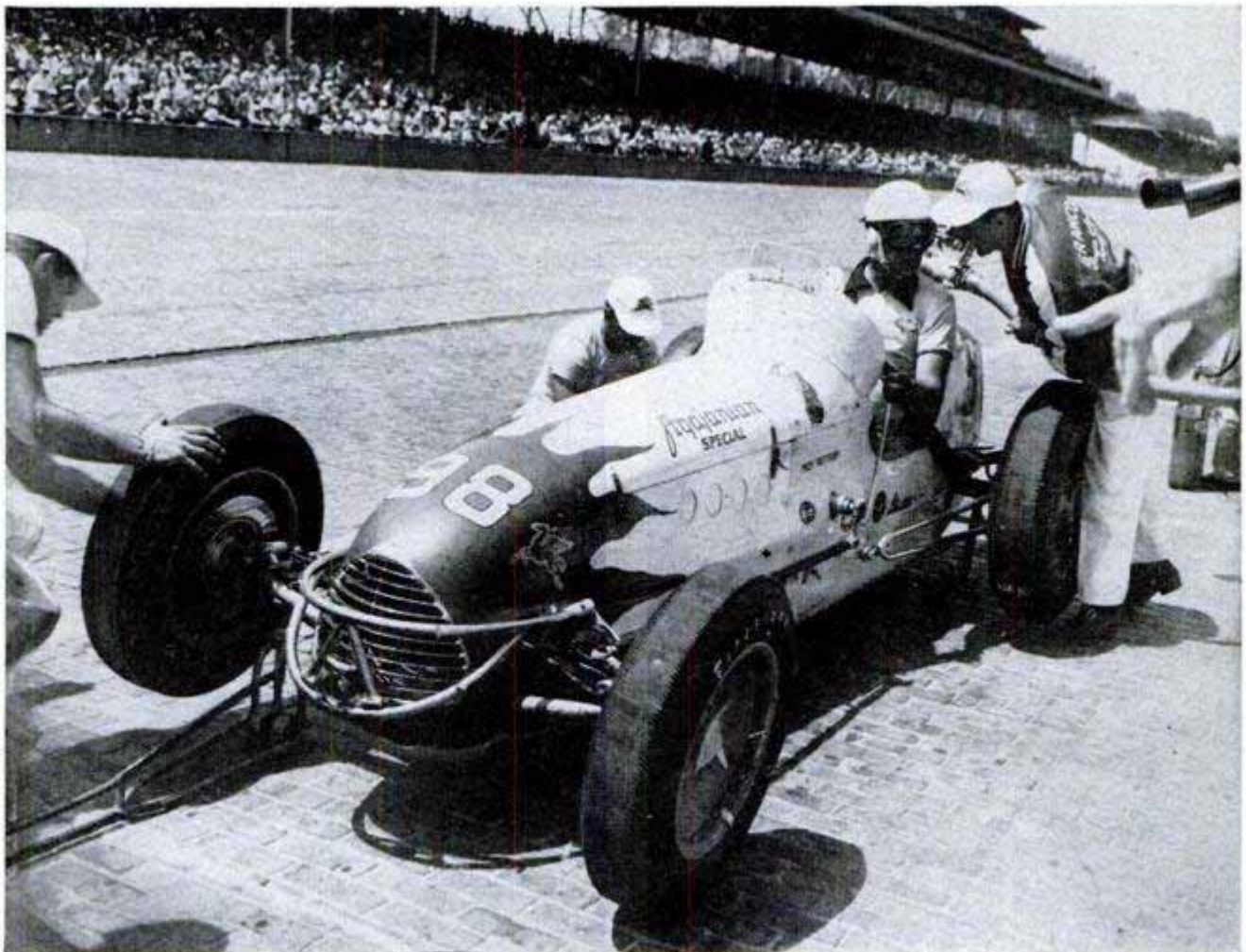
he can go on his fuel, so he relates tire life to fuel mileage. They are interlocked. If he has to stop at 80 laps for fuel then he may just as well run at a speed that will require changing tires at 80 laps.

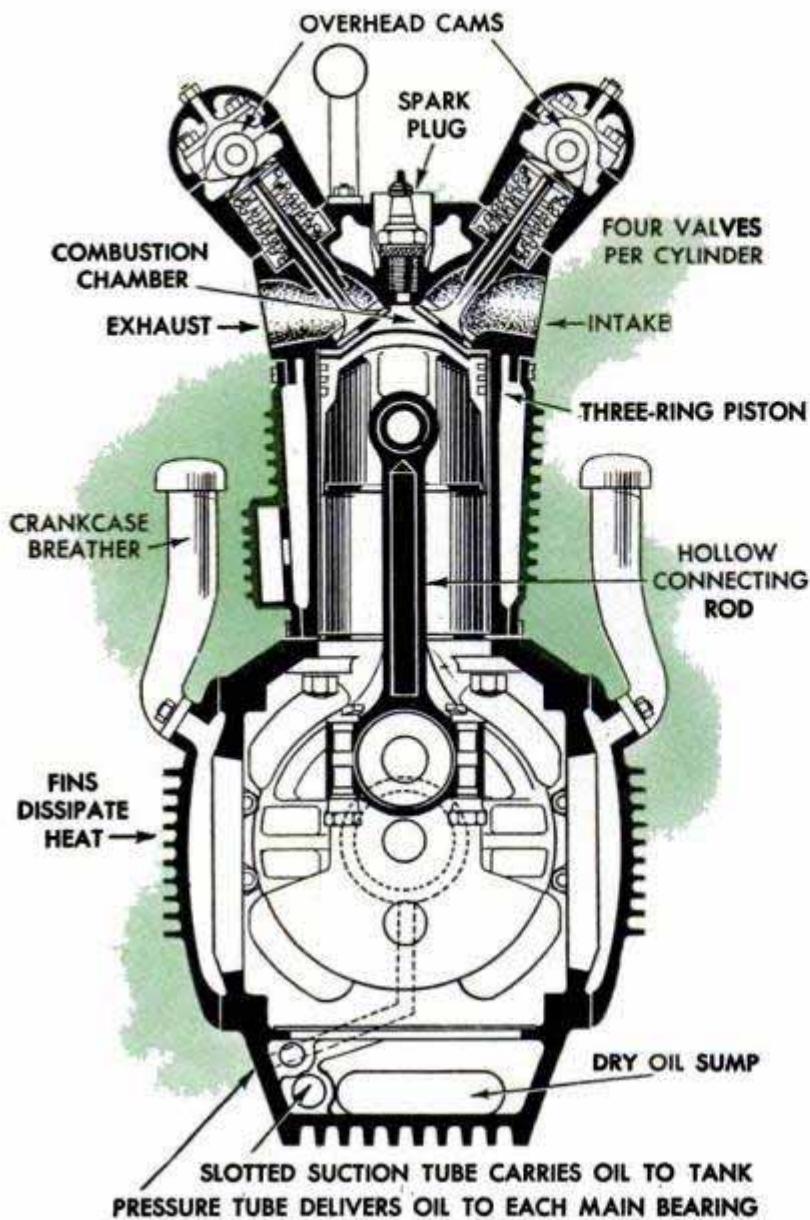
Q: Then the one or two tire changes mean the driver can be more wasteful of fuel?

MILTON: I don't think you ought to use the word wasteful because they vary the mixture of alcohol and gasoline to give the best combination of speed and mileage. They use about twice as much alcohol as gasoline and they are concerned about keeping the load variable at a feasible minimum.

Q: American Indianapolis racers are designed for counterclockwise motion on a circular track, aren't they?

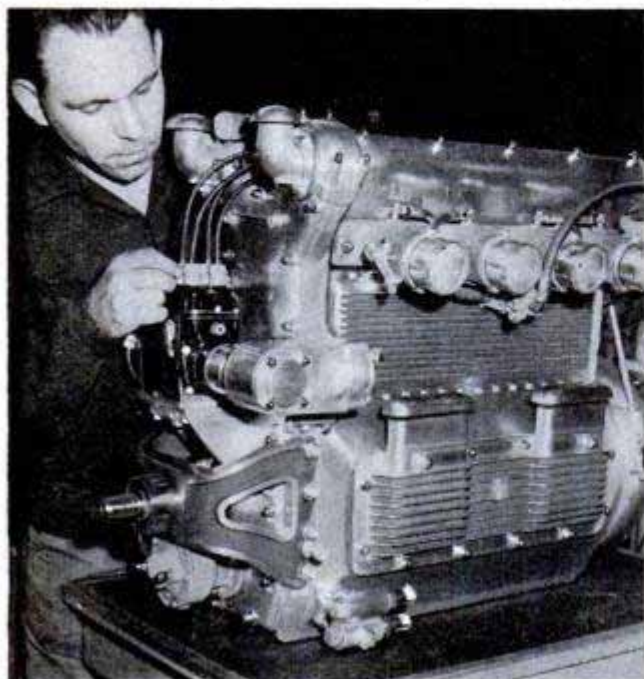
Winner Ruttman gets tire change and fuel during the 1952 race. Note the unusual tread on racing tires



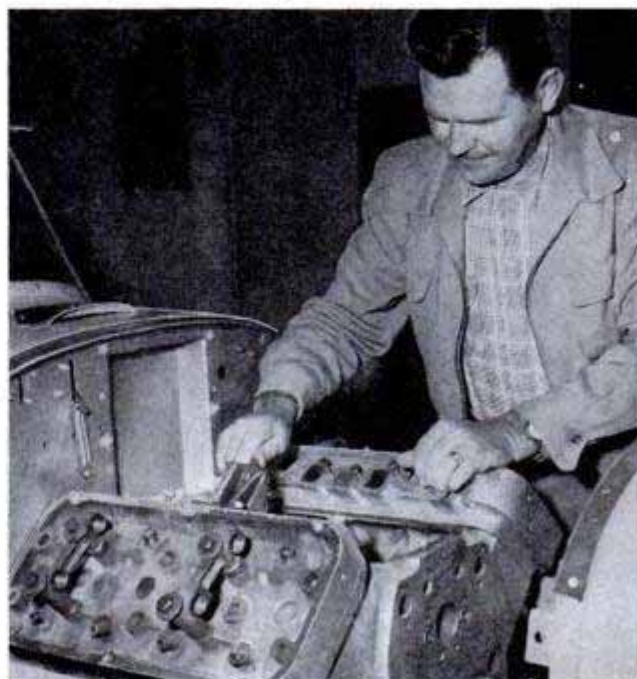


Cutaway of the famed Offenhauser. It is made in four sizes, the 270-cubic-inch model being most popular with Indianapolis drivers
Courtesy Meyer & Drake Engineering Corp.

Shown here ready for installation is an Offenhauser 270 with fuel injection. It develops 340 horsepower



Milton says to watch the modified stock engines, like the Chrysler V8 being mounted in this race car



VANRANST: Only to a limited extent. Few of the cars would make good road racers because they haven't adequate brakes or suitable gearboxes.

MILTON: The only cars that I can think of designed particularly for the 500 are those in which the engines and related parts have been put in at a slant or angle to influence centers of gravity. The major proportion of Indianapolis cars are quite conventional with little digression from standard practice to accommodate that particular track. I am surprised that it hasn't been done more.

Q: Will there be a turbine entry in 1953?

MILTON: I think they have opened the race up to jet and turbos or a combination, but of course the energy must be geared to the wheels. It couldn't be just the thrust of the exhaust gas.

Q: Is there anything like that in prospect?

MILTON: I believe not for '53. I don't believe it is closer than 1954.

Q: A controversial question is this one: Has anything of value to Mr. Family Car Owner ever resulted from Indianapolis? What is your position on this?

MILTON: I am glad you said "what is my position" because I feel that I should take a position. Just what Indianapolis is depends

largely on how objective one is in his evaluation of it. There are those who say it is just a legalized bullfight, strictly entertainment. There are others who say that our passenger cars wouldn't be what they are today were it not for Indianapolis. I suspect the truth lies somewhere in the middle ground. I don't know just where that is. In earlier years many contributions were made to the automotive engine. Manufacturers didn't have proving grounds. They had no place to run a car continuously at high speed. I think it has helped tire development. I don't know how anyone could devise a tire test where so much could be learned. Around 1920, the 500 helped make heat treatment a focal point in engineering. I don't know how many cars broke steering arms that year and, as I recall it, immediately thereafter the industry in general became more concerned with metallurgical problems. I believe it contributed substantially to supercharger development. It is more or less common gossip that one V8 manufacturer has an engine on the shelf with a supercharger in the center of the V—just in case it is needed in sales competition. Certainly every year you will see engineers from almost every auto company snooping around the garages to see what the boys are doing. Most of them are quite vocal in praising the ingenuity of those fellows who use rule-of-thumb, cut-and-try methods generally.

Q: Would Indianapolis be a better race if instead of this rule-of-thumb engineering, more academic skills were used?

MILTON: Perhaps, but new gimmicks are not found in textbooks. Certainly, sound engineering is coming in more today. This fellow Keck out on the Coast has a

Johnny Parsons, Indianapolis winner in 1950, holds a frame of a Kurtis race car. The chrome-moly frame weighs 115 pounds, combining strength and lightness

couple of young graduate engineers who developed what they call fuel injection. It isn't direct injection, it is manifold injection. Vukovich and others used it with fine success.

Q: Do you think this might lead to fuel injection for the family car?

VANRANST: Oh, yes. The advantage of fuel injection is that you can get better control, better distribution. The jets are usually adjacent to each inlet valve so therefore the fuel is metered to that cylinder. You get better balance than you can when you take fuel from one source and use a manifold to distribute it. Of course, you have no float valve, a cause of trouble in most carburetors. Also, you don't have to use the energy of the air to pull the fuel off the jets, which takes away from your volumetric efficiency.

Q: Then fuel injection is coming?

VANRANST: It would be here now if they could afford it.

Q: Racing cars use torsion-bar suspension. Will that come on the family car?

MILTON: I think it will. Van doesn't.

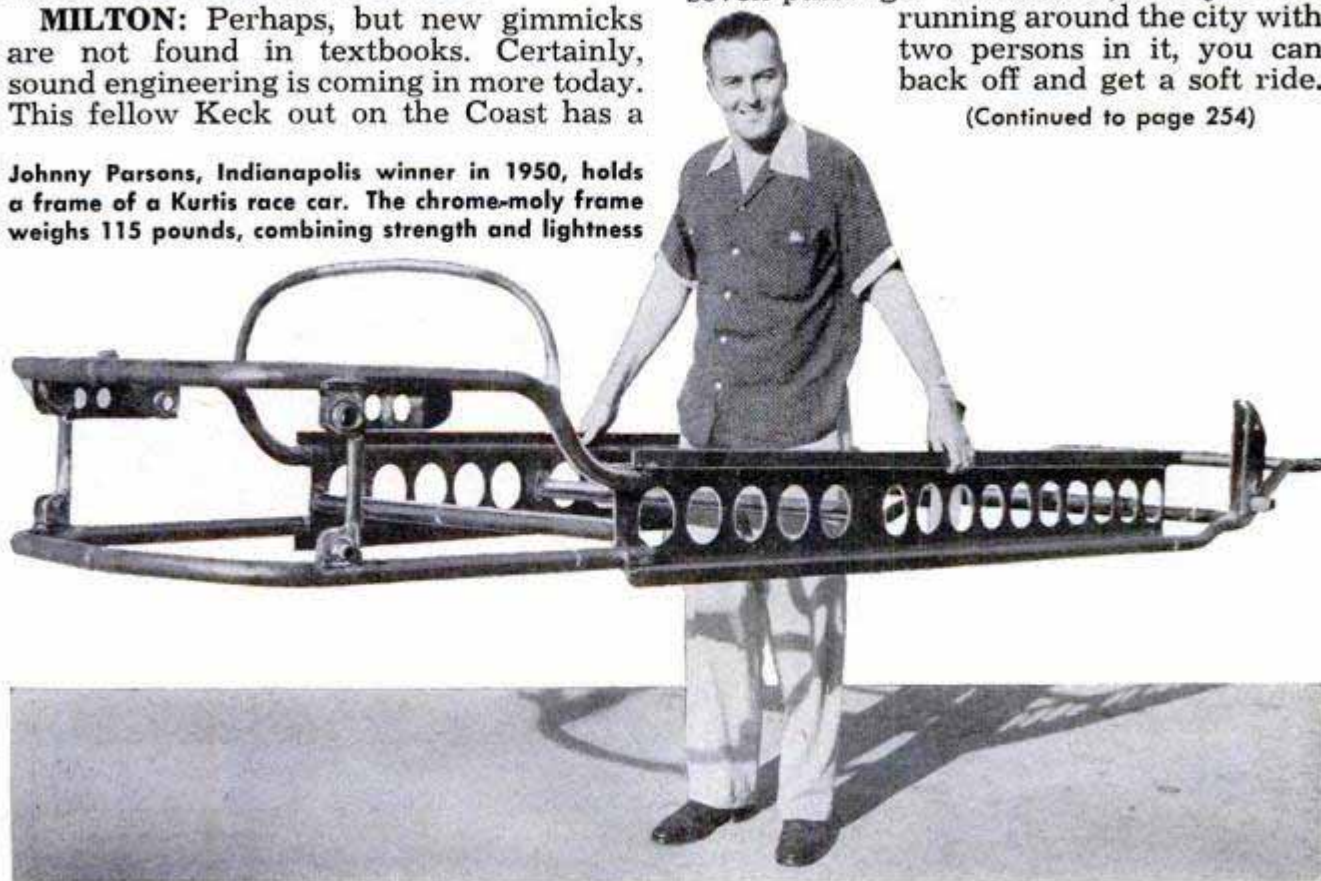
VANRANST: The reason it won't is the extra cost. Most American manufacturers have built experimental cars with it. It's no secret.

Q: What are its advantages?

VANRANST: Lightness of weight is one important advantage and also the fact that you can vary the rate of your spring with a simple adjustment.

MILTON: That is, if you have a big car, a seven-passenger automobile, and you are running around the city with two persons in it, you can back off and get a soft ride.

(Continued to page 254)





At left is a Jeep. Three other vehicles are Marine Mites, rigged as ambulance, gun mount, signal truck



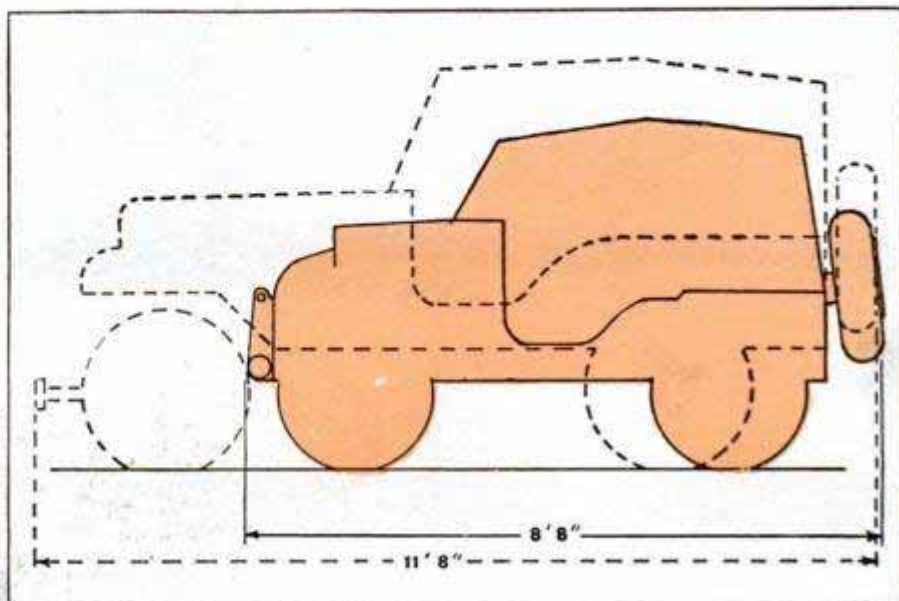
Above, a Mite runs with a wheel off! Below, it zooms up the test hill. Right, comparison of Jeep (dotted line) and Mite

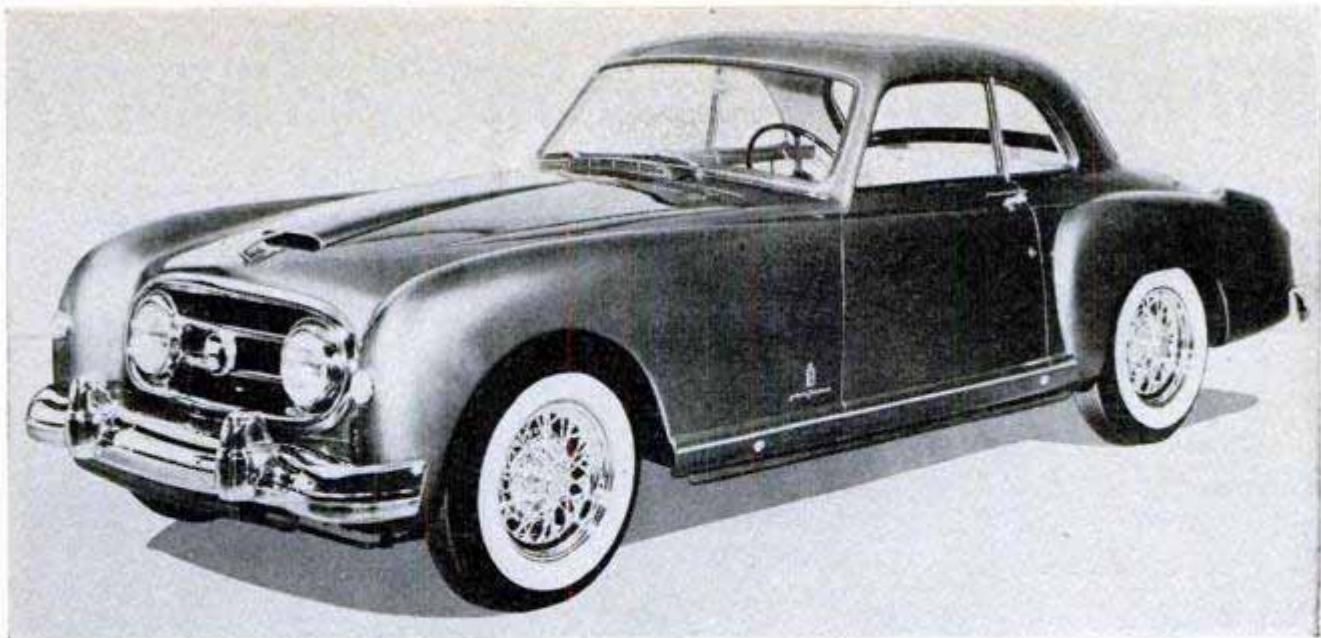
Marines Unveil Mighty Mite

U. S. MARINES have unveiled a tiny vehicle that promises to do everything the famed Jeep will and more. They call it the Mighty Mite—and with reason!

The 1500-pound car bristles with talent. Only 96 inches long, it will haul four Marines anywhere. It can be rigged as a combat ambulance, a recoilless cannon mount, a tractor for a rocket launcher or a field-radio station.

It has an air-cooled aircraft engine (test models use the Porsche sports-car engine). The three-speed transmission drives all four wheels, each independently sprung for roadability.





Nash-Healey Adds LeMans Hardtop to Sports Line

Named after the famous French 24-hour race, the Nash-Healey LeMans hardtop features the sleek styling of Pinin Farina. The name LeMans is a natural for this production-model sports car because Nash-Healey convertible models have performed creditably in the endurance race, finishing third in 1952. The LeMans, a genuine sports car, combines the skills of three countries. Engine and major mechanical parts are manufactured by Nash Motors in the United States. The chassis with its trailing-link front suspension is made by the

Donald Healey Company of England. The bodies are produced in Farina's custom body plant at Turin, Italy. Power plant in the LeMans is the Dual Jetfire Nash Ambassador engine that in the 1952 race averaged 91.5 miles per hour for 24 hours and was one of only 17 cars to finish from a starting field of 58 cars. It is an overhead-valve six, developing 140 horsepower. Compression ratio is 8 to 1. Two side-draft carburetors in conjunction with an oversize intake manifold and a seven-bearing crankshaft are also features of the engine.

SPECIFICATIONS OF NASH-HEALEY LeMANS HARDTOP

Wheelbase—108 in.
 Over-all length—178.75 in.
 width—64 in.
 height—55 in.
 Weight (approx.)—2970 lb.
 Suspension, front—-independent
 rear—coil

Engine—OHV 6
 Brake horsepower—140 at 4000 r.p.m.
 Bore and stroke—3½ x 4¾ in.
 Displacement—252.6 cu. in.
 Compression ratio—8 : 1
 Rear-axle ratio—4.1 : 1
 Forward speeds—4

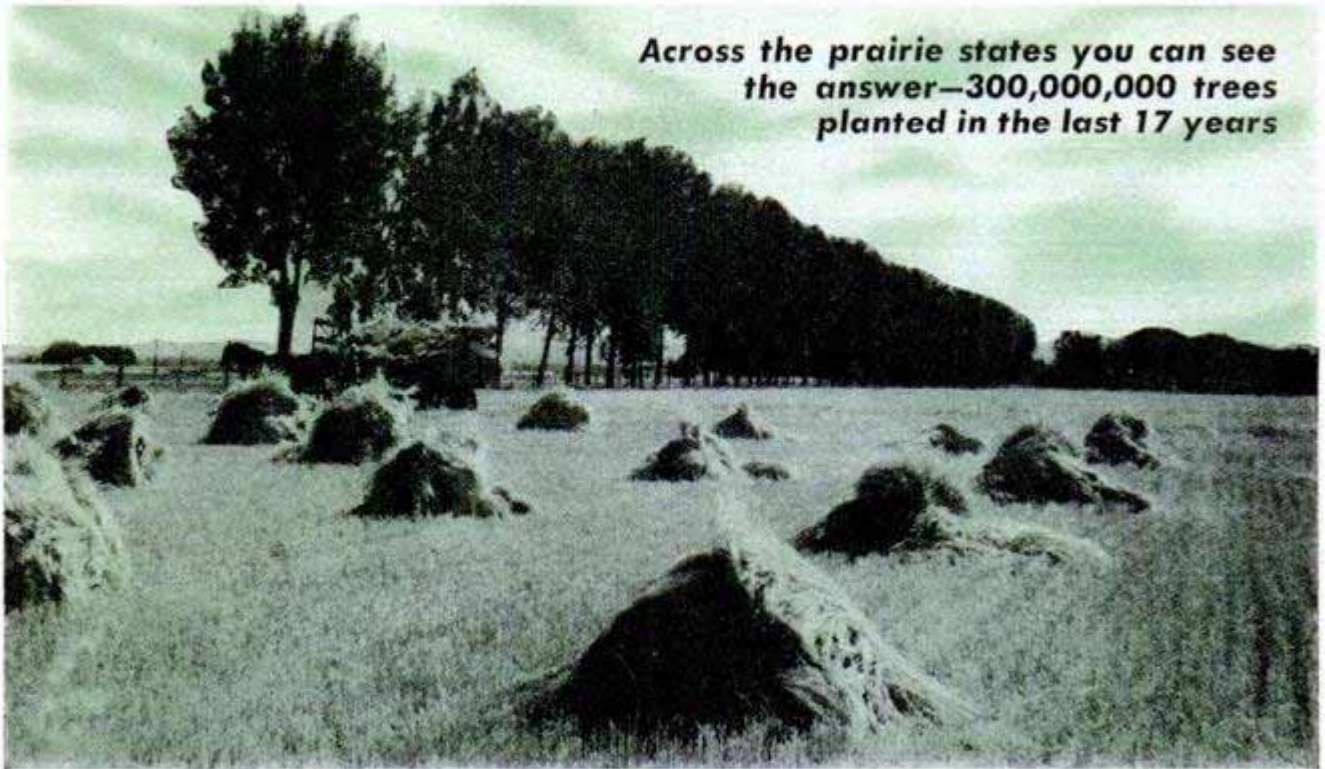
Waterproof Compound for Brakes Makes Them Wear Longer

Brake linings are made waterproof and given increased useful life by a metallic compound that is applied with a brush. The linings are rasped before the compound is brushed on. After it has dried, the material is "bedded" in by driving the car for a few miles with the brakes lightly applied. The manufacturer claims brake linings last longer and have less tendency to fade and grab when treated with the compound.

British automobiles are shipped to Cape-town, South Africa, in parts and assembled in a new 110-acre plant which, it is hoped, will eventually manufacture cars entirely from South African materials.



WHAT BECAME of the SHELTER BELT?



Across the prairie states you can see the answer—300,000,000 trees planted in the last 17 years

Long line of thriving trees—a typical windbreak—cuts strength of wind and whirls it up above the fields

IT WAS THE blizzard-plagued winter of 1950, and across Nebraska farms you knew the fence lines only by the waves of snow that had rolled over them. Hundreds of farmers couldn't get hay to their cattle and planes had to bomb bales to the stock. But near O'Neill, Clarence Ernst just hitched up a team each day, rumbled out to his haystacks, loaded up and fed his cattle.

By Rafe Gibbs

Ernst had easy sledding because of the mile of shelter-belt trees on his farm. The haystacks on the lee side of the belt were protected from the storm and so were the cattle.

Ernst's trees are among more than 300,000,000 which have been planted with federal aid in the last 17 years in Nebraska and neighboring states. They form shelter belts, or windbreaks, that are paying off both in

Photos here and directly opposite show a fast-growing windbreak. Trees below are just getting established

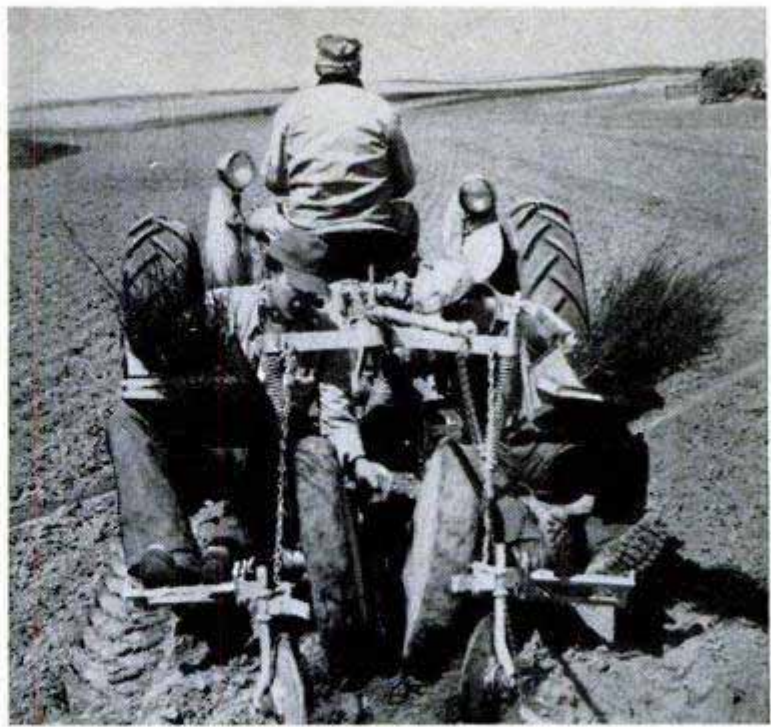


winter and summer. Throughout the states of North and South Dakota, Nebraska, Kansas, Texas, Oklahoma, Wyoming and Montana—where the wind in many parts blows only one way: Hard—more than 20,000 miles of windbreaks on more than 80,000 farms have been planted since 1935.

The man who would really smile broadly at these figures, if he were still alive, is President Franklin D. Roosevelt.

The story that broke July 1, 1934, stated that Roosevelt had approved a Forest Service plan, officially known as the Prairie States Forestry Project. A hundred windbreaks, each seven rods wide, were to be planted in a belt of land with a total width of 200 miles. This belt was to start in the middle of North Dakota and run south for 1200 miles in an almost straight line into the Texas Panhandle. Embraced were 20,000,000 acres of which 1,820,000 were to be devoted to the planting of trees. Time to complete: 10 years. Total-cost estimate: \$75,000,000.

That was in the dust-bowl and depression days of withered grain and money. Not only was much of the farm land in the prairie states blowing away, but yields from what was left brought little return. It was figured that 90 percent of the \$75,000,000 would go to farmers largely for the employment of labor for plowing, fencing, planting and caring for trees. Also for the acquiring of some land. The trees were to be supplied free to the farmers.

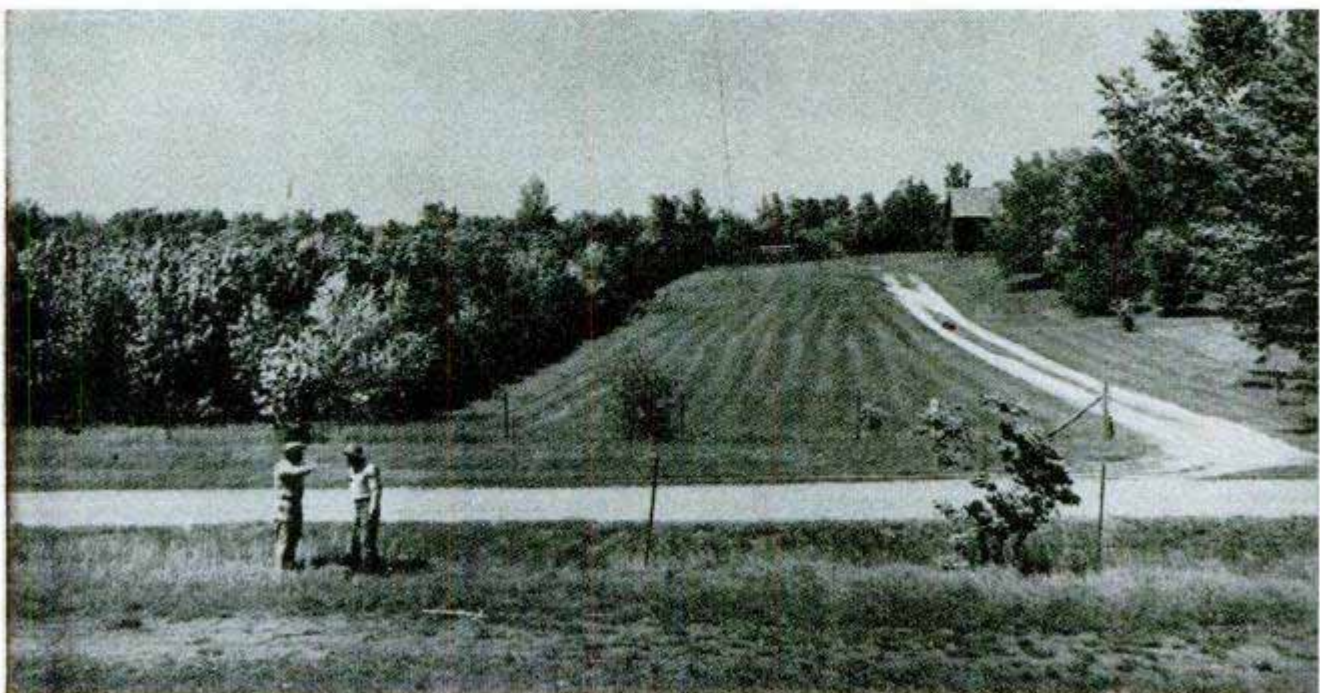


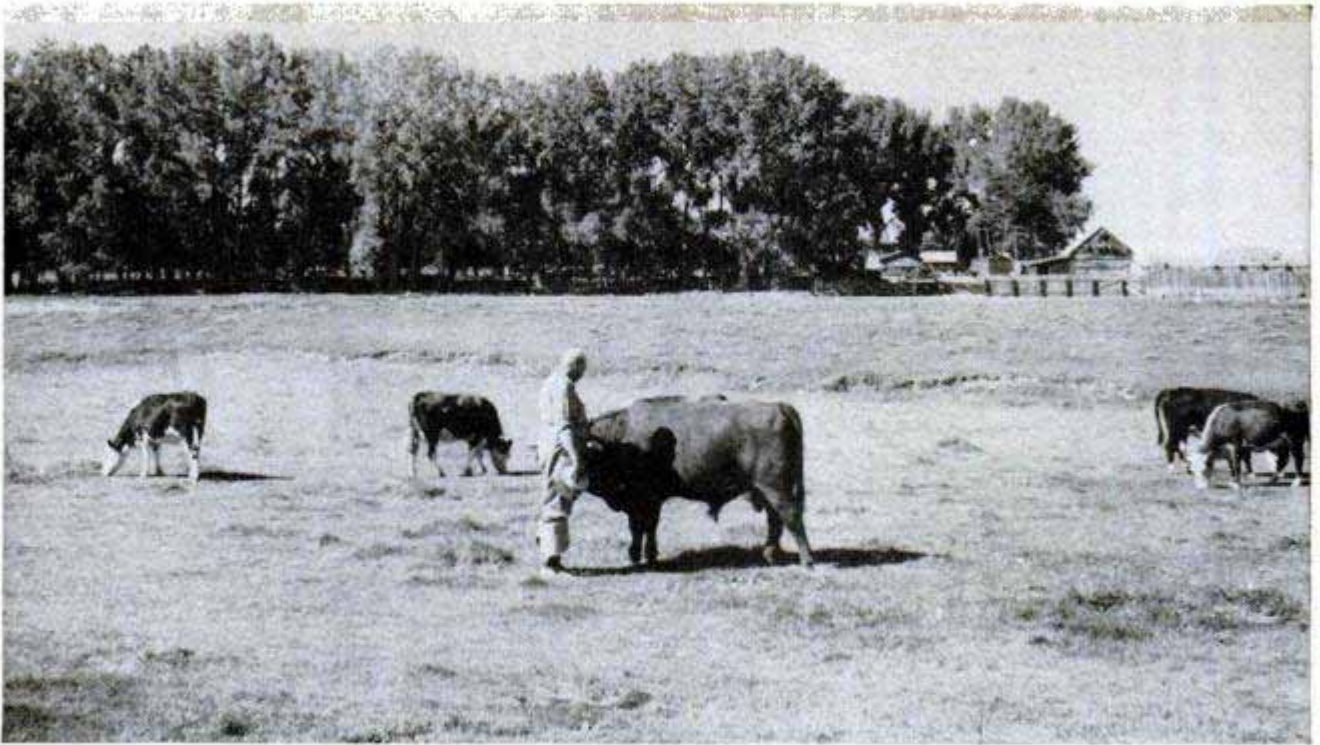
Tree-planting machine, available from the Soil Conservation Service, plants and packs dirt around 3200 trees in one day

Considering the time and situation, the idea of the vast belt of trees made sensational reading. Whether Roosevelt himself actually envisioned an unbroken line of trees is uncertain. It has since been learned that Forest Service officials never did, but for awhile at least, they were stuck with the original conception implanted in millions of minds.

There was no question that something was badly needed to help bridle the winds; to curb the shifting soil of farm lands; to keep the snow in areas where it was vital for spring moisture; to raise the water table of the soil around the trees; and also to give

Same farm view three years later shows how trees have flourished. They must be cultivated like other crops





Here's a windbreak, old-style: Lofty cottonwoods grew from branches buried in furrows by the early settlers

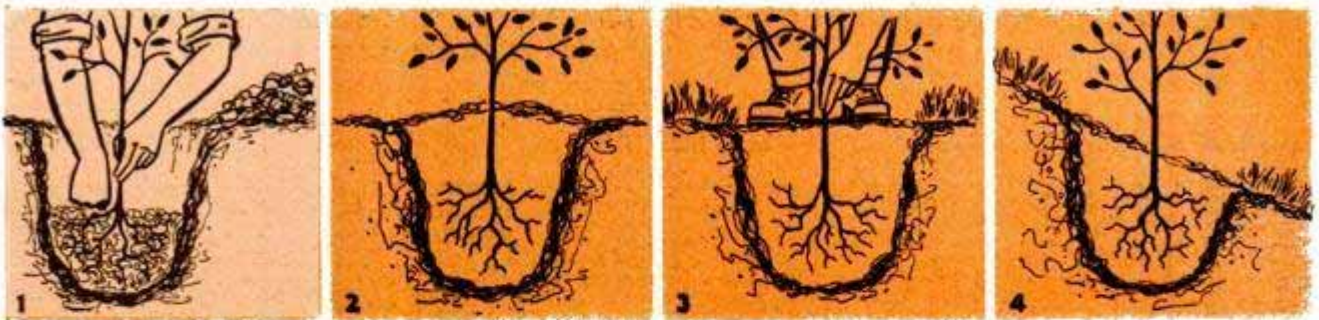
jobs to the many jobless of that depression period.

Researchers had found that tree belts reduced the average wind velocity between strips by 35 percent in the summer and 20 percent in the winter. Evaporation of moisture between the strips was cut 30 percent. The Prairie States Forestry Project indeed seemed to be just what the middle states were waiting for.

Enough money was allocated from Roose-

velt's emergency funds to get the project started in 1935, but it had not gone a year when it was deep in trouble and Roosevelt was deep in ridicule. One writer referred to the project as "Roosevelt's folly." Another as his "dream belt."

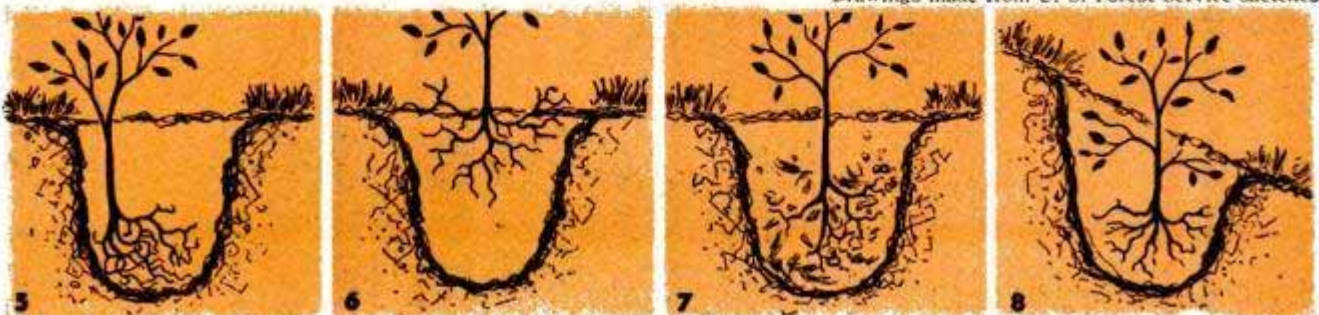
Fatalities to trees planted in the first year were reported to have run in some areas as high as 80 percent. Many farmers failed to cooperate. Others cooperated too well. One farmer said:



HOW TO PLANT A TREE: 1—Dig hole larger than the root structure, hold tree in position and tamp soil carefully around roots with fist. 2—Fill the hole with loose soil, heaping it above the natural level. 3—Tamp carefully with feet, leaving depression for water. 4—On hillside, continue slope of the ground

HOW NOT TO PLANT A TREE: 5—Tree has been planted too deep and the roots are crowded together. 6—Tree has been planted so shallow that some of the roots are exposed. 7—Sod, rocks or grass around the roots will dry them out and kill the tree. 8—Tree too deep on hillside will be covered by soil rolling from above

Drawings made from U. S. Forest Service sketches



"I've got six different government agencies helping me now. I know trees won't grow on my land, but why not let a seventh agency try to make 'em and give me a job in the bargain?"

In 1936, Congress failed to appropriate \$1,000,000 requested in continuing funds, and the government was left holding a huge bag of 60,000,000 seedlings ready for planting. To let the trees out of this bag, Congress had to appropriate \$170,000 for the chore of giving them away to farmers.

Did the project then fold? Not by millions of trees, it didn't. Roosevelt dug into WPA funds year after year, and told the Forest Service: "Plant more trees."

Meanwhile, there were other important developments. The Forest Service made it clear that the idea of a continuous belt of trees was a misconception. The so-called shelter-belt zone was only the area within which the Prairie States Forestry Project was to operate. The plan was to plant field shelter belts to protect individual farms within that area, with the exception that all of the farms within the zone would eventually have adequate tree protection against the winds.

Also, the critics were rapidly becoming less critical. Thousands of trees that had been thought dead were perking up. So was Congress. In 1942, it thought enough of the project to appropriate money directly to maintain its administrative setup.

But before the year was over, the Prairie States Forestry Project was officially terminated — without loss of honor to the Forest Service. The United States was deep in World War II and many governmental shifts were being made. Federal responsibilities for helping farmers and ranchers in the Great Plains with tree planting were transferred to the Soil Conservation Service.

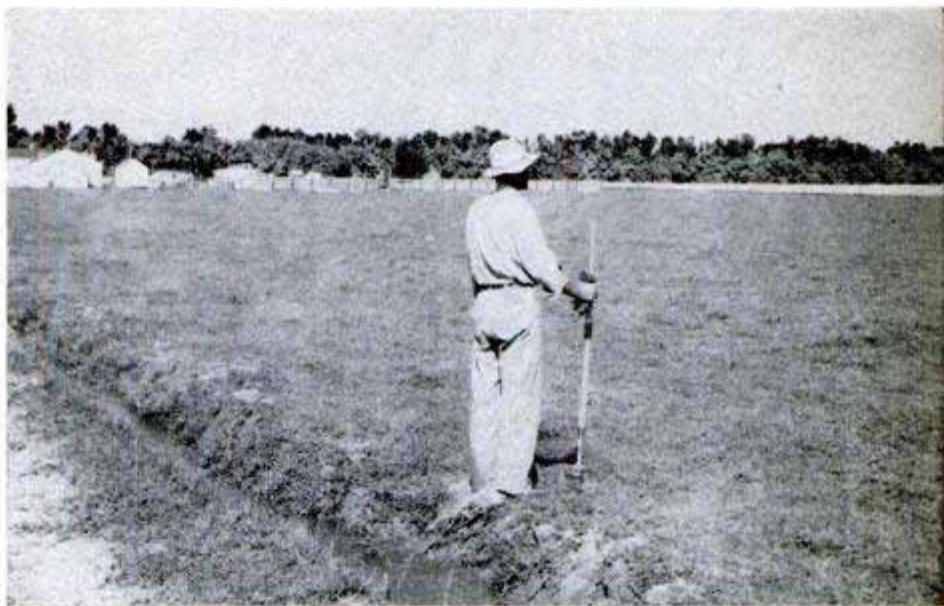
The final report of the Forest Service was a most creditable one. Its plantings from 1935 to 1942 covered 238,212 acres on 30,223 farms. They numbered 218,378,352 trees to form 18,600 miles of shelter belts. Of the belts, 78.4 percent were rated good or better; only 10.4 percent unsatisfactory.

And even as the war progressed



Soil Conservation Service photo

To insure growth, shelter belts are cultivated two or three times a year until trees are big enough to shade surrounding ground



Twelve years ago this Wyoming farmer didn't have a tree on his land. Now he has a fine windbreak that stretches across horizon. [Most windbreaks have been planted in straight rows, but some farmers now plant in curves corresponding to cultivation pattern





Aerial view shows how shelter belts can protect fields in summer, highways and farm buildings in winter. Below, belts have become so popular some farmers have started their own nurseries. This one is in Idaho



so did the planting of trees—under the guidance now of the Soil Conservation Service.

The SCS was no novice organization at tree planting. Since 1934 the SCS has been aiding farmers and ranchers in the planting of field shelter belts, farmstead windbreaks, feed-lot windbreaks, wildlife areas and gully-control plantings as parts of complete, coordinated soil and water-conservation plans. Explains A. E. Ferber, regional forester for the SCS at Lincoln, Neb.

“The old Prairie States Forestry Project idea hasn’t changed much, except that it’s now on more of a cooperative basis. The Forest Service used to plant trees using WPA crews; the SCS did the same, usually with CCC crews. Today the farmers handle the planting themselves through rental of tree-planting machines with two-man crews from their soil-conservation districts.”

Not only that, but farmers and ranchers now are procuring more than half of the trees themselves. They furnish the land to start with, then cultivate it two or three times a year after the planting until the ground is completely shaded.

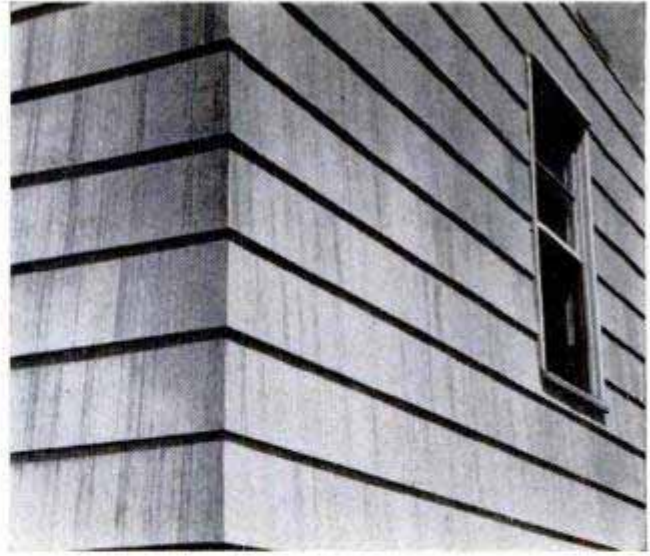
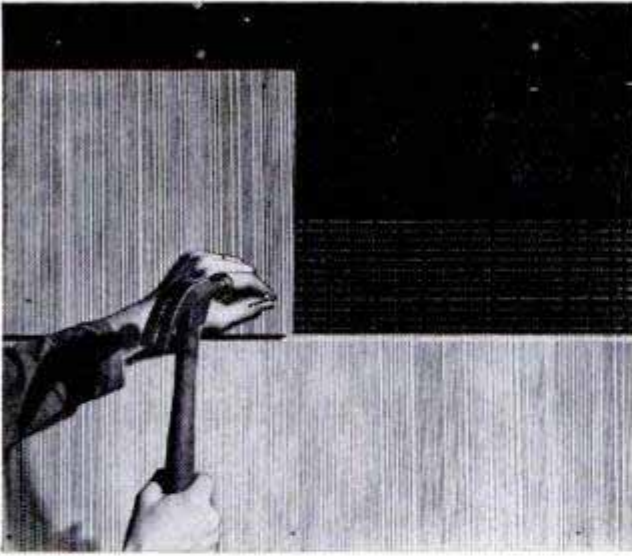
And this system of giving root to the land has spread far beyond the reaches of the so-called prairie states. It is going strong, for instance, in the Rio Grande Valley in Texas, in northeastern Arkansas and the Gulf Coast region of Texas and Louisiana. You don’t think of timbered Wisconsin as needing farm shelter belts, but it does—and is getting them. The Badger State has more than 6000 miles of such new plantings. California is now going into shelter-belt tree planting in a big way to protect its vast citrus groves.

In 1948, residents of the village of Shelly, Minn., decided to try a community shelter belt. The city fathers leased an L-shaped strip 150-feet wide and the residents planted trees in the approved pattern. Today the center trees are 20 feet high and the village already is feeling the benefits through lower fuel bills, less snow to plow and greater comfort.

Near Riverton, Wyo., D. D. Jarvis has a flourishing shelter belt dominated by Chinese elms and Russian olives. The SCS helped him get started in 1940 with the windbreak which now rises high above his farm buildings. Jarvis came to the newly irrigated section of Wyoming 14 years ago from a wind-swept area in Nebraska, and he needed selling on tree planting.

“My windbreak is a quarter mile long and covers about two acres,” says Jarvis. “That acreage is the most valuable I’ve got. If it weren’t for those trees, the wind would blow my farm right off the map. And in the spring the trees make a man mighty glad

(Continued to page 238)



Asphalt Strip Applied to Sheathing Gives Siding Deep Shadowline

Nailed directly to the sheathing, an asphalt-composition strip is used as an underlayer for shingled or lapped-siding walls. It not only provides increased insulation and more protection from the weather, but it

also is tapered to move the lower edge of the shingle out, making a deeper shadowline. The bottom half of the composition strip is ridged to a thickness of $\frac{5}{16}$ inch and the over-all size is one by three feet.

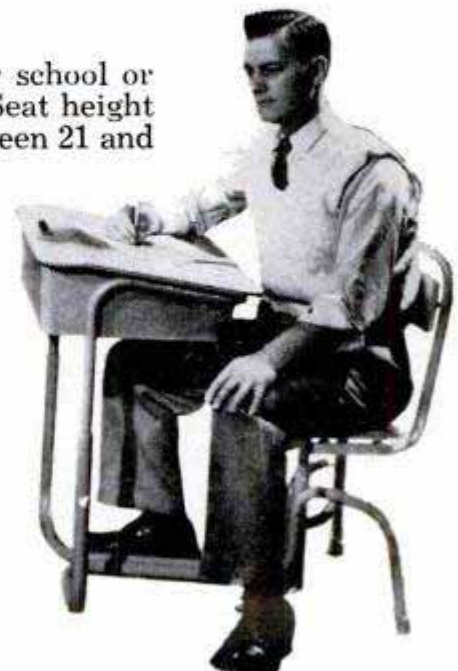
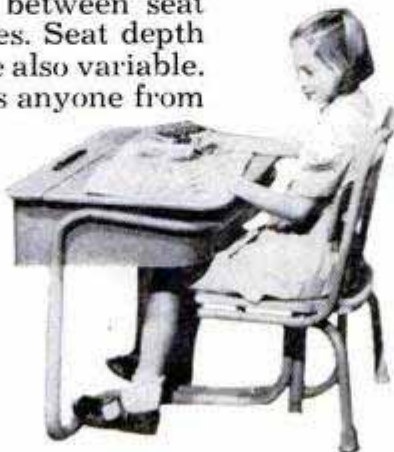
Quickly Mounted Pump Makes Truck or Tractor a Fire Fighter



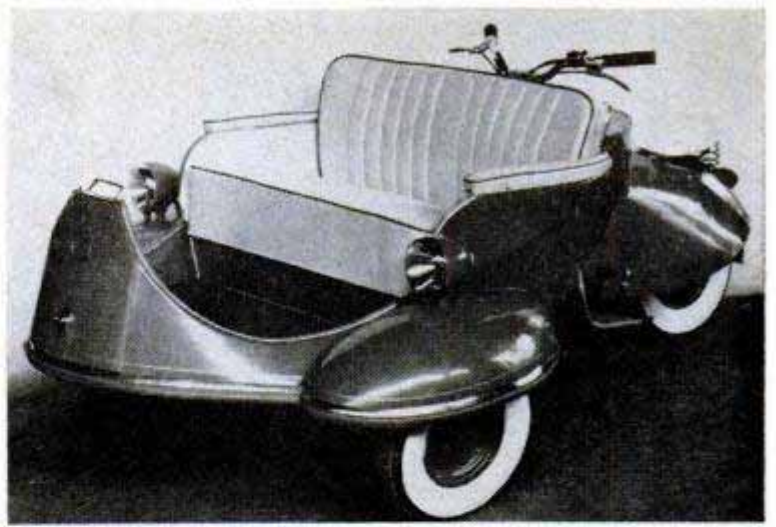
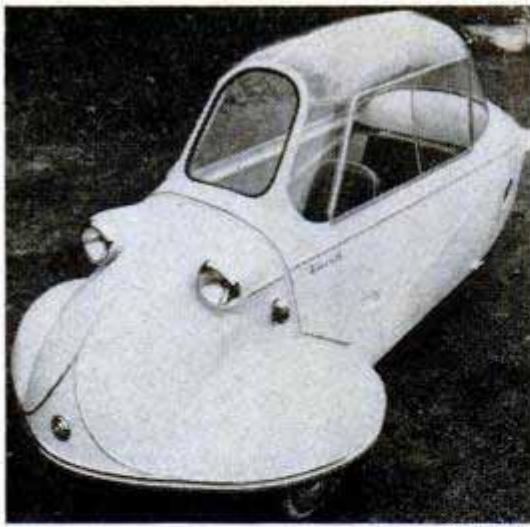
Mounted in three minutes, a centrifugal pump which connects to the crankshaft of a truck, or attaches to a tractor, transforms a vehicle into an auxiliary fire fighter. One large fire hose connected to the water supply attaches to the front of the pump. Water under pressure is supplied the firemen by a second hose. It is in use in Germany.

Telescoping Desk Adjusts to Fit Child or Adult

Designed to "grow with the child" is a study desk for school or home which has a telescoping tubular-steel framework. Seat height may be varied between 12 and 18 inches, desk height between 21 and 30 inches, and the distance between seat and desk a total of five inches. Seat depth and height of the back rest are also variable. Thus, the desk accommodates anyone from a small child to a full-sized adult. A large steel book box which is topped by a hinged wooden-lid writing surface holds 15 books and a lunch package.



Busiest railroad junction in the world, claim the British Railways, is their Clapham junction, where 2500 trains pass every 24 hours.



German Aircraft Manufacturer Now Builds Small Automobiles

Famous as an airplane manufacturer, Dr. Willy Messerschmitt of Germany is now building a line of small vehicles. One is an extremely small car that seats two persons in the same manner as a light plane—one behind the other. The all-plastic top swings upward like the lid of a suitcase for entry of the driver and passenger. The car's tiny

engine drives it along at about 45 miles an hour. Another Messerschmitt creation is called the German taxi and has a wide-open front seat for two passengers. The driver sits in the rear on the power plant which is designed like a motor scooter. A canvas cover is available for the passenger compartment for protection from sun and rain.

Seismograph May Prove Earth's Core Is Molten

Is the earth's core molten, or solid? That's a question a new seismograph developed by Columbia University may soon settle. First indications are that it's molten. The machine, an "ultra-long-period vertical seismograph," measures the extremely long and penetrating waves of a major quake. The first major test was during the Kamchatka quake of Nov. 4, 1952, which shook the earth for 20 hours. One group of shock waves traveled completely around the globe eight times, a distance of about 182,000 miles. The shorter waves, which did not penetrate the earth deeply, increased in velocity as they went deeper, indicating that the density of the earth's crust increases to a certain depth. But the extremely long waves, which the scientists believe penetrated the earth's core, slowed as they reached the center of the earth. If the center were solid, the waves should have increased in velocity.

Too Tough to Die!

That's the tribute paid the invincible old Ford Tri-Motor by an aviation expert. He recently took a nostalgic hop in one of the old-timers (remember their "barn roof" skin?) and comes up next month with a long look at one of the most fabulous contraptions in the history of aviation. You will find it in the June issue of *Popular Mechanics*. Don't miss it!

Lightweight Motorcycle Weighs Only 175 Pounds

Hailed as the "newest and safest" of motorcycles is the low-slung English Commander. The lightweight machine weighs only 175 pounds, but its radical design reportedly makes it tops in road safety. It was recently shown at London's cycle and motorcycle show.





Detroit Listening Post

By Siler Freeman

THE POPULARITY at auto shows of the plastic-bodied sports cars, with which General Motors is experimenting this year, has hurried Chevrolet into production of its Corvette. Plans call for production to begin in June with a first-year schedule being estimated at 300 to 1000 units.

Bodies will be of plastic (glass fiber) as was the model shown to the public at the auto shows. They will be made for Chevrolet by an Ohio plastic company. Prices are not definite yet. Estimates range from \$3000 to \$3500 with bets being on the top figure.

The stepped-up Chevrolet engine in the Corvette will have three carburetors to give it 160 horsepower. Although sports-car fans may object, Powerglide automatic transmission will be standard on the car. The hand-operated canvas top will be retained as will the snap-on side windows. The untried frills, like the hydraulic trunk and hood lifts, have been eliminated from the production model.

There are many things that GM wants to find out about plastic bodies before it goes further than that. It may appear mighty expensive even to put out 300 of these cars, but for a company which once spent about \$17,000,000 to tool up for a light car and then discarded the whole idea, it's a trifle!

But the sports car is not just another experiment—experimental though the Corvette may be. It is looked upon as a development and much more time, money and effort will be going into the field. Eventually, steel-bodied sports roadsters will emerge for the market in a serious way.

Like the hardtop convertible, the sports car may develop a much broader appeal than it has now. Originally, the hardtop was aimed at a small segment of the market, those who like the outdoorsy look of the convertible but who didn't want its drawbacks, including the higher price.

But the public took to it even beyond the expectations of manufacturers. It has become so established that the hardtop line now includes sedans as well as coupes. It is getting a bigger share of scheduling.

Studebaker may be cited as conducting a similar experiment with sports cars. It has two lines, one being the low-silhouette

sports line. It is not truly a sports car, but it has some of the attributes that make the sports car attractive and it appeals to more than the hard core of sports-car fans.

And don't think it hasn't opened the eyes of some competitors. They are watching public reaction to Studebaker's pioneering efforts. The South Bend company has shifted its production schedules to put more units into the hardtop or sports line and away from the more conservative regular line.

So, as in the case of the hardtop, other makers may join the trend toward the low, sporty look. It means some altering of the public taste and in some quarters there are pessimistic predictions of another flop like the Chrysler Airflow. But right now, the betting is the other way.

Studebaker had some difficulties with its sports line. It was a long time in getting into full-scale production because of difficulties with body dies that tore the steel sheets. The problem was ironed out, finally, about a month after dealers had been scheduled to show the cars publicly.

While the trend to V8 engines has been definite and prolonged, some manufacturers who had rushed plans to substitute them for present eights and sixes have slowed down. Tooling is more available, but they have discovered that sales are not entirely dependent upon engine shape where there are other compensating features.

A significant advance in 1953 (the model year with more changes than any in auto history) is the variety of optional-accessory equipment that has real value to the owner instead of merely providing the dealer an added source of revenue. As W. S. James of the Fram Corporation told the SAE:

"Such accessories provide the means of accelerating development and reducing the cost of items usually available only in high-priced cars."

Power steering, James said, will be simplified by manufacturing experience. This will cut the time required to make it standard equipment. Turn signals have just about completed the change to standard equipment and automatic transmissions are midway. Power brakes may follow.

THE OWNERS

average for poll was 1149 miles

POPULAR MECHANICS OWNERS POLL CONDUCTED BY FLOYD CLYMER

Speedometer reading 3714

1. I own a 1953 Plymouth:

Cranbrook Cambridge

2. I use regular gasoline

Premium (high test) gasoline

3. Average gasoline mileage in city: 17 m.p.g.;

in country: 19-20 m.p.g.;

4. Oil consumption: One quart every 650 miles.

I change oil every 1000 miles.

5. My Plymouth is equipped with:

Conventional 3-speed transmission
Conventional transmission with overdrive

Yes No

6. Would you like an automatic transmission in your Plymouth?
If so, what type would you prefer?

Excellent

Good

Unsatisfactory

7. Roadability at high speeds:

Excellent

Good

Unsatisfactory

8. Maneuverability in traffic:

Excellent

Good

Adequate Poor

9. Acceleration:

10. What is the most satisfactory cruising speed of your Plymouth? 47-55 m.p.h.

11. My main reasons for buying a Plymouth: I travel around 35000 miles a year and must have an economical car which I can depend upon. Plymouth cars have given me dependable service with little or no cost for repairs in the past. Future??

12. Which engine would you prefer in your next car?

In-line 6-cyl.

V-8

13. Would you prefer overhead valves rather than side valves, as your Plymouth is now equipped?

Yes

No

14. Rate these points:

Visibility, forward:

Like

Acceptable

Dislike

Visibility, rear:

Like

Acceptable

Dislike

Riding qualities:

Like

Acceptable

Dislike

Horsepower output:

Like

Acceptable

Dislike

Exterior body styling:

Like

Acceptable

Dislike

Traction on Snow, Ice:

Like

Acceptable

Dislike

Cold-weather starting:

Like

Acceptable

Dislike

High-speed wind noise:

Like

Acceptable

Dislike

Position of gas tank cap

15. Specifically, what are your complaints on the Plymouth? Gas tank cap & ash tray in wrong place. I have written Plymouth about this. Riding qualities do not equal other Plymouths I have owned.

16. Have you ever owned a Plymouth before? Yes No

How many? nine

17. Would you buy another Plymouth? Yes Possibly No

Average Poor

18. How is your dealer service? Excellent Good

Average Poor

19. An overall rating of your Plymouth: Excellent Good

Average Poor

20. What specific improvements do you want in your next car? Put the gas cap in the middle under the license or put it back on the fender. Put another ash tray under the radio speaker, a light under the hood would be great improvement.

Write additional comments on reverse side. This questionnaire will be tabulated fairly and your name will be held in strict confidence. Thank you.

MAIL PROMPTLY TO:
FLOYD CLYMER
Popular Mechanics Owners Poll
1268 S. Alvarado St.
Los Angeles 6, California

YOUR NAME [redacted]
STREET [redacted]
CITY & STATE Valley Stream, N.Y.
OCCUPATION Salesman

Owners have high praise for Plymouth economy

Plymouth is correcting filler neck and gasoline cap

87% rated car excellent or good

by Floyd Clymer

The true test of a car begins when the owner takes the wheel. Popular Mechanics sent questionnaires to 1000 Plymouth owners. Here's what they say about their cars

REPORT on the '53 PLYMOUTH



Owners say Plymouth hugs the road well. Clymer hit this abrupt incline at high speed and agreed with them

PLYMOUTH OWNERS are a faithful bunch—75 percent of the owners replying to our 1953 Plymouth questionnaire had previously owned one or more Plymouths. An amazing 18 percent stated they had owned five or more and 87 percent rated their cars “excellent” or “good.”

Answers to our survey question, “What were your main reasons for buying a Plymouth?” included one from a Sheboygan, Wis., sales manager, who wrote: “This is my fourth Plymouth. I have gotten 84,000, 64,000 and 52,000 miles respectively on the first three without any overhaul job and none of the cars ever used oil.” A Waupaca, Wis., salesman said: “Low maintenance cost. In 105,000 miles on my last Plymouth

I spent only \$27.05 on minor repair jobs.” Other comments included:

“Best car I’ve ever owned . . . economical to operate. Front seat back needs better springs and front springs are too soft. On quick stops, front end dips down too much. These are my only complaints.” — Las Vegas, Nev., salesman.

“My ninth Plymouth and the best I’ve owned. Like most modern cars, ‘bugs’ are in all new models and assembly could be better.”—Pasadena, Calif., gardener.

“Top of horn ring annoys me by partially obstructing instrument and speedometer vision. Otherwise, the car is excellent.”—Hollywood, Calif., doctor.

One characteristic of Plymouth owners

Maneuverability is rated “excellent” by 85 percent of owners. The shorter, 114-inch wheelbase contributes to it



Percentages From PM Owners Poll

Owners of Cranbrook models.....	81%
Cambridge models.....	19%
Average speedometer mileage reported.....	2832
Owners using regular gasoline.....	75%
premium gasoline.....	25%
Average gasoline mileage in country.....	20.1 m.p.g.
in city.....	16.7 m.p.g.
Average mileage for adding one quart of oil.....	1149
for change of oil.....	1578
Cars having conventional 3-speed transmission.....	58%
conventional with overdrive.....	42%
Owners desiring an automatic transmission on next car.....	33%
Type desired: Chrysler-made Fluid Drive.....	27%
Hydra-Matic Drive.....	25%
Borg-Warner Automatic Drive... ..	8%
Other makes.....	10%
No type specified.....	30%
Roadability excellent.....	64%
good.....	34%
unsatisfactory.....	2%
Maneuverability excellent.....	85%
good.....	15%
unsatisfactory.....	0
Acceleration excellent.....	44%
good.....	47%
adequate.....	6%
poor.....	3%
Average cruising speed.....	59 m.p.g.
Owners desiring six cylinders in next car.....	60%
a V8 engine in next car.....	40%
Owners preferring L-head (like Plymouth).....	65%
overhead valves.....	35%
Owners of Plymouth cars previously.....	75%
Owners of five or more Plymouths previously.....	18%
Owners who will buy another Plymouth.....	64%
might buy another Plymouth.....	32%
will not buy another Plymouth.....	4%
Owners rating dealer service excellent.....	51%
good.....	24%
average.....	18%
poor.....	7%

OWNER'S RATING OF PLYMOUTH

Excellent.....	47%	Average.....	12%
Good.....	40%	Poor.....	1%

OWNER'S COMMENTS ON SPECIFIED FEATURES

	Like	Acceptable	Dislike
Visibility, forward.....	97%	3%	0%
Visibility, rear.....	90%	8%	2%
Riding qualities.....	90%	8%	2%
Starting in cold weather.....	79%	18%	3%
Exterior body styling.....	70%	26%	4%
Horsepower output.....	60%	36%	4%
Traction on snow, ice.....	60%	37%	3%
High-speed wind noise.....	26%	43%	31%
Position of gas filler pipe.....	28%	24%	48%

CHIEF PURCHASE REASONS

1. Economy of operation and maintenance
2. Previous satisfactory Plymouth ownership
3. Riding qualities and seating comfort
4. Styling features of car
5. Original purchase price of car
6. Maneuverability and handling ease
7. Mechanical features—engine, transmission, etc.
8. Purchase conditions—trade-in allowance, dealer service, etc.

MOST FREQUENT COMPLAINTS

1. Arrangement of gas filler pipe (tendency of full tank to spill mentioned particularly)
2. Rattles, body squeaks
3. Excessive wind noise at high speeds
4. Styling generally—interior or exterior
5. Location of rear-view mirror (too low or tends to obstruct forward vision)
6. Light weight of car—heavier car desired
7. Insufficient acceleration at lower speeds

IMPROVEMENTS DESIRED IN NEXT CAR

1. Tighter body fitting, better workmanship
2. Increase in power output
3. Automatic transmission
4. Improved styling features—exterior or interior
5. Heavier, larger car
6. Relocate or redesign gas filler pipe
7. V8 engine
8. Improved paint work and chrome trim
9. Relocate ashtray or install two on instrument panel

Improved vision and access result from door design. Right, rear-deck gas cap brought complaints of spillage





Plymouth's fast window cranking is tops but you can pinch a finger on metal trim



Clymer pulls out overdrive control. A fluid torque converter is now available for Plymouth. Instrument panel is neat, easy to read

that sets them apart from those with other makes is: They are not too favorably disposed toward automatic transmissions. Plymouth does not feature this and only 33 percent said they want some form of automatic transmission in their next car.

However, Plymouth is now offering a fluid torque-converter unit called the Hy-Drive. It is basically the same as the converter used on the Dodge, but slightly smaller. It is used with conventional three-speed transmission. The clutch pedal remains and is used for initial starting. After the shift lever is engaged, the clutch is no longer used. Like the Dodge unit, it shares its oil supply with the engine, making oil changes necessary only twice a year. Its price is \$135. The converter was announced last month, too late to be covered in this survey.

A Grand Rapids, Mich., taxi driver wrote: "In the taxicab business you have to give your customers riding comfort and that is what the 1953 Plymouth has." Another taxi driver in Tupper Lake, N. J., cited "economy of operation and later trade-in value."

A Kenosha, Wis., life-insurance agent said "I've always been a big-car owner, but since I bought a new Plymouth I have been amazed at the ease with which it handles. My gas economy is much better and yet I can hardly tell the difference in riding qualities."

Another advocate of shorter and lighter cars said, "All United States cars are too long and bulky for present traffic conditions. I drive 20,000 miles a year and Plymouth rides and handles better than many larger cars. I hope future cars will have smaller instead of larger engines."

Virtually everyone seems to like such Plymouth features as the chair-height seats, but when we asked for complaints we en-

countered one outstanding dislike. Many owners pointed out that the new Plymouth's gas-tank cap and filler pipe are so located that fuel leaks out under certain driving conditions and that the gas tank is difficult to fill. In all, 48 percent of the owners replying in the survey expressed a dislike for the new gas-tank setup.

[Plymouth engineering states that changes are being made in the filler neck and cap to eliminate this leakage. It also states that if the gasoline-hose nozzle is inserted all the way in the filler neck the tank will take the full flow of the pump without spillage.]

Other complaints, most of them minor, included the following:

"Dash light reflects on windshield at night," writes a Topeka, Kans., Air Force chaplain.

"The rear-view mirror causes a blind spot in front vision which might be dangerous."—Colorado Springs, Colo., administrative assistant.

"The dashboard ashtray is in the way of switch keys and cigarette lighter. Also, it's too small."—Fayetteville, N. C., taxi driver.

"Wind noise is most disturbing at the top of the doors."—Columbus, Wis., field man.

"I am a loyal Plymouth fan, but the Plymouth assembly line is careless; I find 10 or 15 minor things such as one loose bolt on windshield wiper, cowl wouldn't come open until fixed, bolt drilled wrong in the transmission so it must be replaced, heater adjusted wrong."—Whitewater, Wis., school executive. ("Careless" assembly lines is a complaint which crops up in surveys of every make.)

"Steering wheel is too close to driver's chest."—Smithfield, N. C., cab operator.

"Rear window is pulled down to where it



On rough, mountain roads, Clymer found Plymouth's improved suspension reduced the tendency to roll on turns

is difficult to get a complete view on rolling or hilly terrain. Lowering the mirror isn't the solution, as it is already too low."—Parlin, Colo., cattle rancher.

Favorable comments include one from a Pomona, Calif., orange grower who wrote: "I like the shorter wheelbase. It rides excellently and is easy to drive in traffic. Cars should be smaller for present highways." A Los Angeles attorney said: "Plymouth, like all Chrysler products, is one of the few modern cars a man can enter without knocking his hat off, and the seating position is comfortable. It's best of 20 cars I've owned."

Car owners always have their own ideas as to specific improvements they would like next time. Some of them for Plymouth are:

"Redesign right side of dash panel and put something useful in that space, such as a clock or a second glove compartment."—Salem, Ohio, draftsman.

"More weight. The car is too light to drive in high winds at high speeds."—Muleshoe, Tex., department-store owner.

"The front seat should be wider and just a little deeper at the back."—Topeka, Kans., soldier.

"This occurs in all new automobiles: The curved one-piece windshield does give more visibility, but when it snows the windshield wipers can't clear the snow from the driver's left as well as when the glass wasn't curved. The snow packs to the left."—Kenosha, Wis., registered nurse.

"I would like to see Plymouth come out with an economical engine. . . . At the same time, the new Cambridge body style is the greatest improvement in years."—Kansas City, Kans., printer.

Theorizing on late-model American cars is an ever-popular pastime in these surveys. This came from a Plymouth owner in Orange, Tex.: "The American motorist has come to expect a poorly constructed car and is generally prepared to remove half a

dozen rattles and squeaks, but he is not prepared (either with tools or know-how) to make body parts fit. I fail to see why the automobile companies can't turn out cars that are equal to prewar models in paint, body and trim work."

And from a Cleburne, Tex., auto-parts salesman: "It's my opinion that the average American light car wears out too soon on the inside, that it weighs 500 to 700 pounds too much and that all in all we have too much 'junk' and not enough car."

In praising his Cranbrook, a Kalamazoo, Mich., traveling salesman said: "I buy the car that gives me the most for my money. . . . I have owned and driven Chrysler-engineered products exclusively since 1924. Why? They cost me less per mile to own than any car I know."

Is Plymouth underpowered? Of the owners responding, 60 percent said they like the present horsepower output; 36 percent said it is acceptable, only 4 percent dislike it. As for maneuverability in traffic, 85 percent rated the Plymouth "excellent," 15 percent "good," and none "unsatisfactory."

More miscellaneous comments:

"I am very well pleased with my 1953 Plymouth with the exception of four items: 1. high-speed wind noise; 2. slow-speed tire noise; 3. light cushion padding; 4. weak locks on trunk and doors."—Memphis, Tenn., mechanic.

"I really appreciate the wonderful handling and parking qualities since I do much town driving and must park many times a day. The car could be a little heavier, since strong winds make it have a tendency to wander."—Ft. Wayne, Ind., salesman.

"Traction on snow and ice is the best of any car I ever drove."—Racine, Wis., pharmacist. (The survey specifically asked about this and 60 percent of the owners liked the Plymouth's traction, 37 percent said it was acceptable and 3 percent disliked it.)

"One thing I like about the Plymouth is the brakes. . . quite a bit better than other cars in the same class. However, the car is overpriced."—Monroe, Mich., electrician.

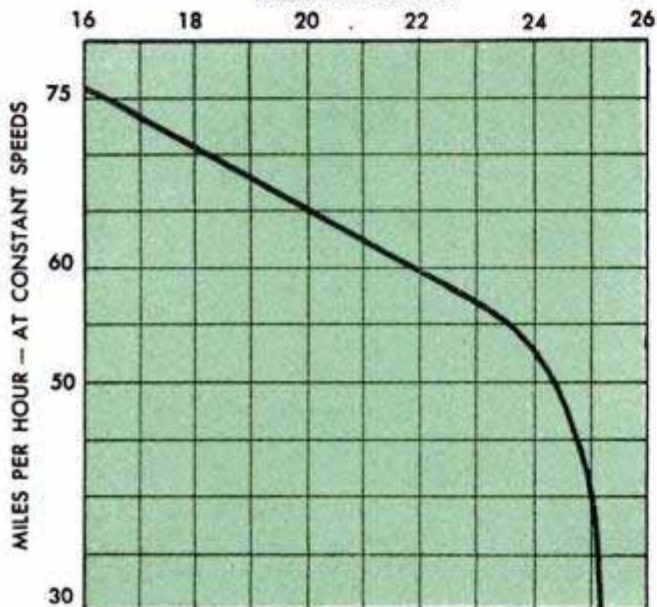
The questionnaires as a whole were returned without much comment on gas mileage, which might mean that Plymouth is satisfactory in this respect. The over-all mileage average reported was 20.1 miles per gallon in country driving and 16.7 miles per gallon in the city. Owners of overdrive-equipped cars average 2 to 3 miles per gallon more. These figures are about the same as those of other cars in the same price range. Regular gasoline is used by 75 percent of the owners, high test by 25 percent.

(Continued to page 246)

ECONOMY TEST

1953 PLYMOUTH CRANBROOK 4-DOOR SEDAN
with overdrive

MILES PER GALLON



CONSTANT SPEED MILEAGE

At constant 30 m.p.h.	25.1 m.p.g.
At constant 50 m.p.h.	24.3 m.p.g.
At constant 60 m.p.h. (in overdrive)	21.8 m.p.g.
At constant 75 m.p.h. (in overdrive)	16.2 m.p.g.

CROSS-COUNTRY MILEAGE

Los Angeles to Lone Pine over winding mountain roads and Mojave Desert	19.4 m.p.g.
Lone Pine to Las Vegas, Nev. (through Death Valley)	20.3 m.p.g.
Las Vegas to Los Angeles	23.1 m.p.g.
(Non-premium gas, used from Los Angeles to Las Vegas. Premium gas from Las Vegas to Los Angeles)	

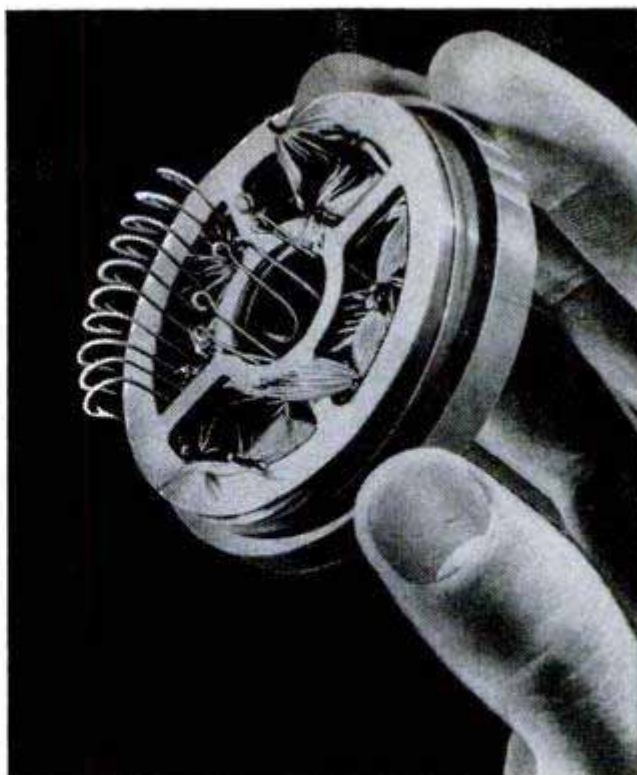
¼ mile from zero18.1 seconds

½ mile from zero (through all gears).....31.8 seconds

0 to 30 m.p.h. (low only)..... 5.2 seconds

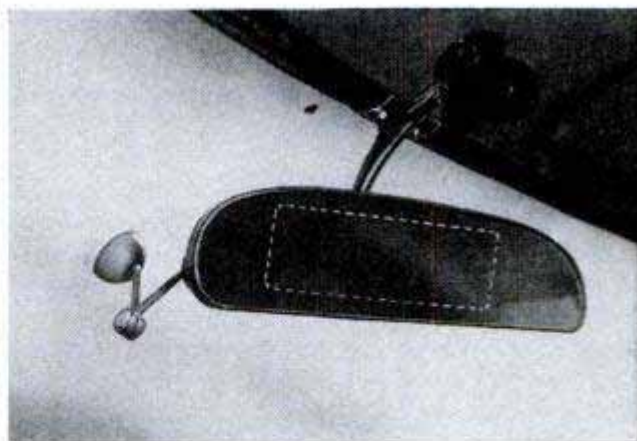
0 to 60 m.p.h. (through all gears).....16.8 seconds

Top speed (by speedometer).....94.96 m.p.h.
Actual top speed about 6% less (speedometer variation)



Magnetic Bin Holds Fish Flies

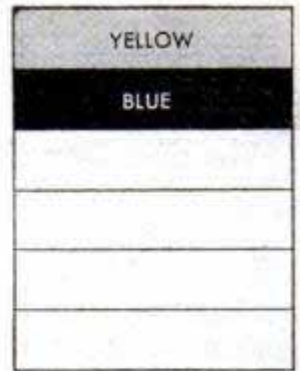
More than 70 hooks and fishing flies are held neatly and firmly inside a magnetic container. The cylindrical bin with a screw-on cover holds the hooks separately and vertically. Shakes or bumps won't alter their position. Built into the container is a hone for the angler to use in sharpening points and barbs.



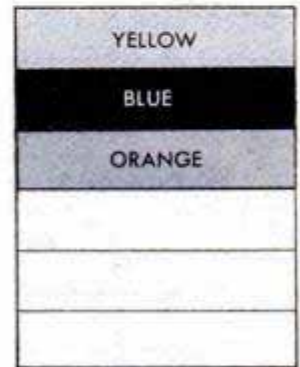
Jumbo-Size Rear-View Mirror Attached With Clamps

Attached to the standard rear-view mirror by spring clamps, an extra-large mirror provides full-width vision through the rear window of the modern car. A vibration damper that has one end secured to the windshield with adhesive eliminates jiggle and the resultant blurred vision. The plate-glass mirror is tinted to reduce glare and may be tilted up and down in the usual manner.

When child speaks into the microphone she sees the sound converted into colors. Panels below show typical color patterns for certain sounds

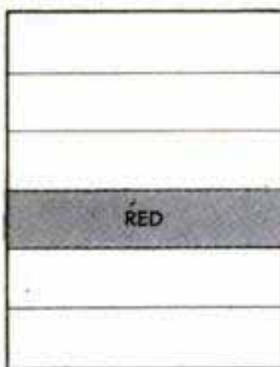


S



SH

Instrument Converts Voice Into Color Panels



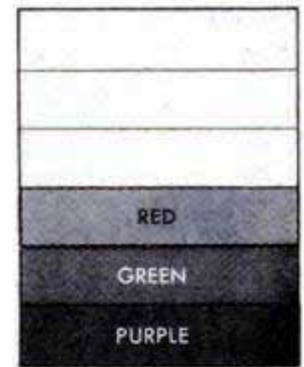
Z



E



AH



O

Speak a word into the microphone of a new instrument and your voice will be converted into a brilliant display of colors; utter another word and the color pattern will completely change. The instrument is designed to aid in speech correction. Since each sound produces a characteristic pattern of colors on the six lighted panels, faulty pronunciation can be immediately detected and corrected. The instrument is particularly valuable in teaching a deaf or hard-of-hearing child to enunciate properly.

The subject can practice by himself, and a child's interest is aroused by the flashing colors. It has been found that the color patterns of difficult sounds are retained in the child's memory, and even when he is away from the instrument he speaks in accordance with the remembered patterns. Each of the six channels in the instrument responds to a different voice frequency, and each operates a light of a different color. Some sounds operate only one or two of the panels and others activate all six colors.

Antistatic Spray Prevents Shock in Cold, Dry Weather

Static sparks that shoot between you and everything you touch on a cold, dry winter day can be eliminated by spraying a fine, colorless mist on your clothes and household fabrics. The spray, applied to clothing, chair or car upholstery, plastic seat covers and other static collectors chemically re-

moves their ability to generate a charge. One application lasts up to six months and requires less than five minutes to apply with an ordinary insect sprayer. Anything coated with it will cease to attract the dust that often collects due to an accumulated static charge.



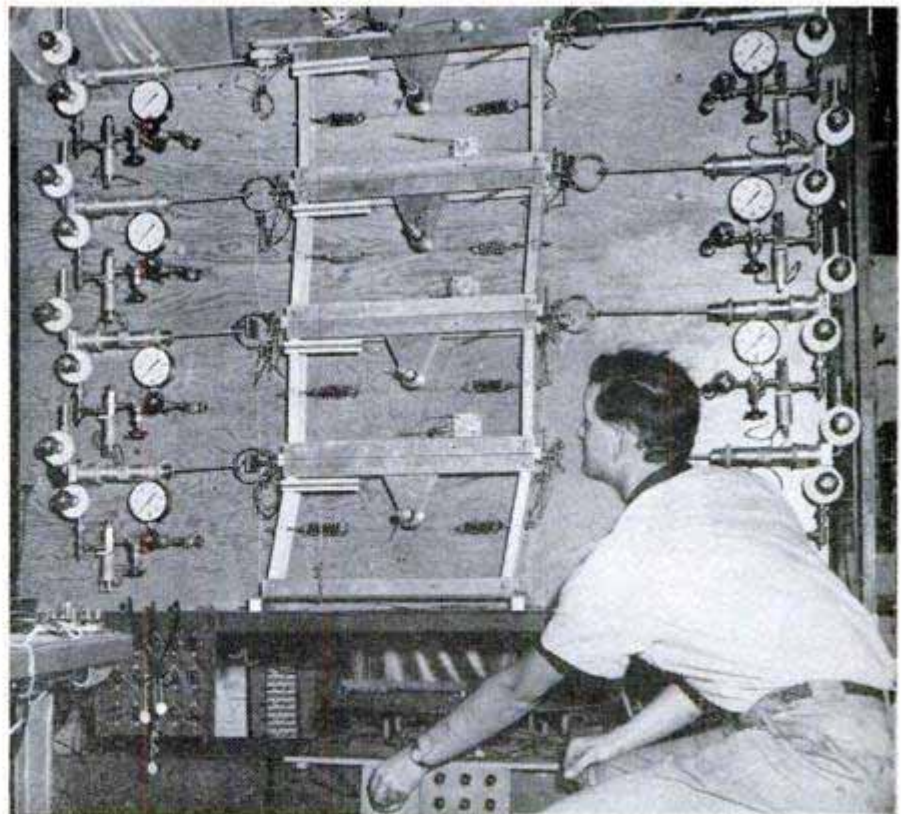
He Harvests Minnows From Former Pasture Land

Pasture land near Camilla, Ga., now is yielding a huge harvest of shiners, a species of minnow. A flood left the land covered with ponds which soon became a shallow lake through natural drainage. Robert Hoggard, a part-time postal clerk, rented the lake from the landowner for \$5 per week. Now he's harvesting minnows, worth \$20 per thousand, and distributing them to fishing resorts through Georgia and Flor-

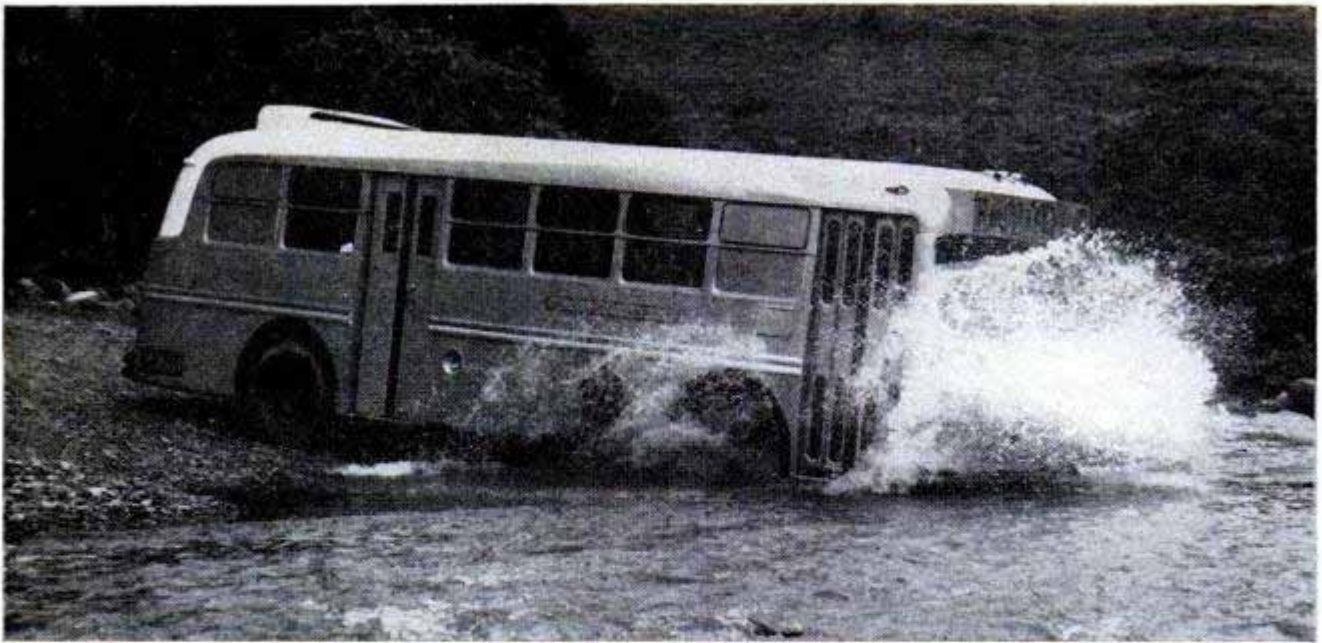
ida. With long poles, he places a 40 by 40-foot net in the water and lures the minnows with oatmeal. He and his assistants raise the net with pulleys and ropes, then scoop the catch into a transportable bait box. The shiners later are transferred to 300-gallon oxygen-fed tanks for transportation to the resorts. Hoggard estimates there are 10,000,000 minnows now available on the former pasture land.

Lab Model Tells H-Bomb Effects

Blast effects of an H-bomb are simulated on a model of a four-story building at Stanford University, providing new information on how buildings behave when hit by different intensities of blasts. The model building consists of four metal rectangles, one above the other and surrounded by rings, rods and gauges. Blast effect is provided by nine air-driven cylinders, four on each side of the building and one on top. Timed electrically, the pistons on the side nearest the assumed blast exert a simultaneous push against the rectangles, then the top piston presses down on the roof. Finally the building receives a push from the opposite side. The resulting distortion of the model is an indication of whether a build-



ing of a certain strength would collapse from or withstand the effects of a blast of a particular intensity.

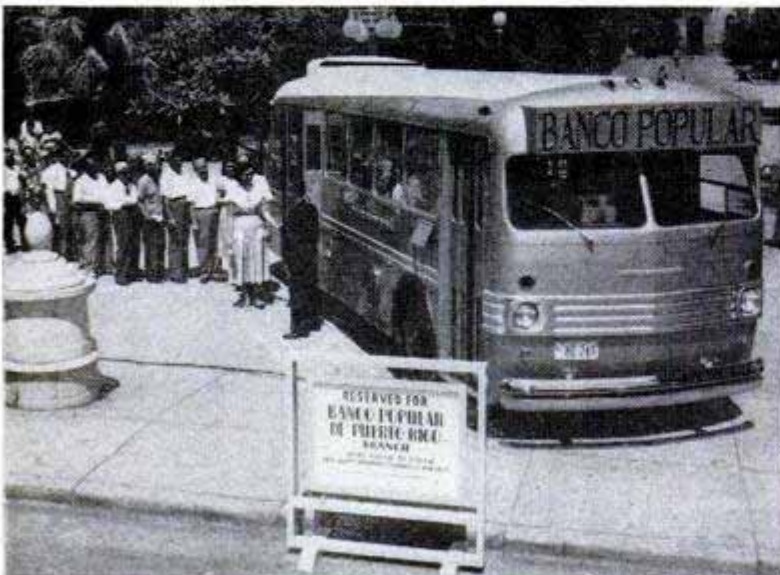


Bank on wheels fords stream en route to rural community. Units are converted diesel passenger busses.

Bank on Wheels Takes to the Road in Puerto Rico



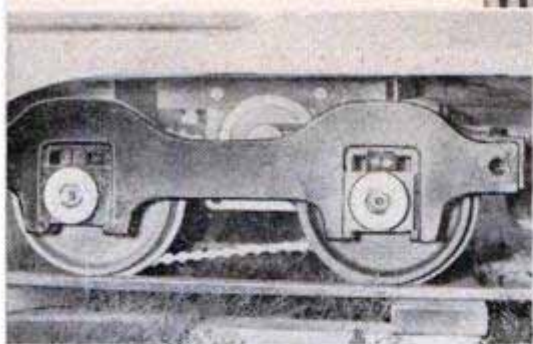
Interior is like that of a conventional bank. Two teller's windows are provided. Below, customers queue up at bank's parking spot



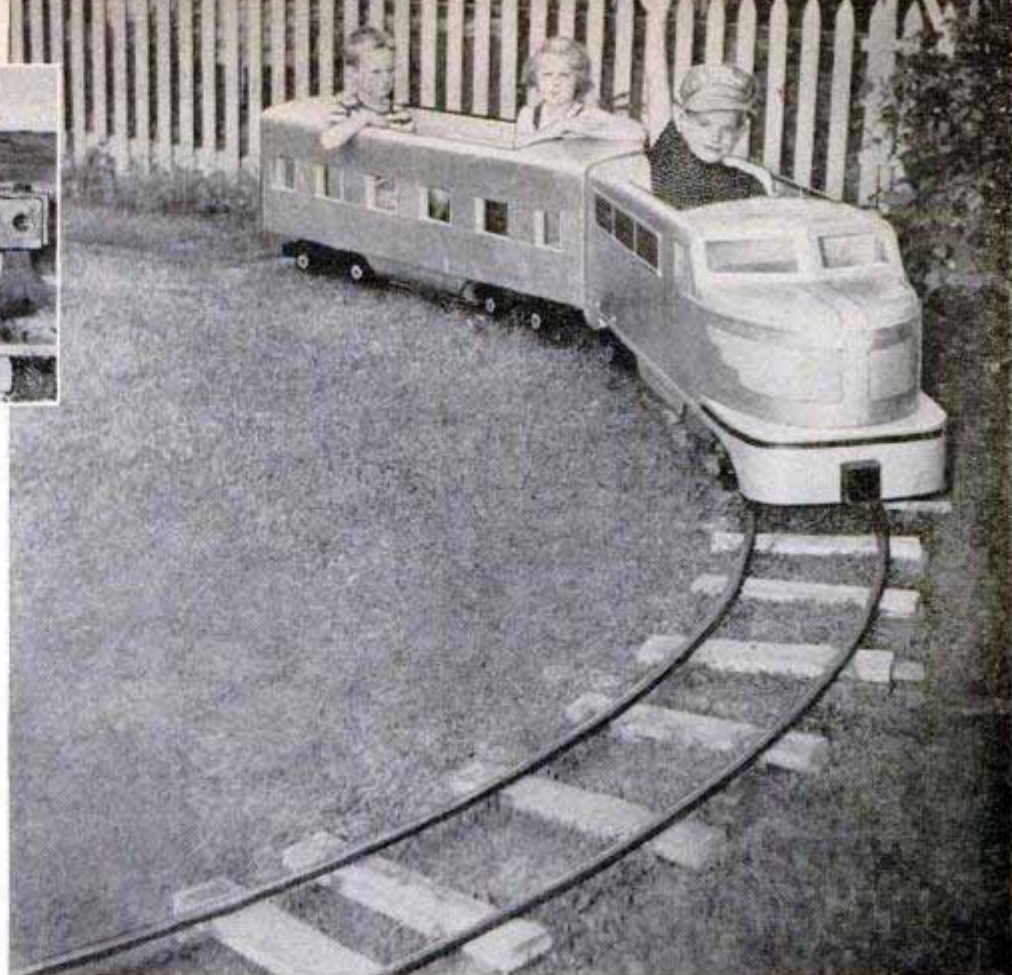
MOBILE BANKS travel to the customers in Puerto Rico where two units of a proposed fleet of 20 now serve rural areas. Eventually, 52 communities without local banking services will benefit from the system and millions of dollars of savings will be put to work drawing interest.

Equipped with their own internal phone systems that can be hooked up to regular telephone lines, the mobile banks can keep in touch with headquarters in San Juan from any point on the island, check last-minute information on investments, bond transactions, approval for "on the spot" loans and similar types of banking services. Each unit consists of a diesel-powered bus converted to include tellers' windows, a loan desk, and facilities for a bond counselor and other staff members.

Semiweekly schedules are planned to bring these units into all 52 communities at designated areas for established banking hours. Thus, banking business in many categories can be conducted at one town in the morning and at another in the afternoon, the unit returning at day's end to headquarters where deposits, loans, withdrawals and other transactions are permanently recorded. The entire system was designed and will be operated by Puerto Rico's Banco Popular.



Truck assembly contains 5½-inch wheels. Dual chains connect motor, drive wheels. Locomotive and coach are constructed of ¾-in. plywood, reinforced with steel, clad in aluminum



Back-Yard Express

IT'S A HECK OF A WAY to run a railroad, but Robert Ernestus, president and chief engineer of the Kent & Shorewood Lines, doesn't charge his passengers one red cent!

You see, all commuting on the K & S is on 150 feet of main line around the crab-apple tree and garage of Bobby's back yard. Besides, young Mr. Ernestus, who has yet to see his fifth birthday, operates his railroad as a philanthropy for his pals of the neighborhood sandbox society.

Rolling stock of the K & S, built by Bobby's father, A. W. Ernestus, a Milwaukee mechanical engineer, consists of a locomotive and a two-passenger coach, each 5

feet long, 18 inches wide and 2 feet tall. The aluminum, plywood and Plexiglas streamliner operates on the same principle as the big diesel-electrics that streak across the nation. A 1½-horsepower, 1-cylinder gasoline engine drives a 37-volt generator, and the generator runs the electric motor that turns the wheels. Dashboard instruments include a throttle, a forward and reverse lever and a voltage indicator. The nine-inch-gauge tracks are simply cold-rolled bar steel curved on a homemade rolling mill and screwed onto scrapwood ties. Wide open, the K & S can do eight miles per hour, and — when you're four years old—that seems like 80!

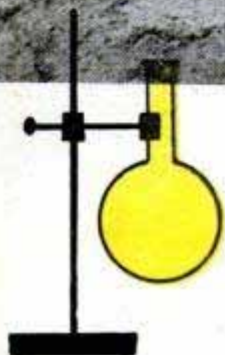
The 1½-horsepower engine is mounted behind driver's seat. Belt transmits power to generator under hood.

Forward-reverse lever is at left; voltage indicator, center; throttle and cutoff switch are at the right





Core drill obtains sample of new pavement. Contractor is paid on basis of thickness and quality

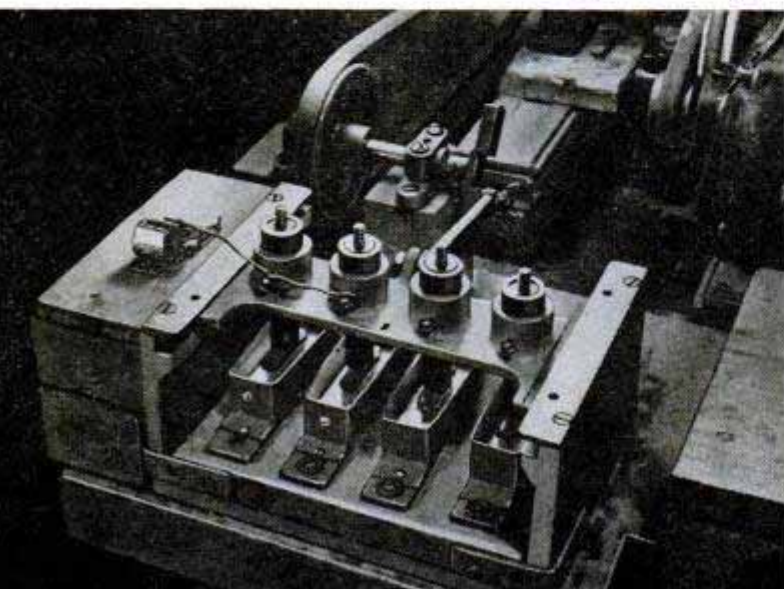


INDUSTRY'S PRIVATE

ANYONE at the Frederick S. Bacon Laboratories in Watertown, Mass., can tell you about the mystery of the pink candles. The smart detective work which broke that case illustrates the efficiency of its engineer-sleuths. Similar problems are being solved every day at commercial research and testing labs across the country.

If you ever want a job that combines the adventure of detective work, the thrill of scientific research, and the satisfaction of proving to yourself that man is still superior to the machine, get yourself a position in a commercial testing laboratory.

This machine tests toothbrushes and toothpaste. Heads of brushes are seen beneath cylindrical weights



You'll get a special kick out of working there if you have an inquiring mind and know that no contraption can make a fool of you. But take warning, now. Some of them will until you track down what makes them tick—or prevents them from ticking—and you ring up another solution.

The industrial detectives who were put on the "pink candle case" admit it had them baffled for a while.

One of the laboratory clients who manufactures altar candles, traditionally ivory, found that every so often a batch of candles would slowly turn pink after coming out of the molds. Churches don't want pink candles. Engineers sent to the factory checked the quality of the raw material and took temperature readings, but found no variation which could account for the change in color. Tests showed that differences in sunlight had no effect. All equipment was checked for cleanliness, but no trace of dirt or oil drip which could contaminate the wax was found. Then a bright idea hit one of the technicians. The candles were handled by employees at several points.

"It's sweat—human perspiration—from their hands!" he shouted to his startled colleagues as they watched the candlemaking process for the umpteenth time on one particular morning.

So they ran more tests, but again the answer was "no." With machinery and em-

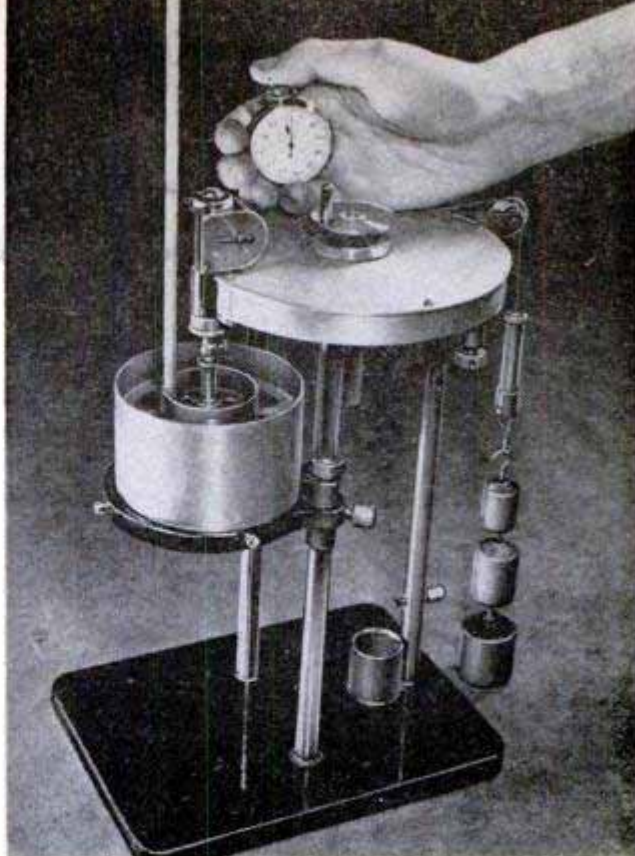
ployees eliminated as suspects, the engineers turned to the environment.

They began an intensive recording not only of the daily temperature, but of wind velocity and other weather data. Did more candles turn pink on rainy days than when the sun shone?

They set their figures in columns and studied them against the days when the candles turned pink. They noticed a connection between the "pink candle days" and the days when an east wind was blowing.

With this clue, and further testing of the dyestuff used to give the ivory-yellow color, the engineers found that sulphuric-acid vapors from a plant two miles east of the candle factory were combining with the yellow dyestuff to transform it into a pink dye. The laboratory's assignment was completed when it provided the client with yellow-dyestuff formulas which tests showed were unaffected by the acid vapors.

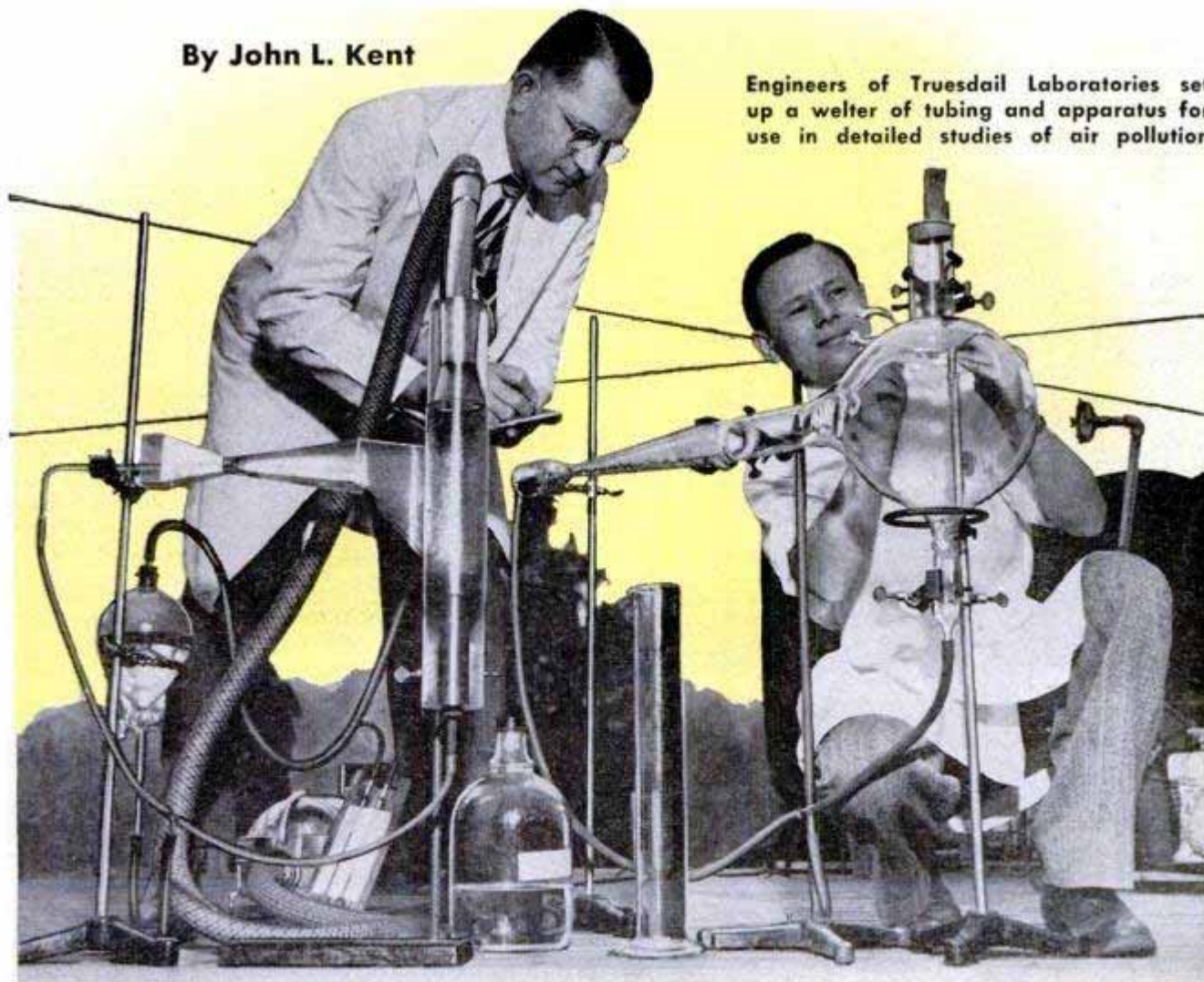
This case wasn't too unusual, although most commercial-laboratory work consists of putting new products through their paces



Oils and paints must have just the right consistency, which this instrument measures. Many products require day-to-day testing if quality is to be maintained

DETECTIVES

By John L. Kent



Engineers of Truesdail Laboratories set up a welter of tubing and apparatus for use in detailed studies of air pollution

and spotting the bugs in defective products. On the side, the labs solve crimes, aid the courts by unearthing scientific evidence, and answer questions which have stumped all previous experts.

Quite often a company will send its product to a commercial testing laboratory in the hope that the results will be so favorable they can be used for advertising purposes. That was the idea of one manufacturer who engaged a laboratory to test his newly developed vacuum cleaner. The laboratory bought all the competing makes of cleaners and compared them with the client's product in a dozen tests. Measured was the amount of dust, lint and dirt each cleaner collected. For one test, the engineers devised a contraption which pushed the cleaners across carpeted surfaces for a week without stopping. This told not only the durability of each cleaner, but how hard it was on the carpet.

When all facts and figures were assembled in the final report, the client's cleaner was not even among the top three! The amazed manufacturer swallowed his pride,

paid the bill and decided right then and there to improve his product. Of course, the lab's report was confidential.

Often embarrassing faults will be discovered in a product after it has been placed on the market. A manufacturer of cedar chests designed one for silverware, taking special pains in its construction to prevent the entrance of air and consequent tarnishing of silver. To his amazement and distress, the first purchasers complained that silver stored in the chest tarnished more rapidly than in the open air!

He took his problem to the Miner Laboratories of Chicago. The chemist assigned to the job studied each component of the chest and discovered that the guilty item was sulphur in the glue used to fasten the flannel lining to the wood. Sulphur-free glue was substituted and the tarnishing problem was solved.

Commercial testing laboratories are called in as fact-finders in some cases which are being prepared for legal action. Often the presumed guilty party is found blameless and the real culprit found.

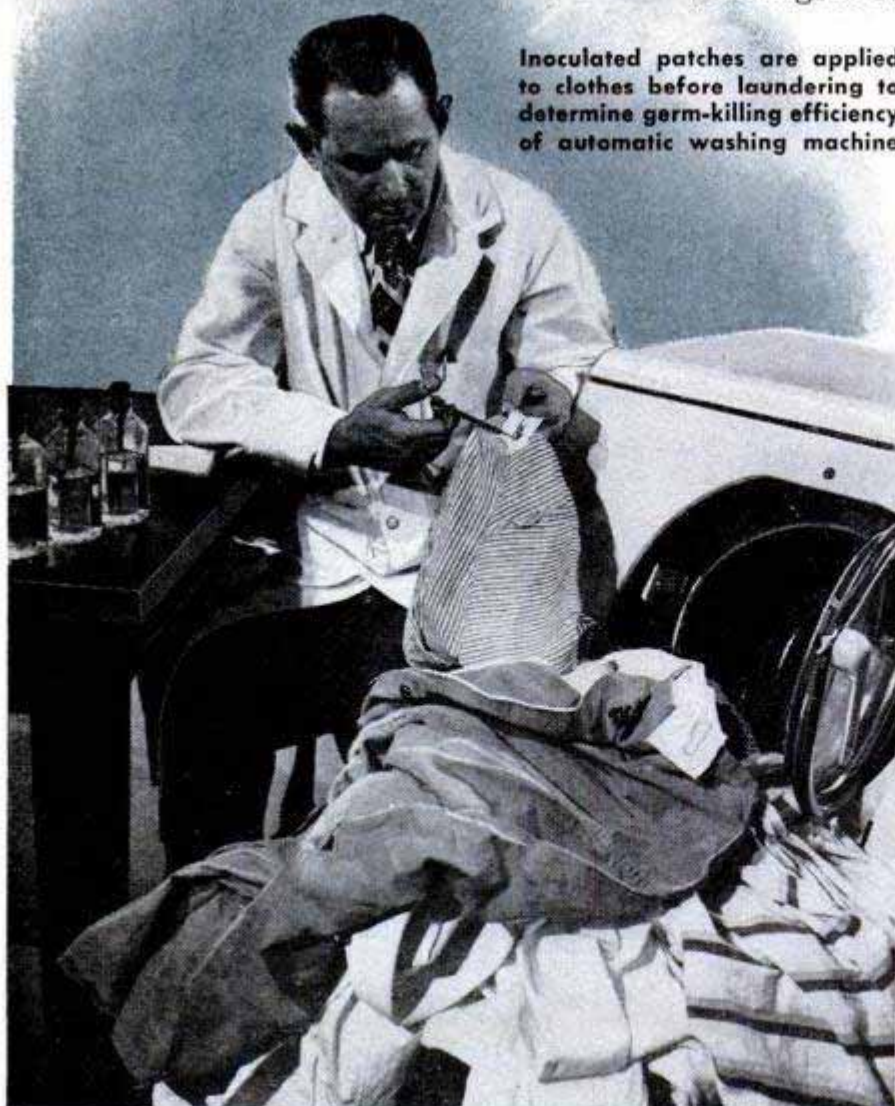
Just after the hurricane in Miami, Fla., in October 1950, the South Florida Test Service was summoned to inspect a number of buildings in North Miami Beach. The paint

on the buildings was developing a serious discoloration following a flight in the area of an airplane which was spraying DDT. Residents complained that the spray from the plane was responsible.

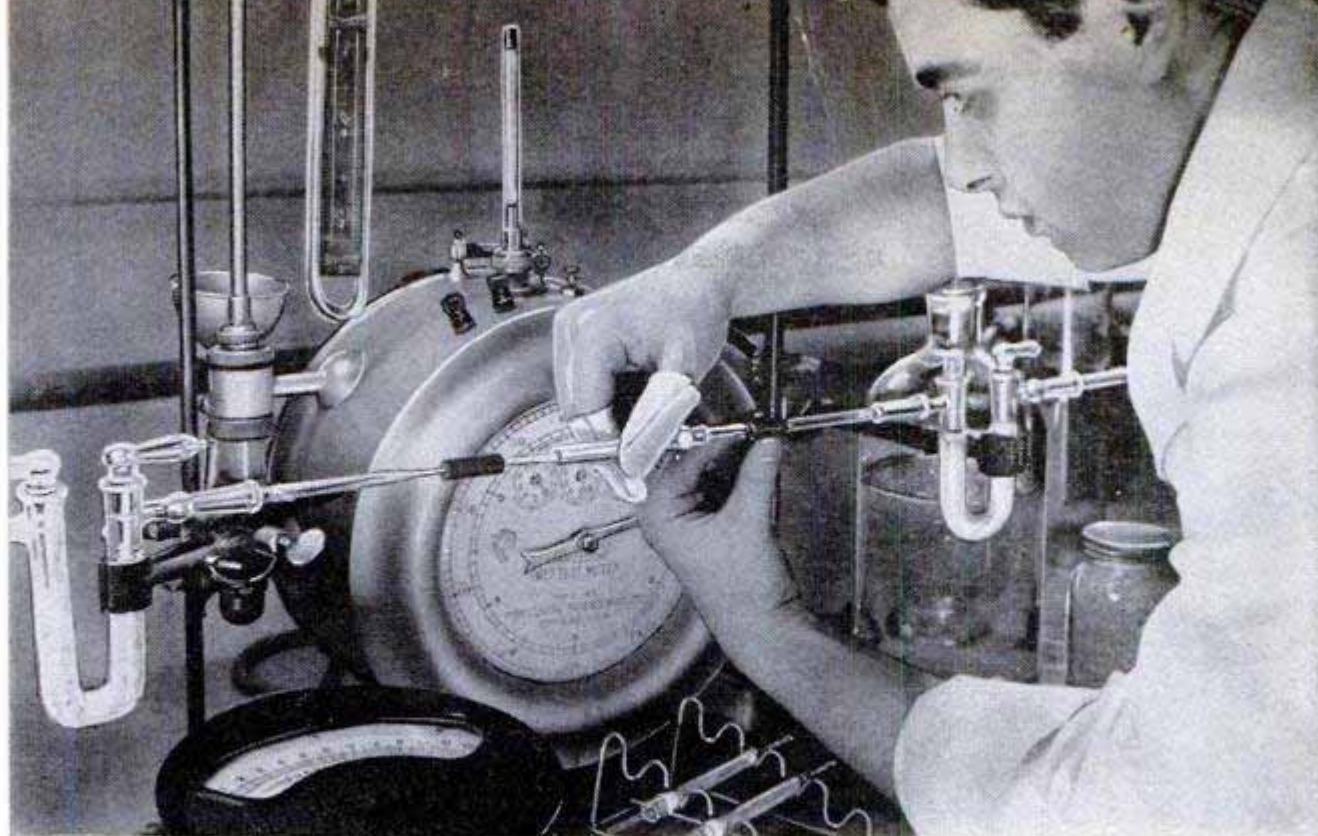
Results of the investigation showed that only buildings painted with lead-and-oil paint were damaged. Further study showed that hydrogen-sulphide fumes generated in filled-in land adjacent to the buildings were the cause. High water during the hurricane resulted in deposition of seaweed on these filled-in lands and a few days later the gas started to generate as the seaweed began to rot.

In a Texas case, the death of several valuable dogs was blamed on an insecticide spray. The manufacturer was being sued for the value of the dogs.

At the trial, several dogs were sprayed profusely with the supposedly deadly insecticide in question, brought into the



Inoculated patches are applied to clothes before laundering to determine germ-killing efficiency of automatic washing machine



In cigarette-mildness test at Foster D. Snell, Inc., cigarettes are "smoked" and results indicated on meters

courtroom and made to sit near the jurors for the duration of the trial. The dogs seemed comfortable and left in good condition when the case was over. The jurors were convinced, and decided in favor of the manufacturer. A later autopsy of the stricken dogs showed they had died of worms.

A spectrograph owned by the Hornkohl Laboratories of Bakersfield, Calif., proved

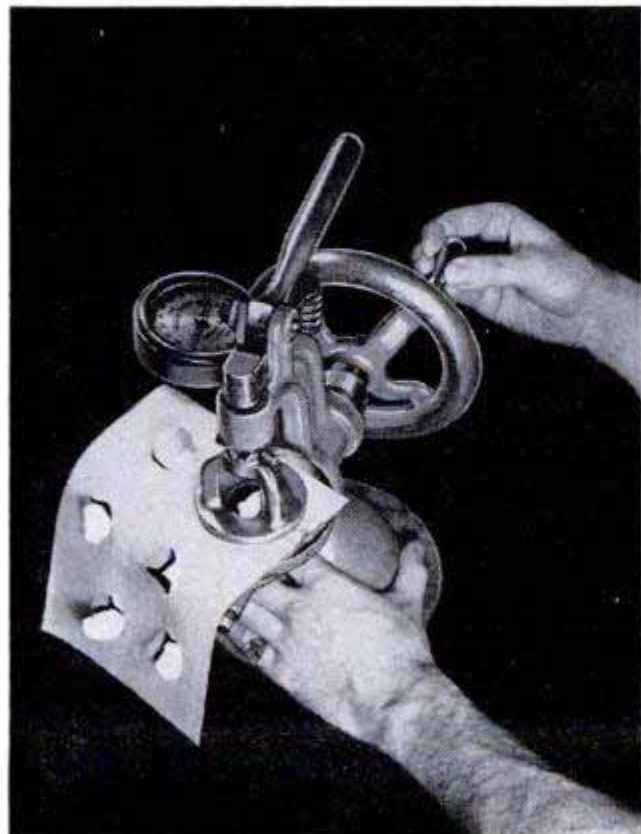
which gun fired a murder bullet. The spectrograph "breaks down" an element into characteristic rainbow colors which are the element's "fingerprints."

The body of a woman who had been missing for three weeks was discovered in a field. A bullet had penetrated her skull and continued out the other side. The victim's

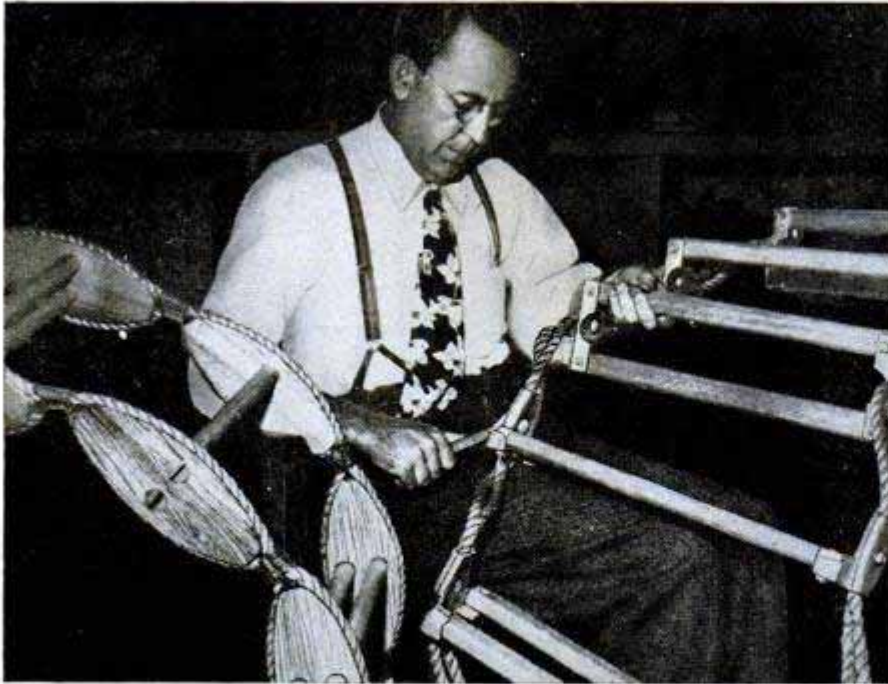
(Continued to page 244)

Mullen tester is used to discover breaking strength of paper. Meter records pounds per square inch

Will it wear? Material to be tested is placed on rotating platform which carries it under abrasives



Modern Pilot Ladder Has Rungs that Allow Quick Repair

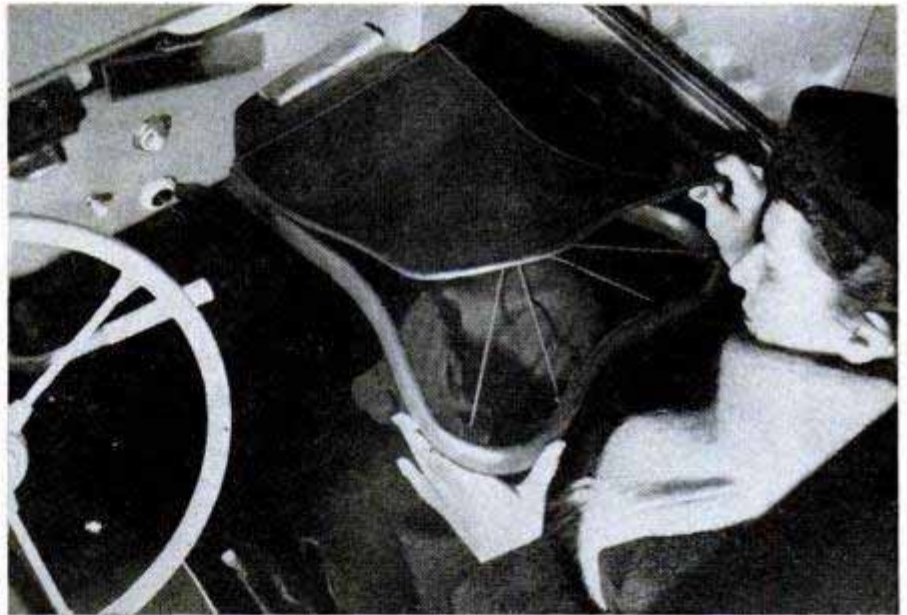


The steps, or rungs, of a new pilot ladder can be replaced in minutes and a full-length ladder built in three instead of sixteen hours. Pilot ladders, made of rope with wooden steps or double rungs, are flung over the side of a ship when the pilot is transferred between pilot boat and ship at the harbor's mouth. The older types required tedious and lengthy lashings to replace an individual step or rope, but the new ladder has its wooden rungs set in aluminum castings which simply clamp onto two vertical side ropes.

Front-Seat Shock Absorber Reduces Hazards of Automobile Crashes

Mounted directly ahead of the front-seat passenger, a rubber-coated steel frame prevents the rider from being slammed into the windshield in a crash. Manufactured in Germany, the device not only absorbs the shock of the crash, but prevents the passenger from being injured by broken glass.

☐ Airplane crashes may be reduced in the future by an automatic control system that feathers the propeller blades when an engine fails.



Auto-Trunk Ventilator Assures Canine Comfort

Dogs may be carried safely and conveniently in an automobile trunk that is ventilated with a simple air inlet. A hole is cut in the side of the trunk and the device inserted. Sliding inside a collar, which is bolted to the car body, the ventilator consists of a capped, chrome or nickel-plated cylinder with air slots along the sides, and may be pushed into or pulled out of the trunk to regulate air supply. Cool fresh air, free of exhaust fumes, is thus supplied to canine passengers.



Dancing Sand Detects Flaws in Honeycombed Panels

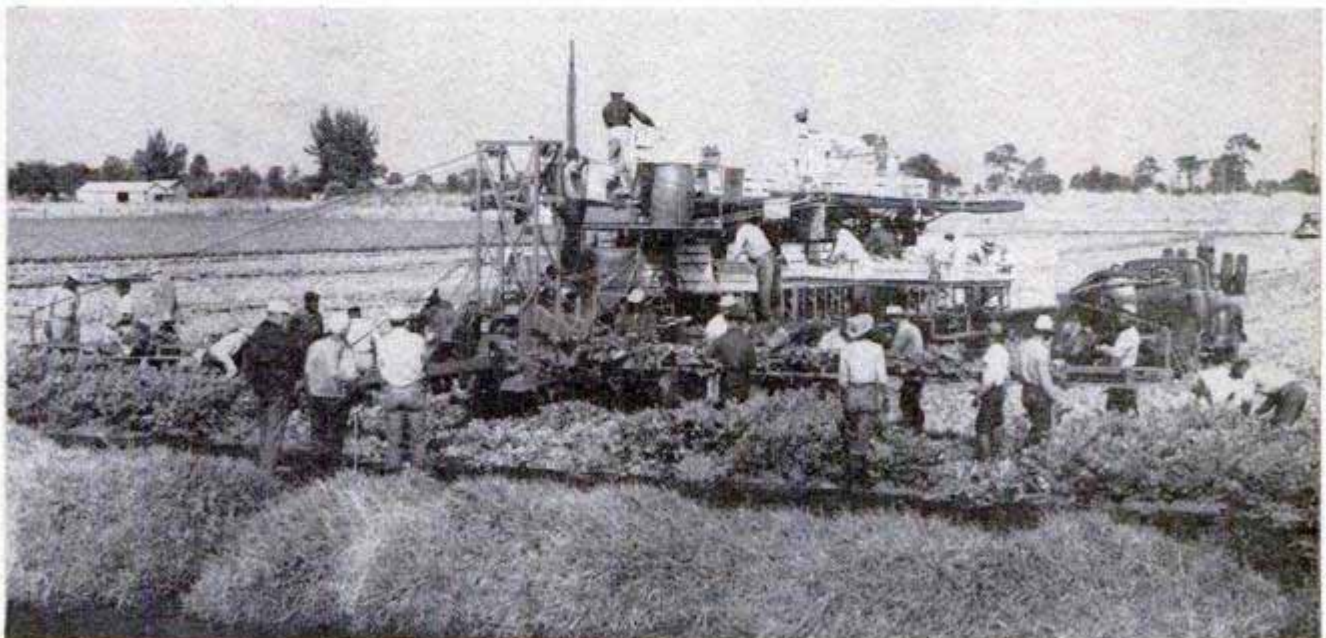
Dancing grains of sand, responding to extremely high-pitched "music," reveal defects in the bonding of honeycomb panels. Douglas Aircraft says it reduces the testing time of panels, honeycombed for lightness, by more than 50 percent. The panels are placed over a trumpet connected

to a tube similar to those used in electric organs. Sand is spread evenly over the panels and when the "mechanical larynx" vibrates, the jitterbugging sand traces a pattern closely following the unbonded structure of the panel. Sound waves from 16 to 50,000 cycles per second are used.

Giant Harvester Field-Packs Celery Crop to Preserve Freshness

Two thousand crates of celery a day are delivered by a mammoth harvester which cuts costs and packs the celery before it has time to lose its freshness. Creeping across the fields at a speed of 34 inches per minute, it keeps 24 workers busy pulling the celery out of the muck, slicing off roots and leaves and laying the bunches on the 27-foot belt conveyors, which extend from each side and a similar conveyor which juts out 18 feet

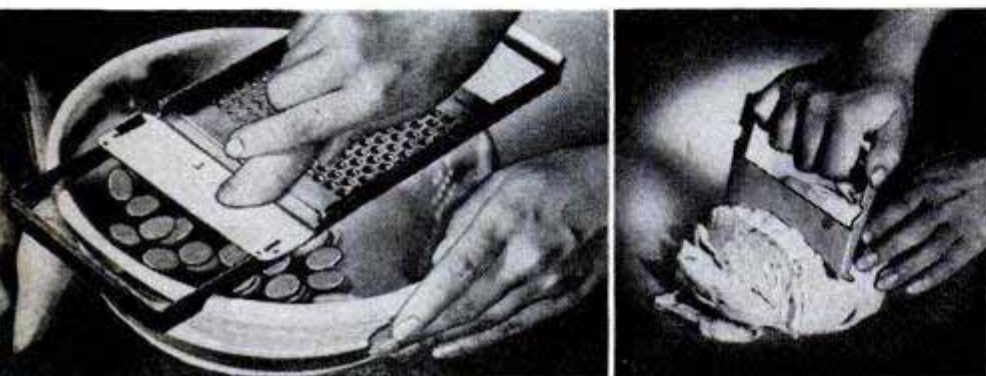
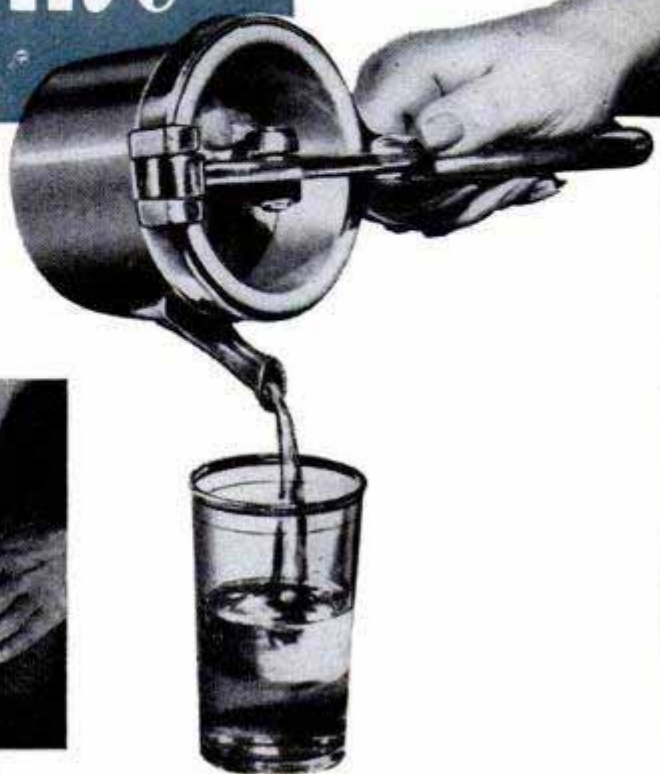
in front. Belts carry the celery under a spray of water and back to a gang of 30 workers who sort it into nine grades and pack it in paper-lined boxes or crates. The filled crates are sped over roller conveyors to a trailing truck which rushes the greenery to the warehouse for chilling and loading. A six-cylinder gasoline engine propels the heavy machine which moves over the soft fields on huge airplane-type tires.



WHAT'S NEW FOR

Your Home

JUICER squeezes with one stroke of the handle, can be used to obtain vegetable puree or fruit juices. Constructed of sturdy aluminum, it is easy to clean, has handy pouring spout



COMBINATION KITCHEN TOOL is a food grater, shredder, chopper and slicer. Notched to rest snugly on top of bowl, it permits food to fall directly into container. Top part is detached for use as chopper

SUPERSONIC WASHER shakes dirt loose from clothes with high-frequency sound waves instead of agitator

DECANTER contains built-in pocket for ice cubes so that they cool but do not dilute the contents

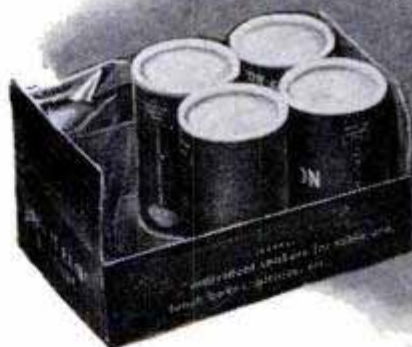
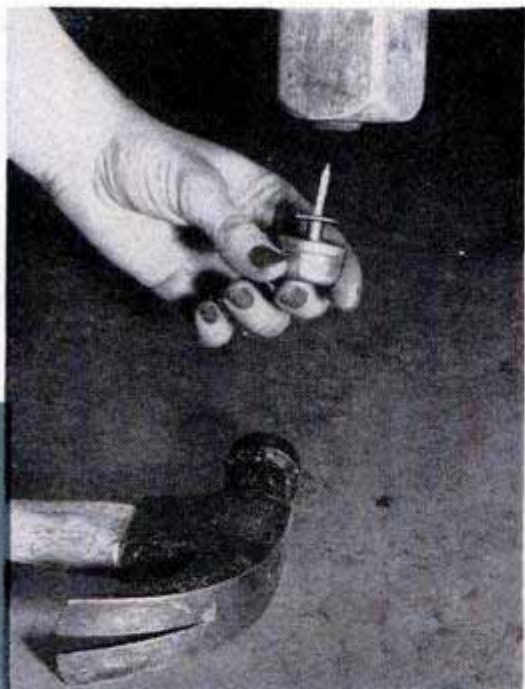




CREAM WHIPPER comes supplied with pressure cartridges for indefinite refilling. Ordinary cream is whipped instantly, kept fresh for week



COCKTAIL TABLE features hinged leaves which form table top until unfolded. "Handkerchief" design permits increase of 100 percent in table surface

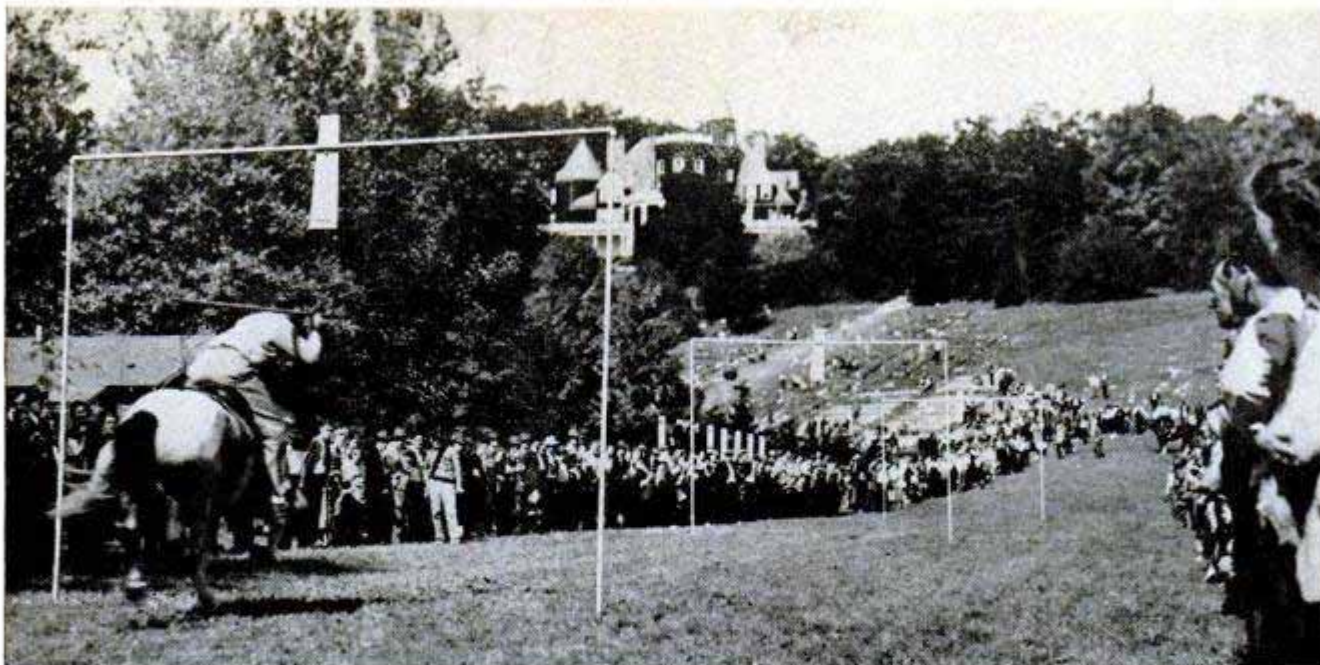


TINY SALT SHAKERS suitable for picnics, TV snacks and box lunches even have perforated plastic tops which can be rotated to regulate the flow of the salt

WOBBLE-STOPPER consists of sealed cylinder filled with silicon putty on which miniature piston sits. Putty expands to suit distance between table leg and floor

SEWING MACHINE features free arm over which socks may be slipped for darning and patching. Adjustable drive permits machine to operate in slow motion for intricate sewing and embroidery work



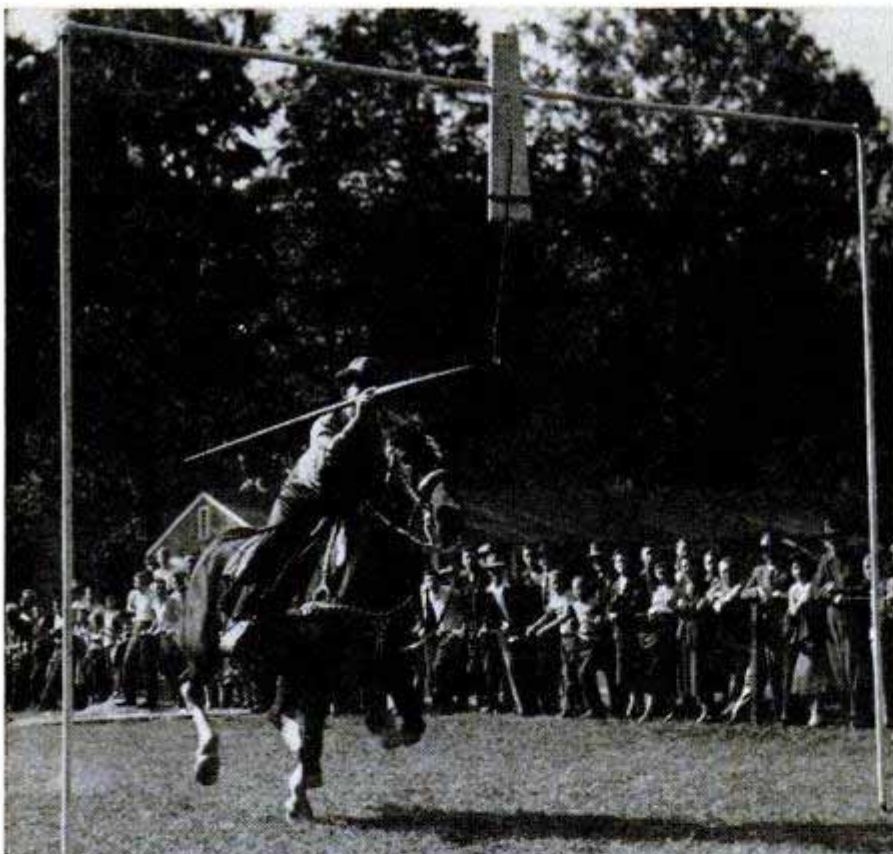


Arches are 60 feet apart. The contest is part of the annual Mountain State Forest Festival at Elkins, W. Va.

It's called "Tilting at the Ring" and takes a steady hand, careful aiming

Galloping Riders "Tilt at the Ring"

Spears in hand, modern knights in a West Virginia tournament charge at full gallop toward unique targets—tiny rings suspended by wire from each of three archways. If they can hook all three rings on their sharp, hardwood lances, they have a chance to try again. After each try, the rings are reduced from the original 1½-inch size until the opening of each ring has been dropped to ½ inch in diameter. The winner must complete all the passes successfully. Once a favorite sport in the mountain counties of the state, this carry-over from the contests of medieval knights takes place each year at Elkins, W. Va.



Automatic Starter Switch

Owners of cars with completely automatic transmissions can install an automatic starter switch that restarts a stalled engine as soon as the shift lever is placed in neutral. In traffic, the switch eliminates the confusion that often results from unexpected stalls. The unit can be installed by the owners in about 15 minutes. Internal safety devices prevent the switch from operating unnecessarily.

Grafts Speed Hybrid Pines

Speeding the production of hybrid pine seeds, the U. S. Forest Service is grafting inbred and crossbred seedlings to mature trees. Result: Each step in the process is shortened by 20 years, since it often takes that long for a normal seedling to develop into a mature, seed-producing tree. Another timesaving method used is a new germination process which produces a seedling equal to one-year stock in three months.



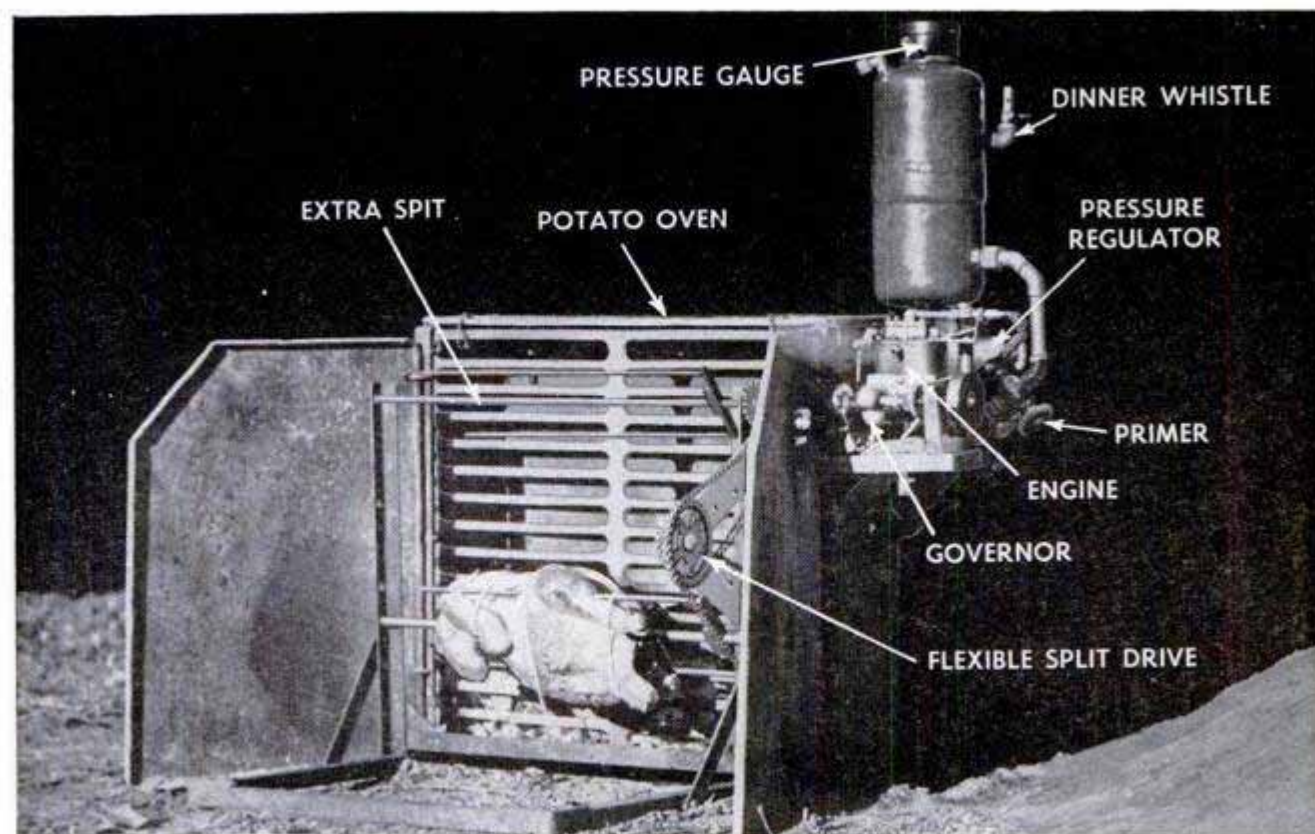
Smiling picnickers have fun while model steam engine on grill does the work of turning turkeys on spits

Homemade Steam-Powered Grill Even Whistles Guests to Dinner

KNOWN TO ADMIRERS in the vicinity of Sharon, Mass., as the Tobey Totable Toaster, a unique rotary-spit grill is powered by steam. The inventor and builder, F. S. Tobey, not only uses steam to turn the spit but to whistle his company to dinner. He made the grill out of galvanized iron and angle iron with a front consisting of the cast-iron grate of an old stove oven. Fastened to the frame is a one-foot length of

half-inch iron pipe which passes through the charcoal fire bed. This makes a flash boiler. A copper tube connects to a small two-cylinder model steam engine. Between the boiler and a three-pint water tank is an equalizer valve which provides an automatic water feed. A flexible chain drive operates two spits. Each holds two small chickens or turkeys. An oven on the back holds potatoes.

One or both spits can be used on the Tobey Totable Toaster. Tank holds enough water to operate three hours



NEW ZEALAND HARNESSSES ITS "YELLOWSTONE"

By A. L. Kidson



Tense engineers uncap a geothermal test bore and steam explodes skyward. Basic project is to convert steam into electricity



For centuries the native Maoris have used the natural steam and hot-water pools for cooking and bathing

NEW ZEALAND, that progressive little nation with a population of 2,000,000, now is striving to convert underground steam into a vast producer of electric power.

Thousands of veterans of World War II who served in the Pacific will never forget the New Zealand thermal regions, an area where nature seems literally to have blown its top. Eerie lands, these, where the ground underfoot roars and trembles, where a stick thrust into the earth instantly takes fire and where 10,000-foot volcanoes belch lava and showers of stones. Boiling mud pools, steaming lakes and scalding geysers dot the landscape. There are some 4000 square miles in this inferno.

The native Maoris have used the boiling water for centuries to cook their food; they have bathed in the milder pools. Today the area is exploited by the white man, who has built health resorts beside the mineral-charged ponds.

Householders in the region sink small wells in their back yards and draw off an endless supply of steam and hot water that doesn't cost a penny. Larger institutions have set up elaborate

Guide shows tourist party the eerie, bubbling "Champagne Pool"

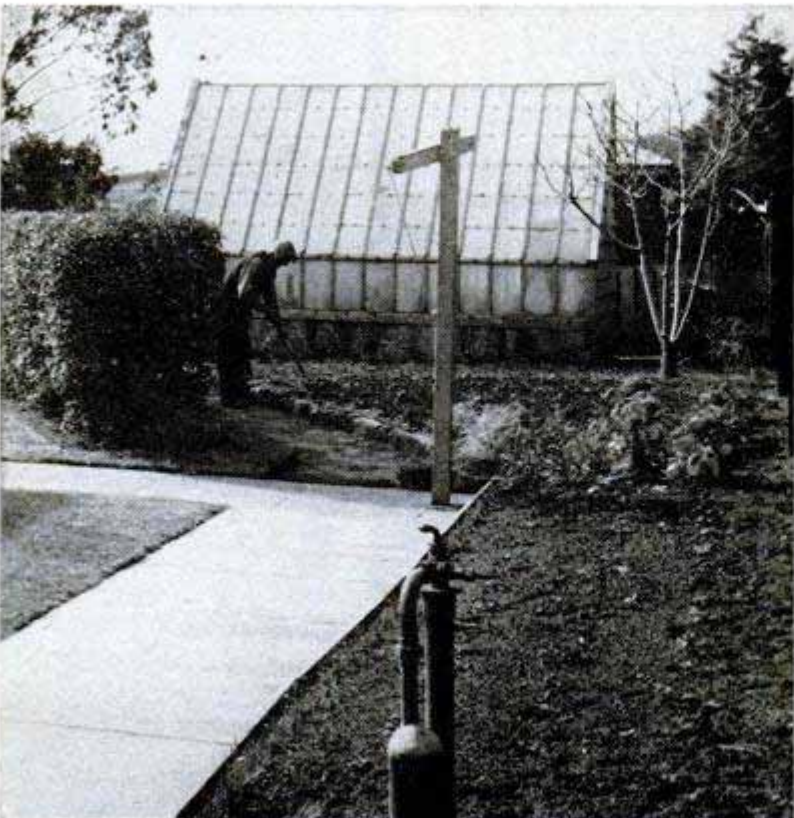




There are several fine bathhouses in the thermal area. Mineral waters are believed effective in treating many common ailments



Even private homes in the area have their own elaborate baths where children and adults can take mineral treatments daily. ↓ Heat is free and plentiful; bore in foreground taps underground pool, and the greenhouse is heated by naturally hot water



pipng systems to use underground steam for heating.

The New Zealand government now is sinking test bores to locate steam at high enough pressures to drive turbines. So far the tests have been highly successful; pressures up to 90 pounds per square inch have been found at depths ranging from 600 to 900 feet.

Converting natural steam into electric power is not a new idea. Italy has developed a successful technique. At Lardarello, near Florence, 150 steam bores generate up to 300,000 kilowatts. The power is used by the Italian State Railways and by large industrial plants near by.

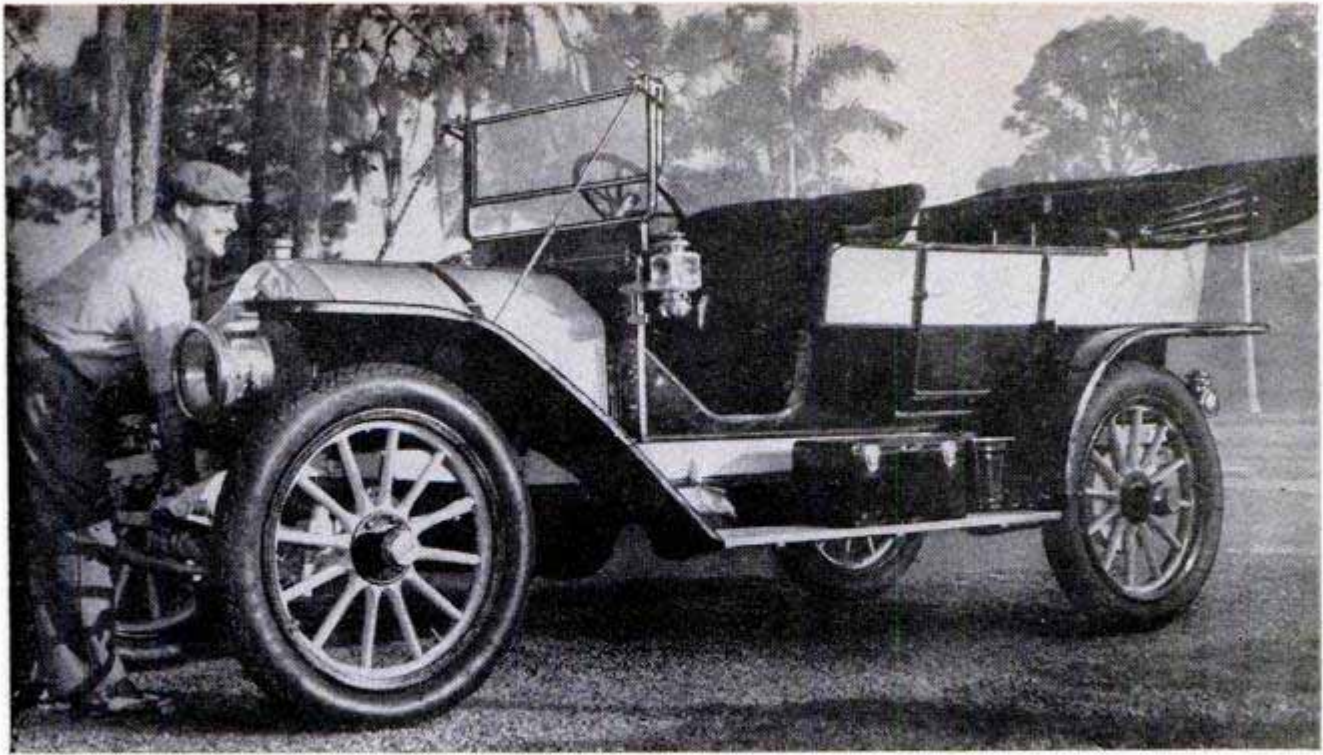
New Zealand scientists recently visited Lardarello to study the methods used there and to discuss problems that may arise in their more ambitious project.

In Italy, one of the principal problems encountered was the corrosive action of the live steam. Another was the danger from violent explosions that occurred during the drilling. To prevent explosions, Italian engineers forced powerful jets of water into their wells to control the steam pressure. They also developed the "gomito" or elbow—a side valve to direct escaping steam away from the drillers.

New Zealand engineers hope to escape some of these difficulties by using techniques already evolved by the Italians.

The steam is there in New Zealand waiting to be harnessed. One manmade geyser shot a column of steam 200 feet high as the drill pierced the overlying strata of rock. Engineers on the job estimate that within 20 years New Zealand's thermal regions will generate enough power to supply electricity to the entire country. If successful, the project will cost only a fraction of the investment required by the vast hydroelectric systems in the United States.

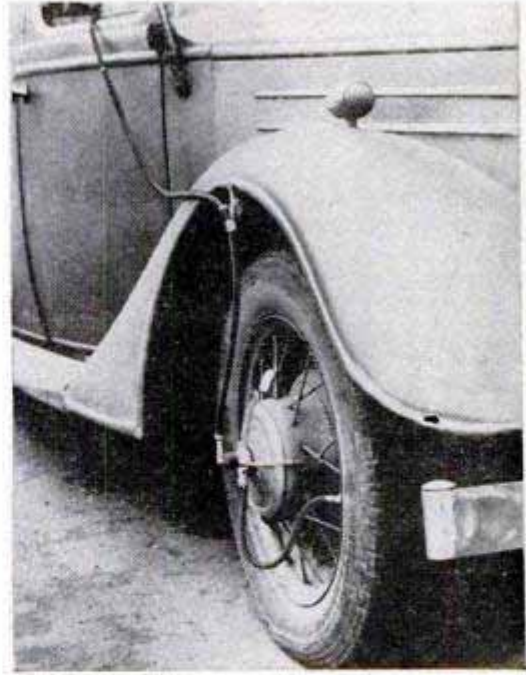
The engineers are convinced their work will be a resounding success. But even if the power project should fail, New Zealand still will have, in her thermal regions, a unique attraction for visiting tourists. ★ ★ ★



1908 National Still Rolls Along the Highways

Despite its age and rarity, the 1908 National seven-passenger touring car owned by M. C. Chase of Branford, Conn., is no museum piece. It will still pound the highway and recently made the 1400-mile trip from Connecticut to Florida without any trouble except a minor radiator leak. The trip took five days because night driving

was undesirable—its carbide lamps being too bright for oncoming traffic. The four-cylinder engine has dual ignition and is started with a hand crank. A comfortable cruising speed for the car is 40 miles per hour, but it will hit 60 for short stretches. Brake shoes are of cast bronze and are applied against steel drums.



Electric Compressor Pumps Air Into Tires As Car Is Driven

There's no need for you to change a flat tire if you have an English device which pumps air into the tire as you drive to the nearest service station. Basic unit is a miniature air compressor powered by the

battery, which pumps air through a hose leading to a universal joint on the hub. The pump can be used to add a few extra pounds of air to unpunctured tires or for anything else requiring compressed air.

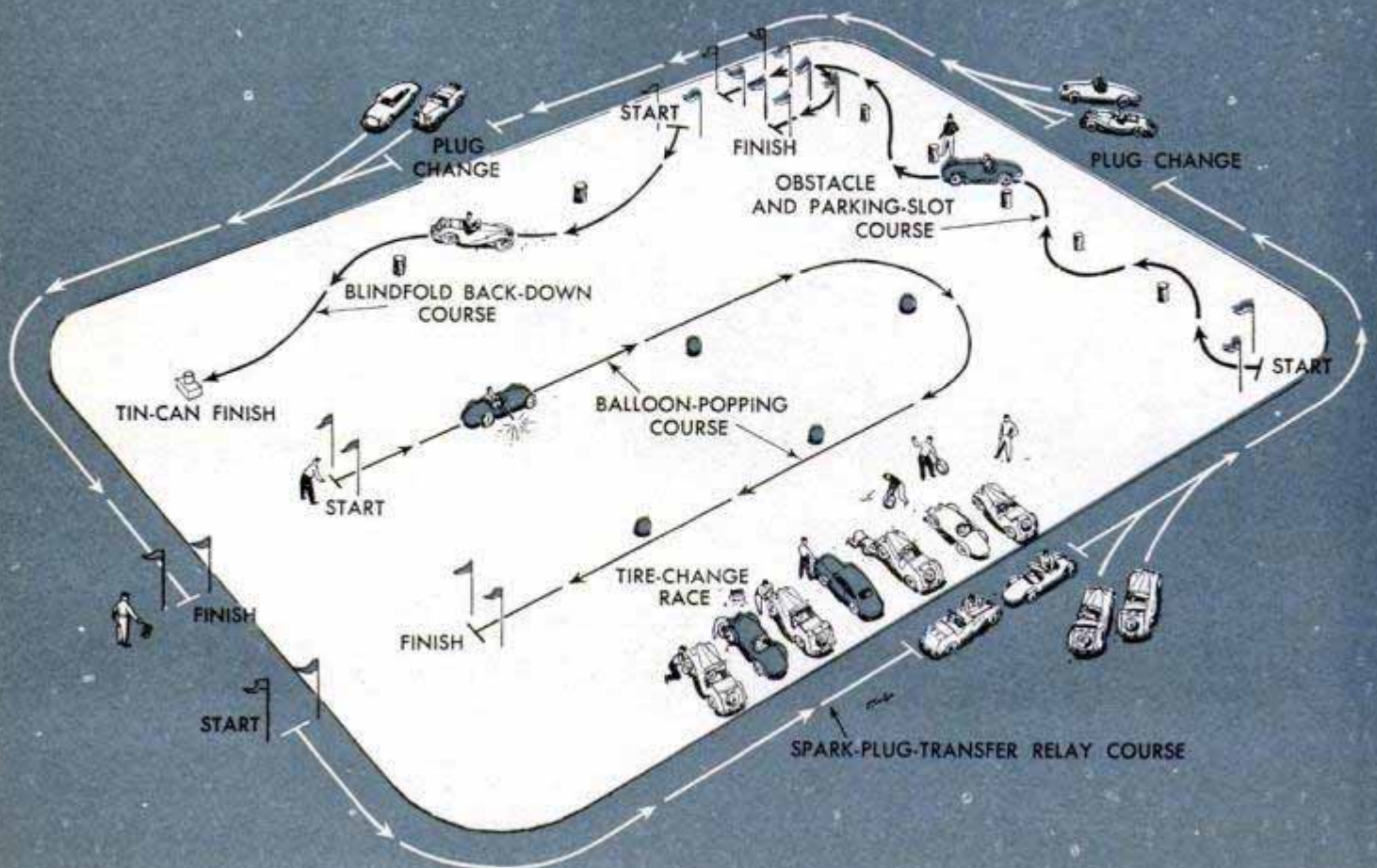


At the start of the run, speedometer readings of all cars are taken down

Sports Cars *Have a Field Day*

By Richard F. Dempewolff

Diagram of five typical courses used in a sports-car gymkhana. Drivers compete in these after they have completed the road course. Field days make driving a recreation as well as a means of transportation





Drivers change spark plugs in one event. First to drive away wins. At extreme left is rear-engine Porsche

OVER THE HILL they go—40 to 100 glittering sports cars chasing each other in a ragged, dust-veiled chain several miles long. They're not breaking speed laws because that's against the rules. There's an intense look on the drivers' faces. "Navigators" beside them hunch over, making hurried calculations as the little cars hit straightaways, or clutch for the "fright bar" when the "pilot" guns around a corner as they bound down a forgotten dirt road that isn't on the map.

This is a sports-car rally, a sort of roving game reminiscent of a treasure hunt, imported from Europe along with most of the low-slung Allards, MGs, Singers, Jaguars, Morgans, Porsches and other specimens of a mushrooming automotive "aristocracy."

At the end of World War II, a sports car was a curiosity in America. Today, some 25,000 of them buzz along the highways. And the rallies, sponsored by local sports-car clubs, are gaining popularity with the acceleration of these junior-size but senior-performing autos.

A regional sports-car rally is not a race. It's an outing or picnic, which can and often does include the family—kids and all. Recently, at a typical affair sponsored by the Connecticut and Westchester (N. Y.)

sports-car clubs, two *Popular Mechanics* entries went along. A. R. Stahman, a *Popular Mechanics* advertising man, drove with his wife in their 1950 MG TD. Its 54-horsepower four-cylinder engine in stock condition is capable of kicking up 85 miles per hour. The writer, with wife, daughter and small friend, piloted a four-seater Vaughan Singer with all-aluminum body and a four-cylinder engine. Many of the other entries, like the lean Jaguars and Porsches, could outrun us by 20 to 40 miles per hour, but speed alone doesn't count in a rally.

Days before the affair, club officials scouted and mapped the 63-mile course, weaving down back roads, doubling back on this leg or that, taking off on a super-highway for a stretch, winding through towns and villages, bouncing across wagon tracks through a field, and finally ending up at a state woodland reservation in a vast clearing where contests would be held.

On rally day, some 50 cars poured into the starting area—a local airport. Polishing rags were broken out. Hoods went up for last-minute adjustments. Everyone was given a list of directions which would keep him on course, or get him lost—depending on how good his navigator (usually his wife) was. Cars were launched a minute



Driving backward past obstacles while blindfolded requires cooperation of driver and navigator

- 21.90 Right on B. T. Winding road. Caution!
- 22.65 Right at T intersection. N. Y. Route 120.
- 22.85 45° Left on B. T.
- 22.95 Sharp left.
- 23.00 Keep left.
- 24.40 Turn left on to B.T. at T intersection by stone pillars.
- 24.75 Dirt to B. T.—continue.
- 25.00 Caution—sharp S bend.
- 25.20 Caution—sharp left bend.
- 25.30 B. T. to dirt—continue.
- 26.12 Bear left—don't go thru stone pillars.
- 26.60 Turn right on to concrete by red brick wall.
- 26.95 Left on B. T. on to road with center island.
Caution! Slow! Private residences.
- 27.50 R. R. Crossing. Full stop. Caution.
- 27.55 Check point. Get instructions for leg 2.

Sample of route instructions. Figures show mileages. B.T. means blacktop road. Note the numerous warnings
Rear-engine Porsche goes through the figure-8 course

apart, each speedometer reading checked out. Off we roared. Our route instructions read like a pirate's map of buried treasure. Here's a five-mile sample:

- 7.45 Left at green with four shrubs
- 8.45 Bear left—Cox
- 9.45 45° left on B.T.
- 9.60 Straight

12.2 Left on B.T. at 18th hole

"B.T." is blacktop road. "Cox" turned out to be the name of a street—it might have been a name on a sign or mailbox. You don't know until you get there. The last clue was a left turn onto blacktop circling the 18th hole of a golf course. The flag was just visible from the road.

Those little numbers on the left are the jokers. They indicate progressive mileage in hundredths from point to point. By checking them against the trip meter, a navigator knows when to start looking for a check point. They are also the key to the time schedule—a vital factor in this game, since points are lost for coming to a check point too soon or too late. A 20-mile-an-hour average between points must be maintained for perfect scoring.

Converting each little mileage jump into the seconds it should take to get there at the designated speed calls for a slide-rule mind. One wrong turn means a time loss of seconds that must be made up, as well as hundredths of miles that must be added to or subtracted from the speedometer reading in all future calculations. More than a few such errors and you need a four-story Maniac computer to clean up the mathematical confusion.

Who knows if you cheat a little? At half-a-dozen spots along the route, as we barreled around corners trying to make up time lost on the last wrong turn, a club official stepped from the bushes like a cop



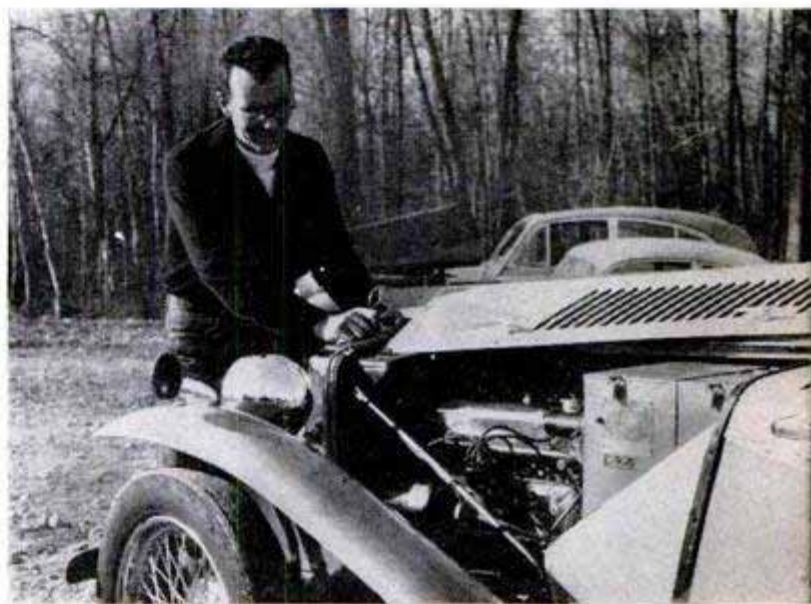


At surprise points along the route, officials stop drivers to check time and mileage. This is a Jaguar

in a speed trap, to flag us down, take our speedometer reading and note the time. On the basis of findings at these surprise check points, scores are figured. You'll lose a point for every minute you're late at a check-in point; two for every minute you're early. A point is lost for every extra mile on your speedometer at the end of a run; two points for every mile under the total distance (to discourage short-cutters). Miss one of the checkers and it costs 100 points. Failure to obey a traffic sign, a light, or a speed limit costs 25 points.

Everyone huddled around to compare notes at the end of the run. New cars were examined, criticized or praised. Some of the members' cars draw crowds at any gathering. A member may be asked to show his chromed engine block, chromed wire wheels, special fittings of one sort or another or maybe a motor that has been hopped up to cruise at 120 miles per hour. Like most sports-car rallies, this one wound

(Continued to page 236)



Above, sports-car owners are proud of their vehicles. This MG boasts a chrome-plated engine. Below, contestants and families watch an MG do the figure 8



Gasoline-Powered Flying Disk

MANY RESIDENTS of Van Nuys, Calif., can report truthfully that they have seen a flying saucer both in the air and on the ground. The saucerlike plane is a flying disk two feet in diameter and powered by a conventional model-airplane gasoline motor. Some earlier models of flying disks have been jet-powered with a rotating rim ("Flying Disk Aircraft," *PM*, May 1950). The Van Nuys model, built by Virgil Wood and George Harris, was designed to demonstrate maneuverability and speed, and is the result of several years of experimentation. The craft has a framework of balsa and is covered with silk. It is controlled by a wire. The engine is completely contained in the airfoil and the model flies equally well right side up or inverted. The disk will perform all the conventional maneuvers of a control-line craft, according to the inventors. In order to compete in model-airplane meets, a single-wheel landing gear was added. Mr. Wood, who is in charge of the model, calls it a Dis-cus.



Inventor Wood shows the egg-crate-type framework of newest flying disk which is made of balsa wood



The inventor and assistant prepare the two-foot model for flight. The craft is controlled by wire. Below, a real flying saucer in the air. Right, the inventor fuels his model in the conventional way





Overhead piston for small doors pulls door open or pushes it shut depending upon direction of water flow



Valve on top of post beside entrance is turned to open or shut door. Another valve is situated in house

Water-System Pressure Is Utilized to Open Garage Door

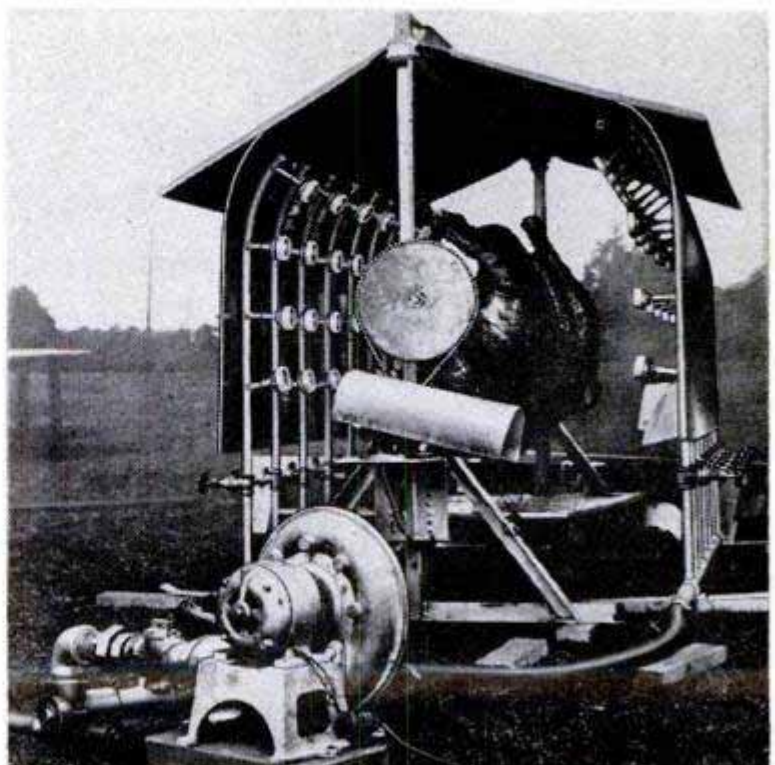
Pressure from your water system runs a garage-door "slave" that opens or closes the door at the turn of a control handle. The actuating mechanism is a long water-driven piston attached to the ceiling of a single-car garage, or a pair of pistons mounted at the sides of a two-car garage.


An electric solenoid permits push-button operation from inside the house. Similar oil-driven units are being designed for use in freezing climates. Now in limited production, the water-drive unit is about half the price of motor-driven garage-door-opening mechanisms.

Gas-Fired Infrared Lamps Barbecue Entire Steer

Roasting a 450-pound steer in 20 hours, an outdoor oven cooks with a battery of gas-fired infrared lamps. Mounted at one-foot intervals on a pipe framework, the lamps burn at 2300 degrees Fahrenheit, producing rays which penetrate deep into the meat, heating it from the inside. The giant beef roast required less than three minutes' cooking time per pound. Hand-operated valves regulate the flow of the gas to the burners. An electric motor turns the spit to revolve the meat. Open at two ends, the structure is protected by a sheet-metal roof; two sheet-metal sides are sufficient to contain the radiant heat.

More traffic than combined total of Panama and Suez canals is carried by the Soo canals at Sault Ste. Marie.





They Weigh the Dew

Dew shaken from alfalfa falls on scale which will weigh moisture and record loss of weight by evaporation

SCALES ARE routine equipment in soil-conservation research, but a huge scale near Coshocton, Ohio, actually weighs the dew.

Resting permanently on the beams of this giant scale is a 65-ton "block" of earth that was left undisturbed when the scale was ingeniously built beneath it. Every 10 minutes, day and night, a recording device ticks off the weight of the huge block of

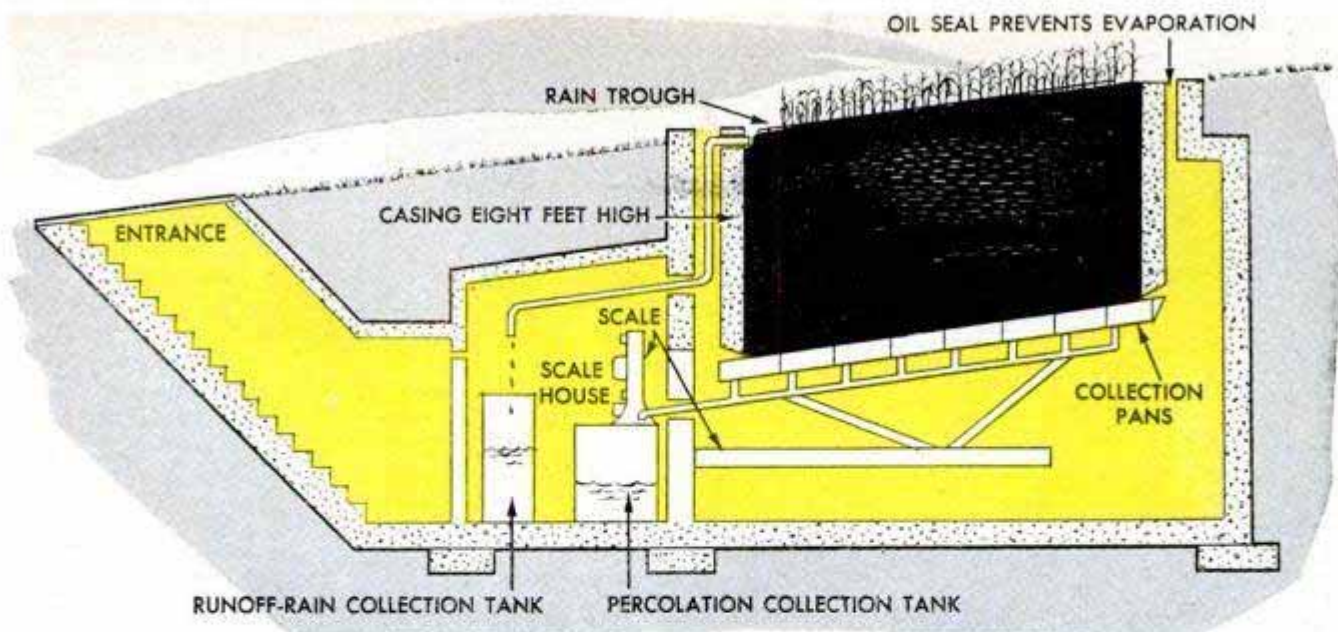
By W. H. Lathrop

earth, plus the accumulation of morning dew or minus the transpiration from growing vegetation. The research is carried on by project supervisor Lloyd L. Harrold and his staff at the U. S. Soil Conservation research station.

The big scale's "ticker tape" is unwinding some of nature's most obscure secrets. How much rain does a heavy dew repre-

Strip-cropped field at research station demonstrates how farmers can save moisture and cut flood damage





Scale built beneath 65-ton "block" of earth preserves natural drainage, yet weighs all moisture on the plot

sent? During August 1951, when only about $\frac{1}{2}$ inch of rain fell, dew totaled more than $1\frac{1}{2}$ inches.

Actually, three of the big measuring instruments — lysimeters the scientists call them — are in use at the station. One is on steep pasture, one is on rolling cropland and the third is on gently sloping cropland.

For a comprehensive approach to water control, scientists need to know how much water is lost by evaporation; how much is gained by condensation and absorption and how much is transpired by crops. Data collected by the lysimeters over more than 12 years is beginning to furnish some of that knowledge. The amount of water transpired and evaporated in the production of a corn crop has ranged from 17.4 to 24.6 inches; for wheat, 12 to 14.2 inches and for first year hay, 19.4 to 21.7 inches.

Corn uses the most water in July but wheat uses water heaviest during late May and early June. In the spring and early summer a good grass-legume meadow normally uses water faster than it falls. In 1948 the big scales showed that from April 15 to July 31 a grass-legume stand used all the rain that fell and borrowed eight inches more from the soil.

How much moisture is saved in a dry season by cultivating corn to break up the packed surface of the soil? So far the weighing lysimeters have been evasive on that point. Rain which fell just after cultivating jostled the scales several times and, in two trials worth examining, one showed less moisture lost, the other more. The greater loss of moisture probably was caused by abnormally dry winds.

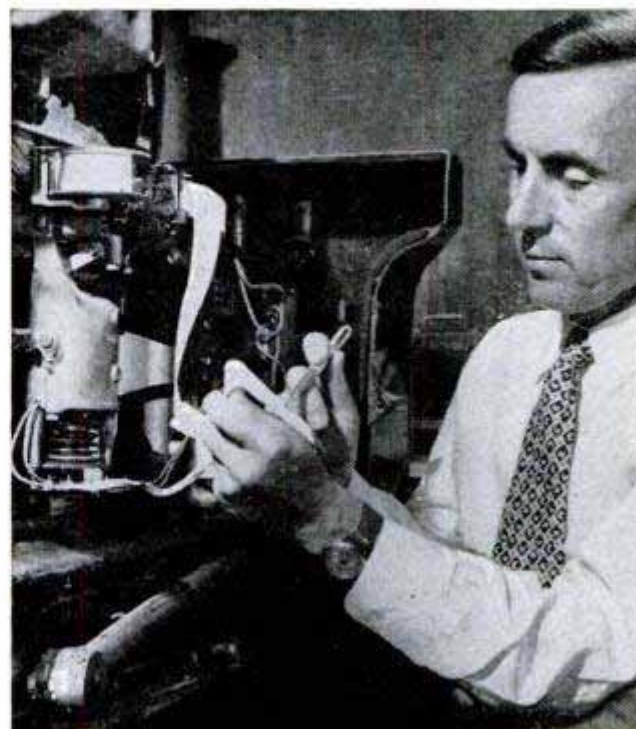
On one occasion, examination of the scale's records showed an erratic reading ranging up to 300 pounds more than weather data would account for. A probing

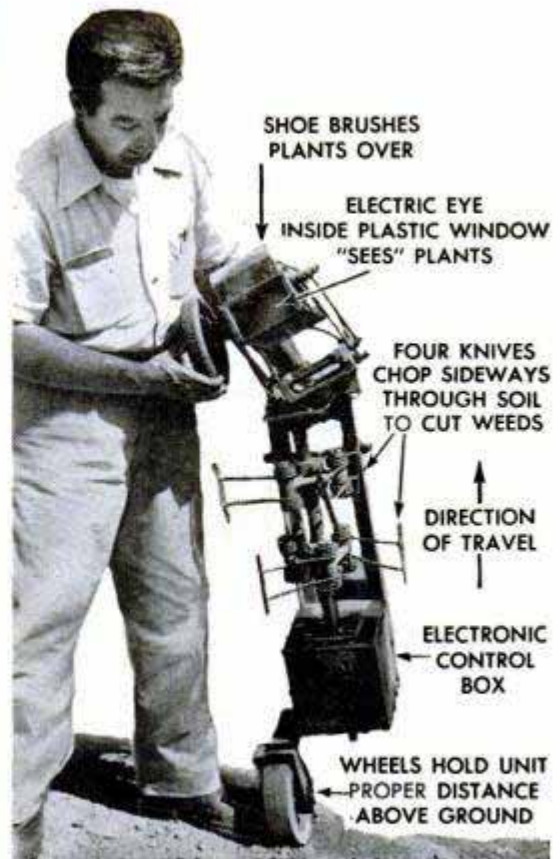
flashlight soon revealed the culprit — a coiled blacksnake out near the end of one of the sensitive beams.

His records from the weighing lysimeters and his own experience have convinced Harrold that the vast storage capacity of our farm land can be used to much greater advantage. He describes an experiment in which two inches of runoff was lost from a corn plot that was nine inches short of its "insoak" capacity.

The Coshocton station's fame has spread beyond its own community and state. From an airplane its trademark of strip-cropped fields can be seen far into the distance — each winding strip a symbol of good conservation methods. ★ ★ ★

Every 10 minutes, day and night, weight of big block of earth is automatically stamped on recording tape





SHOE BRUSHES
PLANTS OVER

ELECTRIC EYE
INSIDE PLASTIC WINDOW
"SEES" PLANTS

FOUR KNIVES
CHOP SIDWAYS
THROUGH SOIL
TO CUT WEEDS

↑
DIRECTION
OF TRAVEL

ELECTRONIC
CONTROL
BOX

WHEELS HOLD UNIT
← PROPER DISTANCE
ABOVE GROUND

↑ Bottom view shows window for electric eye that spots improperly spaced plants

Above left, side knives chop out the weeds but skip plants properly spaced along row

← Hoes are installed in series beneath a tractor to cultivate four rows at once

Mechanical Hoe Has Electronic Brain to Eliminate Weeds

Built for cultivating sugar-beet fields in California, a mechanical hoe with an electronic brain "looks over" every plant to determine whether it is a weed. If it's a weed, sharp blades chop it out of the field immediately. The robot farm hand, which does the work of 20 men, also has been used successfully in cultivating broccoli and lettuce. Four of the mechanical hoes are attached under a tractor to cultivate four rows at a time. Each unit consists of two pairs of chopping knives that dig

through the soil as the tractor moves across the field. An electric-eye scanner in front of the knives picks up light reflections from the leaves of a plant. If the plant is properly spaced in the row, a "memory delay" causes the knives to skip the plant when they come abreast of it. If the plant is improperly spaced, it is immediately removed. In addition to removing weeds, the hoe can be adjusted to thin out plants that are spaced too closely together and is capable of day or night operation.

Safety Thermal Switch

Wired into the furnace-control circuit and installed on the ceiling above the furnace, a thermostatic unit shuts off the furnace and rings an alarm in case of fire or a dangerously high temperature. The alarm is placed in an upstairs hall or bedroom where it may be heard easily. Installation of one switch above the fire door and another above the smoke pipe is recommended for maximum protection.

Ultrasound Inspects Tires

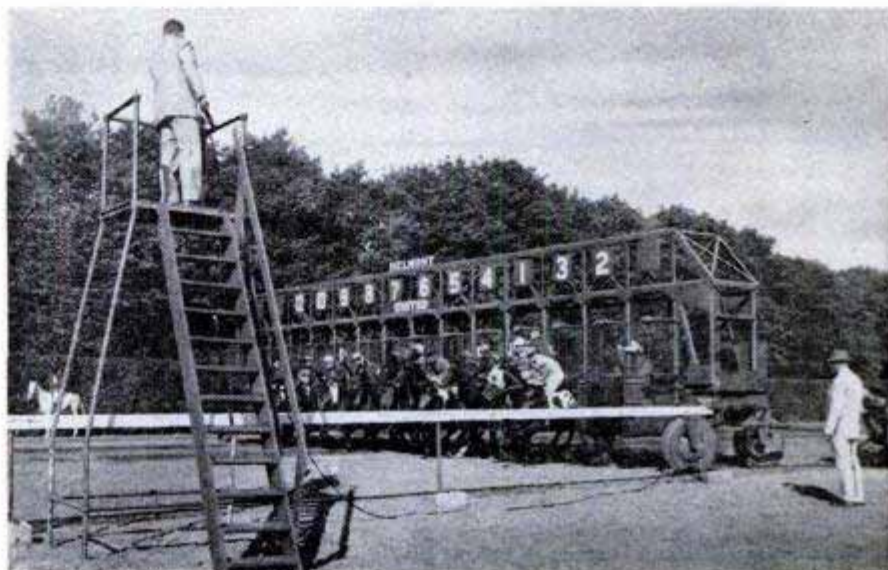
Inspection of used tires by ultrasonic vibrations spots invisible internal defects that make the tires useless for recapping. By assuring that only good tires are recapped, the inspection system makes recapped tires last longer. The tire is rotated in a liquid and the ultrasonic vibration transmitted through the sidewalls and tread to a microphone inside the tire. Breaks and defects are quickly spotted.

They're Off!

NO HORSE gets a head start when the timer goes off on a 60-foot portable starting gate. The seven-ton steel rig, which, at present, is used on more than 20 race tracks, is divided into 14 stalls. The apparatus is mounted on casted truck wheels so it can be hauled around by tractor to any location. Two units can be worked end to end, when the field is larger, to accommodate up to 28 starters. Two sets of truck batteries and a solenoid about the size of a quart Thermos jug, whip open all 14 gates of each unit at the same instant by simultaneous release of a magnetic bolt bar securing each stall door. Another set of batteries and a solenoid hold rear gates shut tightly. Bars making up each stall are padded with sponge rubber to prevent possible injury to either the horses or the jockeys.



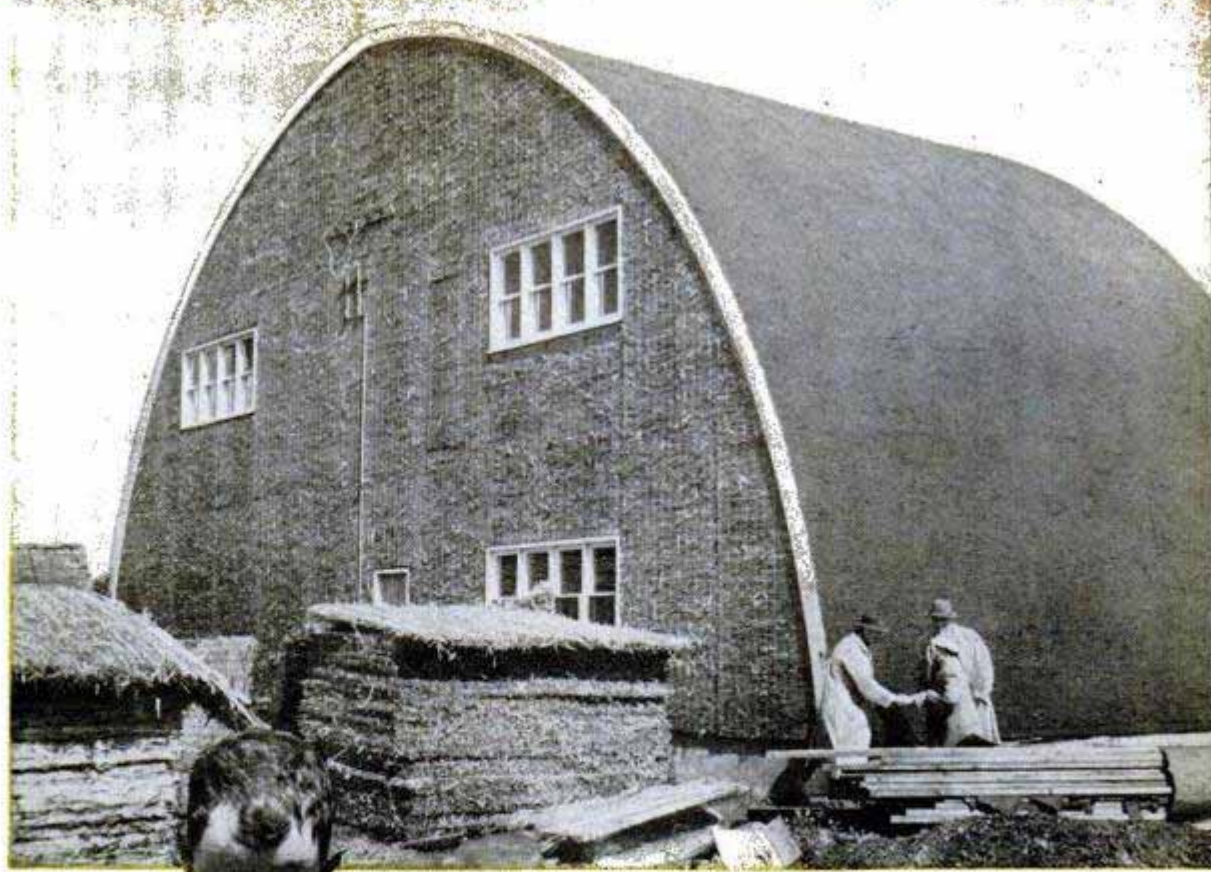
Starting gate is set into position five feet from rail and doors are being closed before horses reach post. Man at right sets control switch



Starter on control stand with complete view of horses presses button connected by cable to main switch to open doors of gate. They're off!

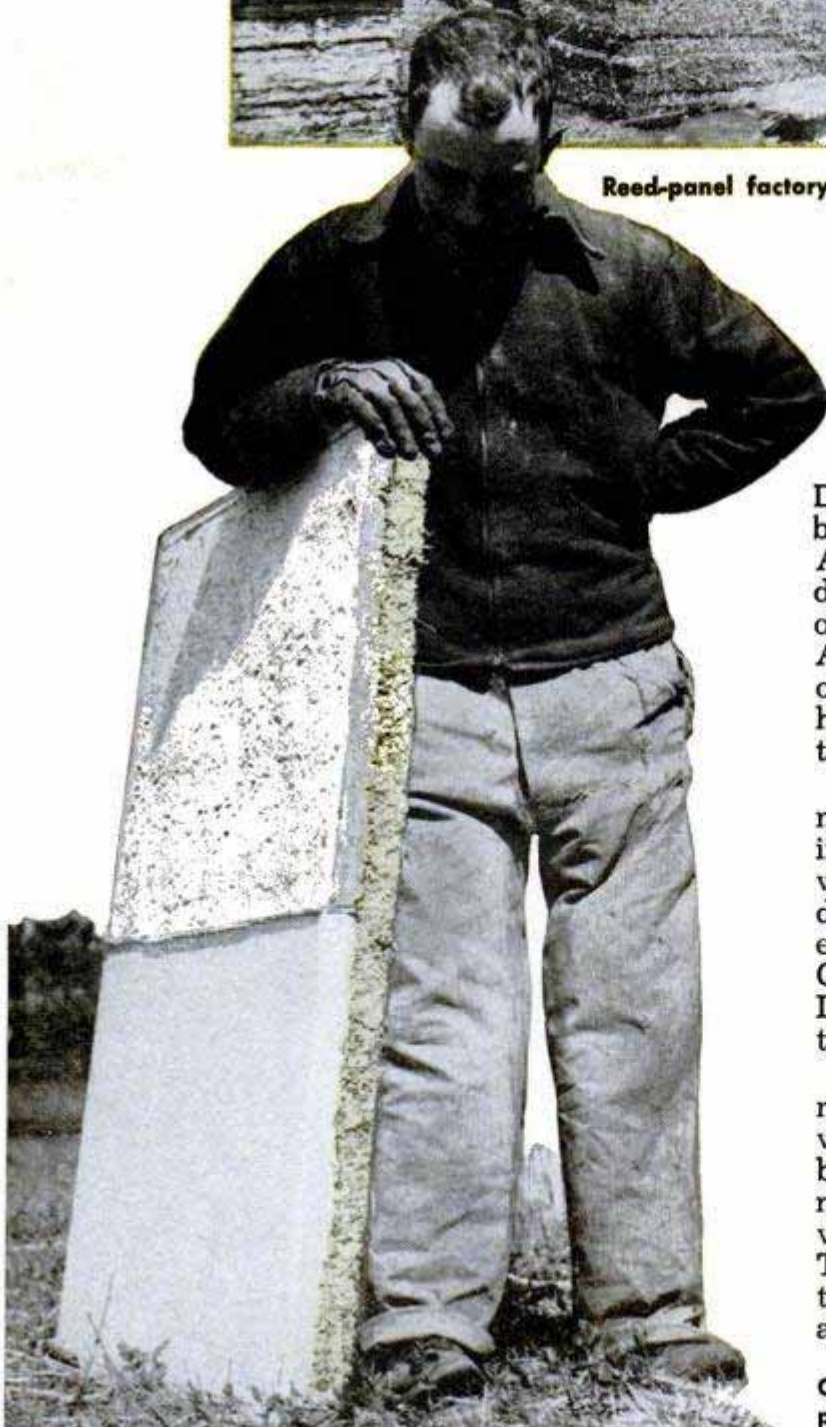
Old-style gate, below left, could injure head of rearing horse. The new gate at right is completely padded





Reed-panel factory is made of its product. Tar covers roof

Houses



SIXTY MILES northwest of Winnipeg, Can., lies the vast Delta Marsh—36,000 acres of reeds, bulrushes and twisting water lanes. A favorite nesting place for wild ducks and geese, it's also the source of a building material new to North America, but used for centuries in other parts of the world. Reeds have long been a popular reed thatching in Europe and Asia.

In 1925, a Dutch firm invented a machine for pressing dried reeds into a thick board that resists winter winds and summer heat, deadens sound, is economical and easy to handle. Two years ago, a Canadian plant using imported Dutch machinery started operations at Portage la Prairie.

Each December, as soon as the marsh is frozen enough to bear the weight of machinery, tractors and binders hired from local farmers move in to cut the dried reeds which stand six to nine feet tall. The frost has stripped them of their narrow leaves until only pith and stalk remain. Workmen toss

Concrete, plaster or stucco adhere to rough panel surface without need of wire base



Two men feed reeds into machine, placing stalk butts in opposite positions to make boards of even thickness

Built of Reeds

By Lyn Harrington

Photographs by
Richard Harrington

the sheaves of reeds onto large trailers and haul them to the big storage yard at Portage la Prairie. Last year, approximately 800 tons were harvested from as many acres.

In the factory, two men feed the reeds into the large compressing machine, which stamps them into firm board under a pressure of 300 tons per square inch, and trims the board to a width of 64 inches.

Twelve reels of wire on either side feed into the machine, while staples at frequent and regular intervals lock the strands together, so that the reeds are imprisoned

Reeds are imprisoned between wires running the length of panel and staples which connect them with wires on opposite side. Crosswise strength equals inch plank



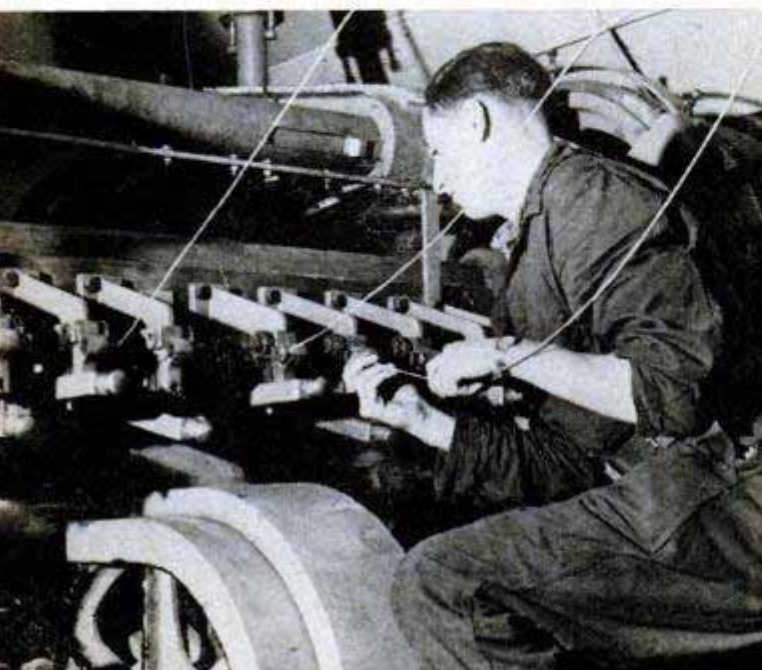


Paneling can be of any desired length. This 64-foot section forms the entire wall of a field granary

between the wires. This makes a board which is inflexible crosswise but which can be curved to almost any extent lengthwise—suiting it for use in curved barn roofs and Quonset-type buildings. The board slides down through the machine on the mezzanine floor to the ground floor under inspectors' watchful eyes.

The finished product may go into a barn, a home or a granary. It may be used for interior or exterior walls, for ceilings, and for underflooring. It can be cut easily into window spaces, curves or arches with nippers and hand or power saws. Application does not require skilled labor, making it easy for amateur craftsmen to use.

Workman feeds fresh wire into the machine. There are 12 strands on each side of standard 64-inch panel



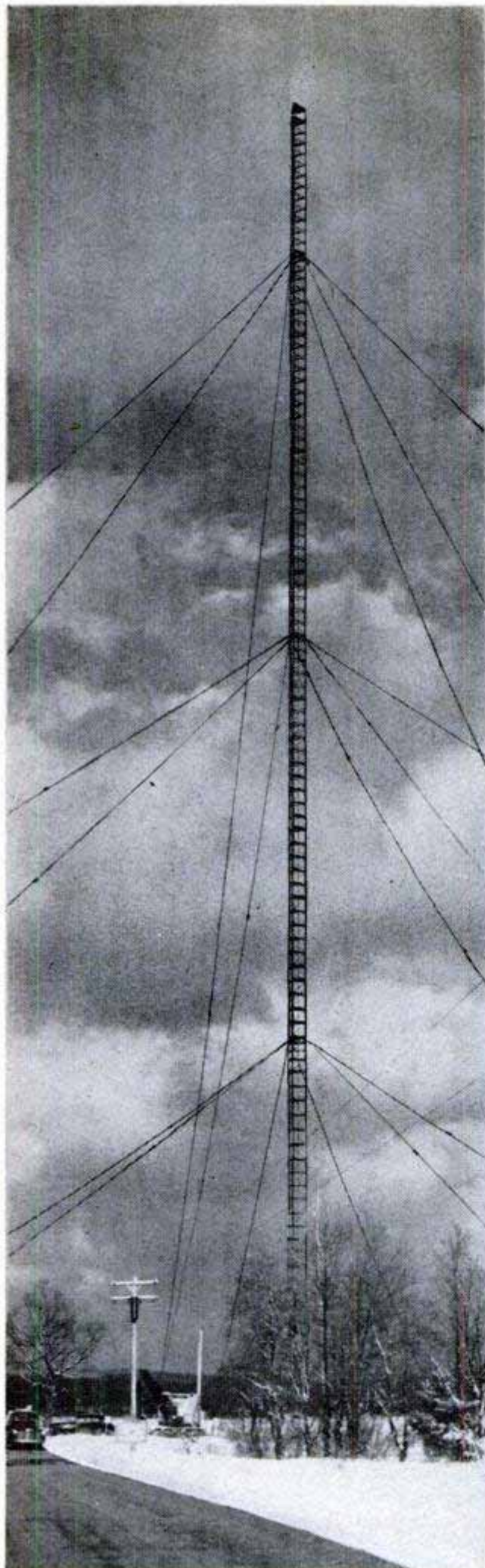
Eight-foot length is standard size, though the paneling may be cut to 12 feet, 18 feet, or any desired length.

The panels are made in two weights. The 2-inch thickness weighs $3\frac{1}{2}$ pounds per square foot and is used mostly for exterior walls. The $1\frac{1}{4}$ -inch thickness is $2\frac{1}{2}$ pounds per square foot and is generally used for interior construction. Both take plaster or stucco readily, and the rough surface forms a good bonding agent. A narrow strip of chicken wire and long nails with curled heads are needed at the seams. Siding may be nailed directly against the panels.

Two-inch paneling costs about 12 cents per square foot. It's light, and therefore needs minimum foundation. An additional saving of materials and labor is possible because the distance between studding can be lengthened from 16 to 32 inches.

Tests made in England and Canada speak well for the reed panels. The British Department of Scientific and Industrial Research reported a fuel saving of 35 percent when the reed house was compared to a standard brick house. The two-inch building panel is said to have the same insulating value as a 22-inch brick wall.

There's no danger of insect or rodent damage. Furthermore, the dry, moisture-resistant reeds which burn easily when loose do not burn at all when compressed. After research figures were released, the government housing bureau authorized its use in construction, and now city homes as well as rural buildings are being built from the marshland product. ★ ★ ★



1218-Foot Radio Tower for Air Force Radio-Wave Tests

Experimental radio waves will be beamed over a large part of the universe from the Air Force's new 1218-foot tower at Rome, N. Y. Triangular in cross section, the tower's 772 tons of fabricated steel are held steady by about four miles of guy wires. Some are anchored nearly a quarter of a mile from the shaft's base. During 120-mile-per-hour winds, which have already lashed the tower, it has swayed less than the seven feet calculated for a 150-mile-per-hour gale. There is a maintenance platform at each elevation of the obstruction lights, 238 feet above the base insulators, and at 120-foot intervals to the top of the antenna. The inspectors use an elevator and there is a telephone at the elevator entrance at each platform level. The central pier, upon which the main tower rests, is a pyramid-shaped reinforced mass of concrete, measuring at its base 30 feet 6 inches in length, 28 feet in width and 7 feet in height. The tower's top is only 232 feet lower than the world's highest antenna, perched atop the Empire State Building.

Automobile Snack Bar Holds Food and Beverages

Slung over the back of the front seat or easily carried to a picnic site, an automobile snack bar provides a center compartment for food as well as two quart-size vacuum bottles. The curved handles pivot together to provide a comfortable grip for carrying the unit. Lithographed with a plaid design, the case is made of sturdy metal.



U. S. Air Force photo

Mobile Hydraulic Jack Gives Workmen Big Lift

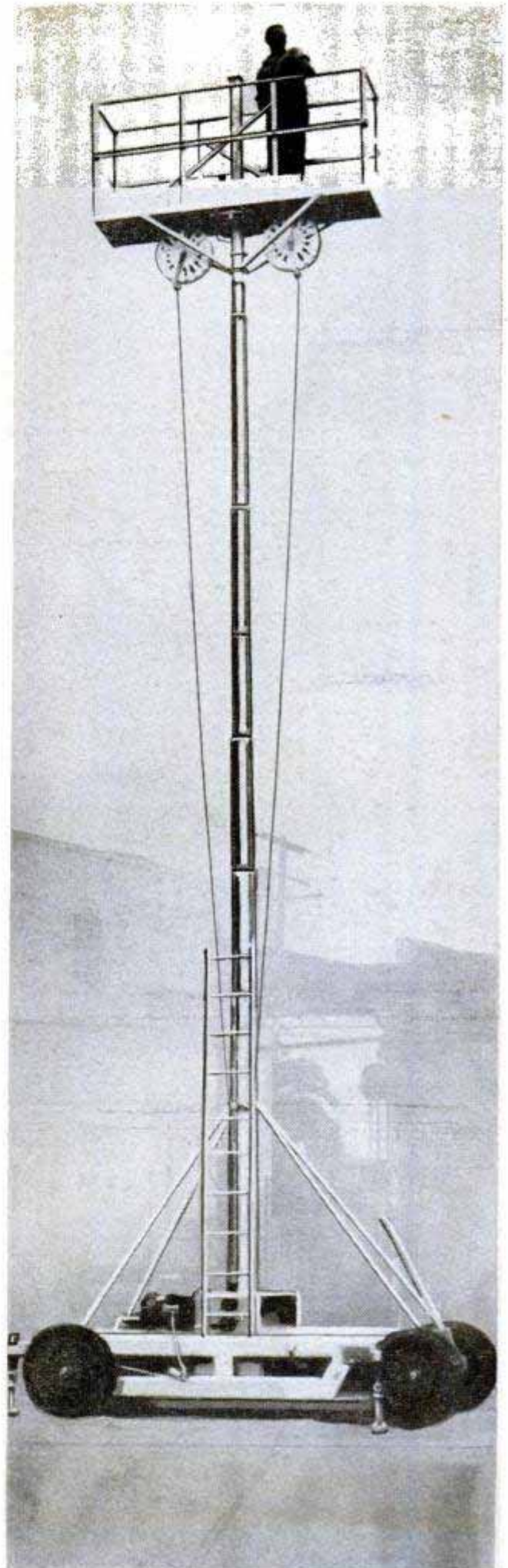
Hoisting a crew of workmen or three tons of building material 38 feet into the air, a mobile hydraulic lift proves valuable on construction and maintenance jobs. Dual controls permit operation from the ground, or allow a workman on top to raise, lower or rotate the eight-foot platform. A 7½-horsepower engine, resting on the heavy, pneumatic-tired trailer, drives the hydraulic columns. Fully retracted, with platform guard rails collapsed, the lift requires a clearance of only 13½ feet. Safety devices provide a gradual descent in case of hydraulic or control failure.

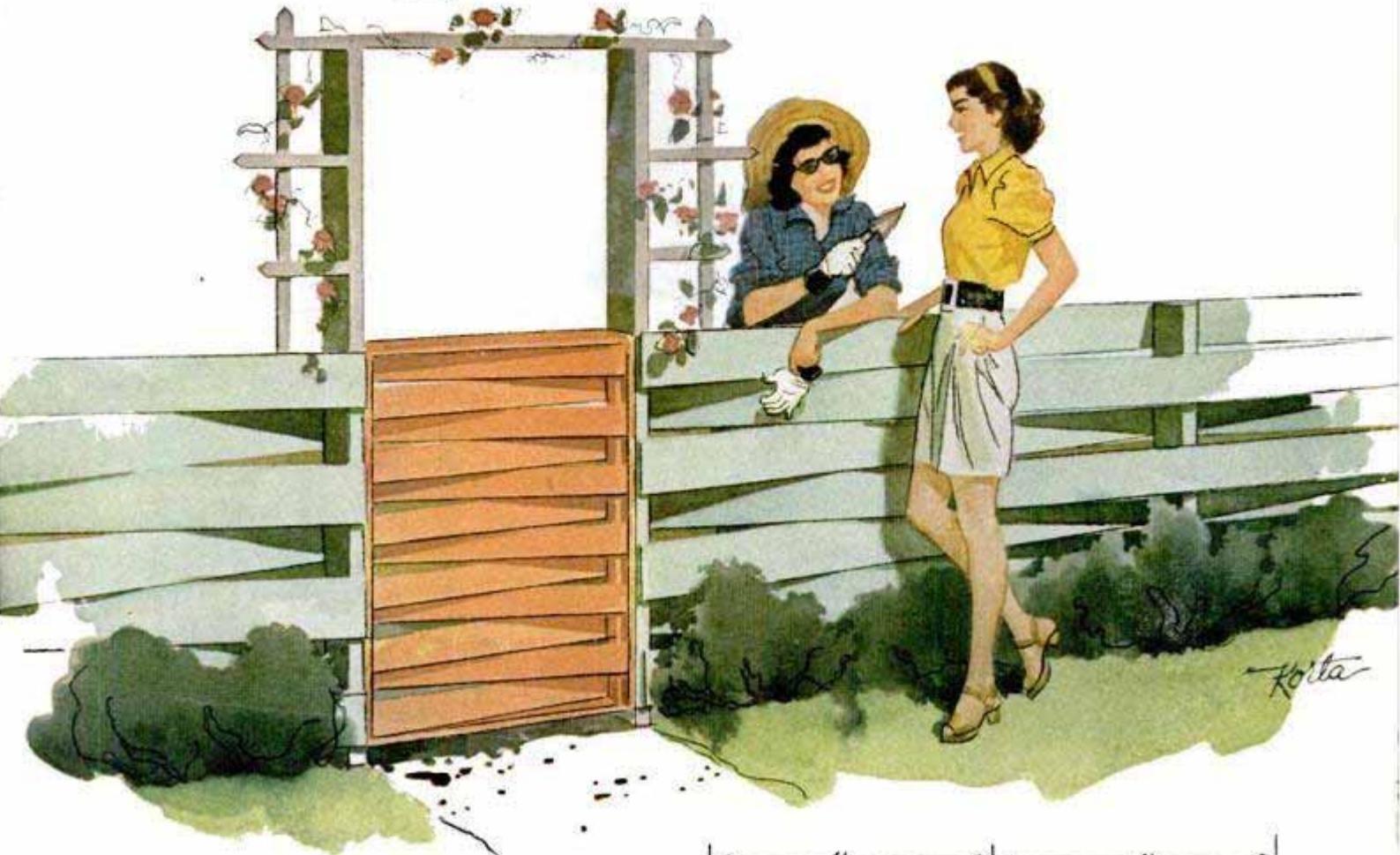
Electric Starter For Outboard Motor

Starting an outboard motor was once a big chore, but today all the work has been eliminated by an electric starter that works with the push of a button. Made only for the 25-horsepower Johnson and Evinrude motors, the starter consists of a small electric motor that fits inside the cowling. A regular six-volt storage battery provides the power. When the button is pushed, the flywheel is whirled around at about 400 revolutions per minute, about three times as fast as it can be spun by hand. This assures fast starts and cuts battery drain to a minimum. Once the motor has started, the mechanism is disengaged.

Taillights That "Talk"

When German movie star Joachim Brennecke drives around, he can "talk" to other drivers with the help of twin taillights. If he feels that the motorist he has just passed has been courteous, he turns on the left-hand light which says in large letters "danke" (thanks). However, should he feel that the driver of the other car was uncooperative or discourteous, he flashes the other light which has on it the head of an ox. No German fails to understand that it means "You are a stubborn ox."

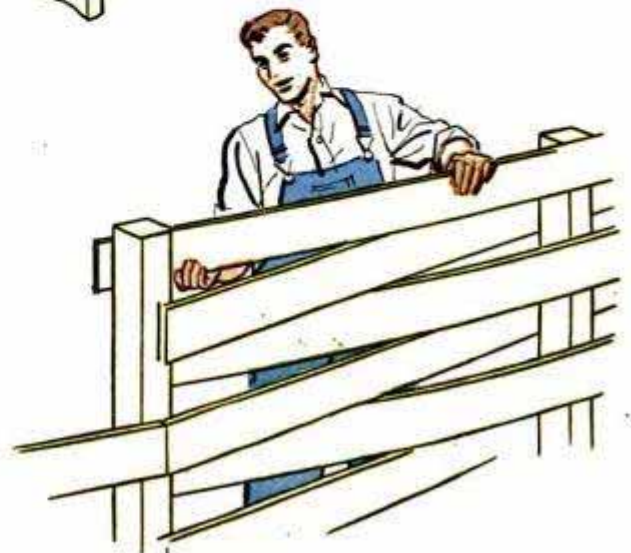
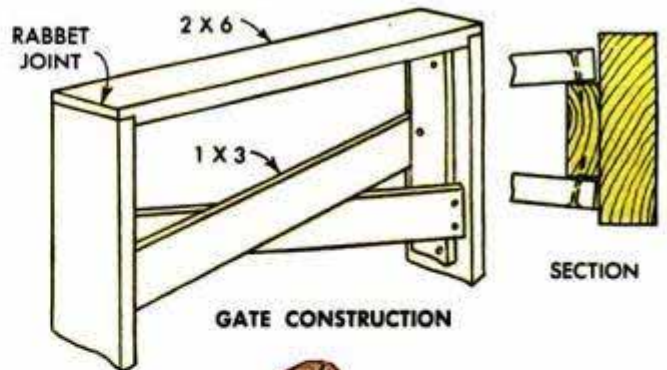




Basket-Weave FENCE and GATE

By Hi Sibley

THE IDEAL FENCE treatment for the modern house, this basket-weave pattern is easy to build and affords privacy without keeping out cooling summer breezes. The fence is made as in the lower detail, nailing 12-ft. lengths of 1 x 6 to 4 x 4 posts. The latter are spaced slightly less than 6 ft. apart so that the ends of the 1 x 6s will butt at the centers of the posts. A matching gate is made by weaving 1 x 3s in a frame of 2 x 6s. A length of 1 x 4 is nailed vertically to the inside of each side-frame member to form a nailing surface for the ends of the 1 x 3s. The gate may be hinged directly to 4 x 4 posts or it can be framed with 2 x 4s or 2 x 6s to simulate a doorway as in the illustration above. Use creosoted lumber or apply a wood preservative before painting. Stock sizes, of course, may be varied.



Contemporary



FOSTER

BAMBOO FURNITURE

By Walter E. Burton

LIGHTWEIGHT and sturdy, this simple-to-build bamboo furniture lends itself to many applications around the home. The slender bamboo poles conform nicely with present trends in modern furniture, so that the coffee table and chair pictured on the opposite page are right at home in the living room. And all three pieces, including the folding table on the next page, are ideal for use as porch or yard furniture.

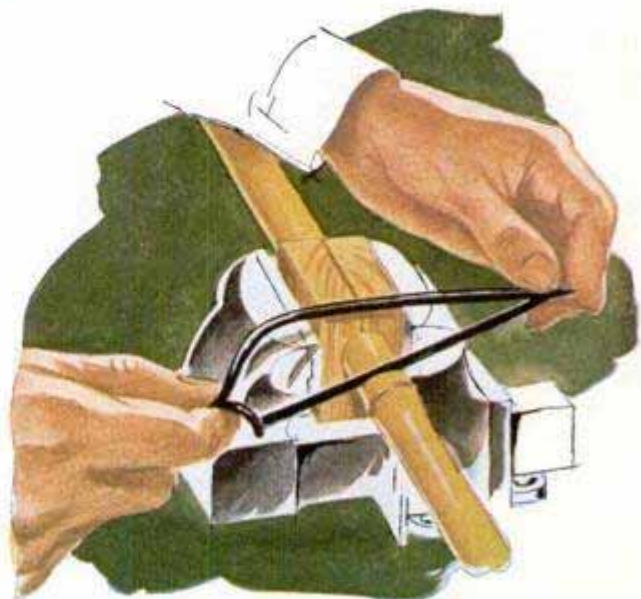
Folding table: Weighing less than 2 lb., the little folding bamboo table is intended for chair-side use but doubles neatly as a luggage rack or serving-tray stand. Use bamboo stems or sections of a fishing pole for the table members, $\frac{3}{4}$ -in. bamboo being about the right diameter for the side rails, $\frac{5}{8}$ to $\frac{7}{16}$ -in. for the legs and $\frac{1}{2}$ -in. for the stretchers. The top is a piece of plastic-coated awning material.

The details on the next page show how to join the table members. Note that in joining the legs to the side rails, the ends of the legs are shaped to fit the curvature of the rails. This is done by using a rotary file or a sanding drum which approximates the diameter of the rail. If you do not have a drill press, the ends of the stems can be concaved with a half-round rasp or a sandpaper-covered dowel.

Fit a $1\frac{1}{2}$ -in. length of hardwood dowel in the end of the leg and drill the rail to receive the projecting end of the dowel, as shown. The dowel is glued in the leg, while the joint between the rail and leg is glued and reinforced with an oval-headed screw. To prevent splitting, drill and countersink the rail to take the screw. The legs and stretchers may be joined similarly or, if desired, without the wood screws. The two leg sections are joined with bolts and washers to pivot freely.

The awning-material table top is hemmed and slipped over the bamboo rails before the legs are attached. Two bamboo spreaders, notched to fit, are inserted between the rails at both ends of the table to hold the table in the open position when books or other heavy items are set on it.

All exposed ends and edges of the bamboo are rounded with sandpaper, and the ends of the legs may be plugged with dowels. If the bamboo shows signs of splitting at any point, wrap the damaged area with nonrusting wire, cord or raffia. Before

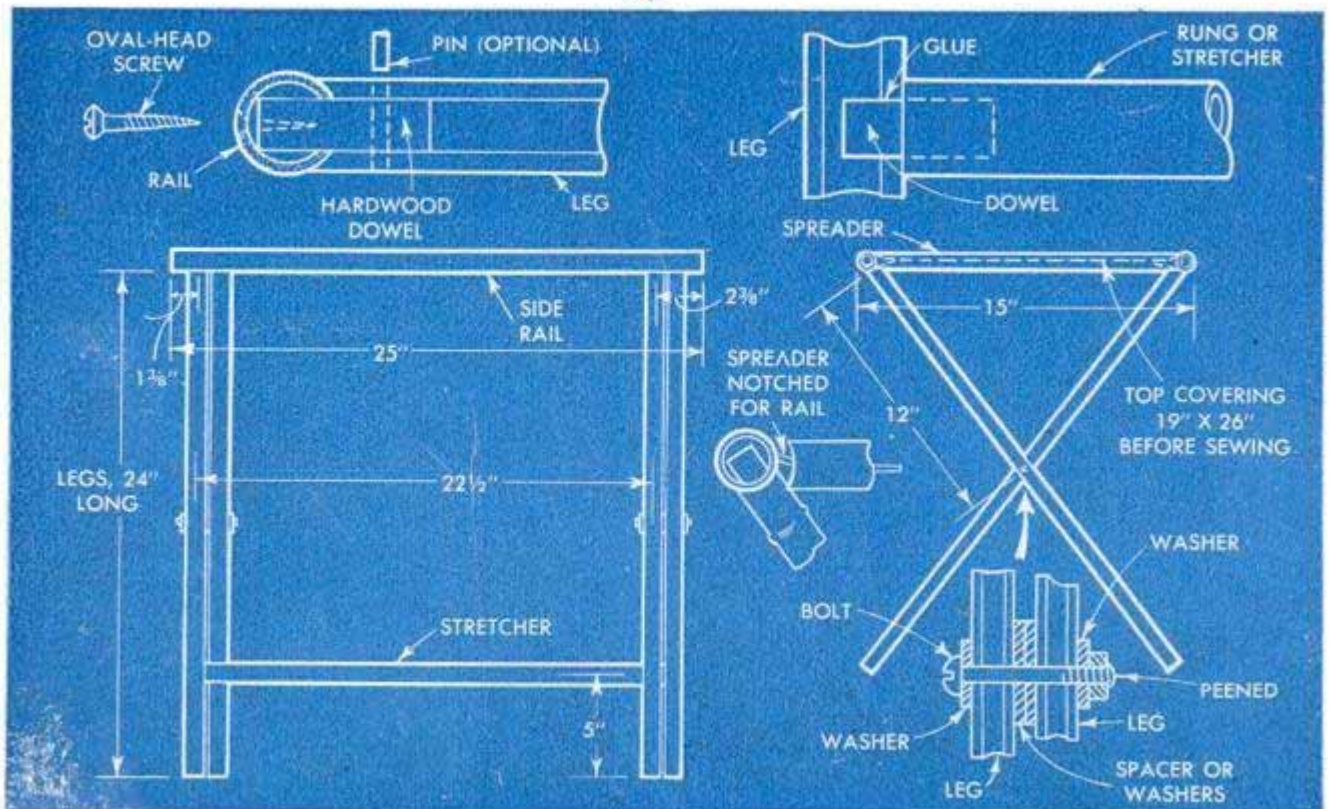


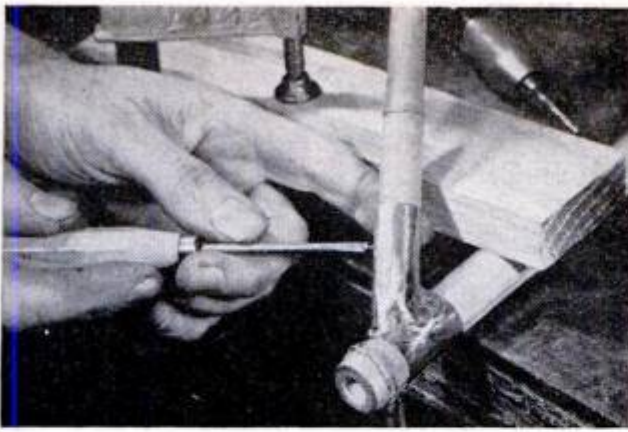
To cut bamboo stem, clamp in vise with protective block, score all around and cut with hacksaw blade



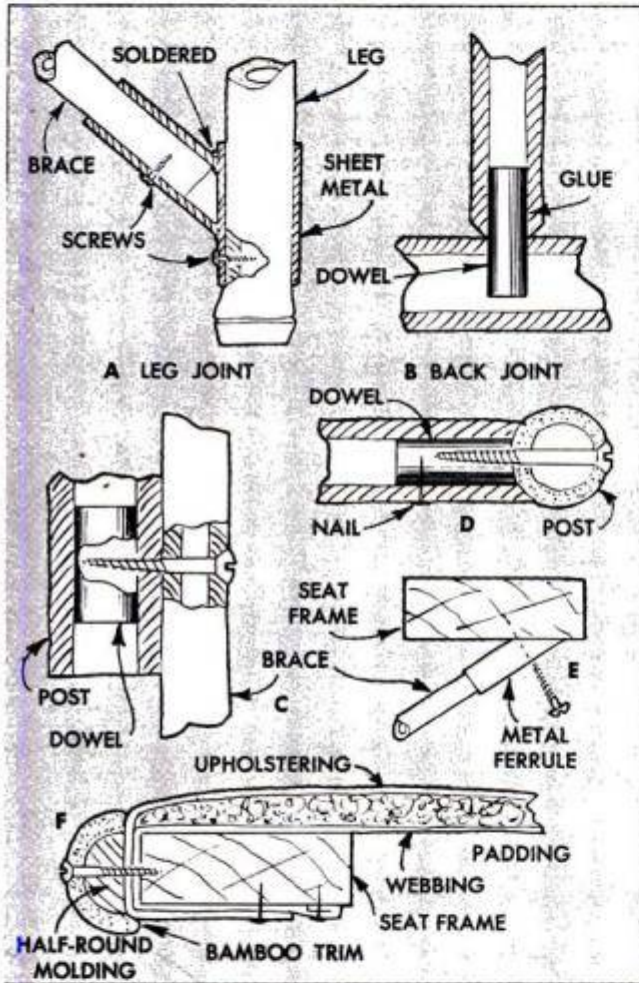
Coffee-table legs, above, and chair legs, below, are joined with brackets made of scrap sheet metal



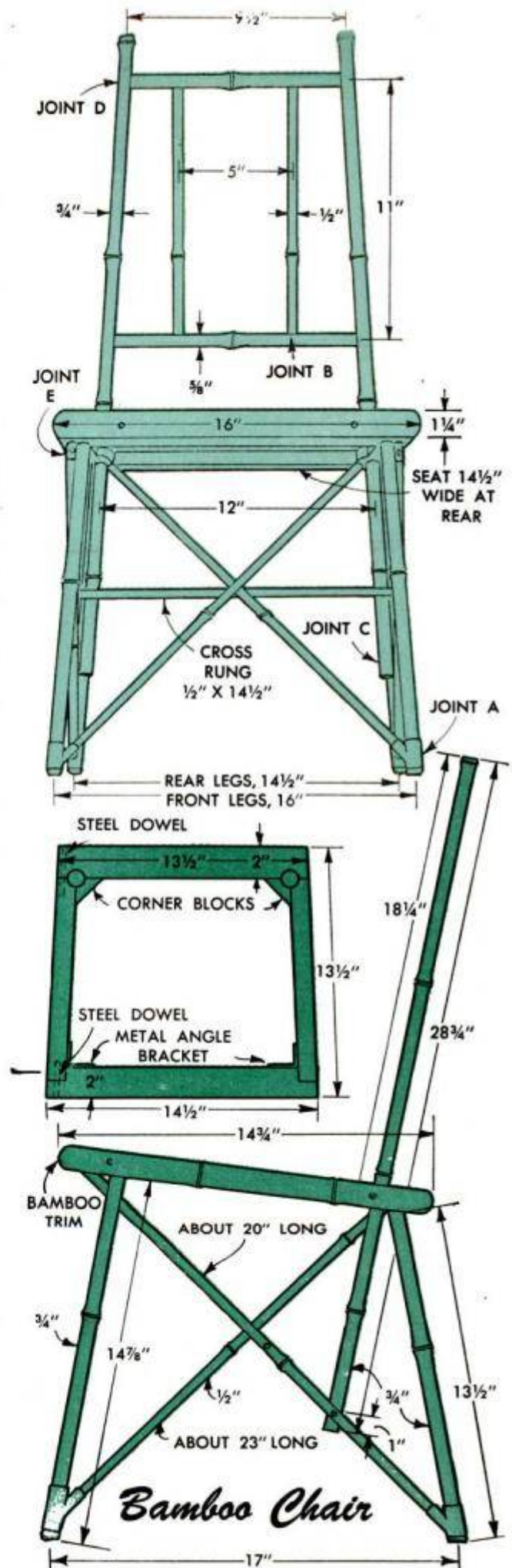
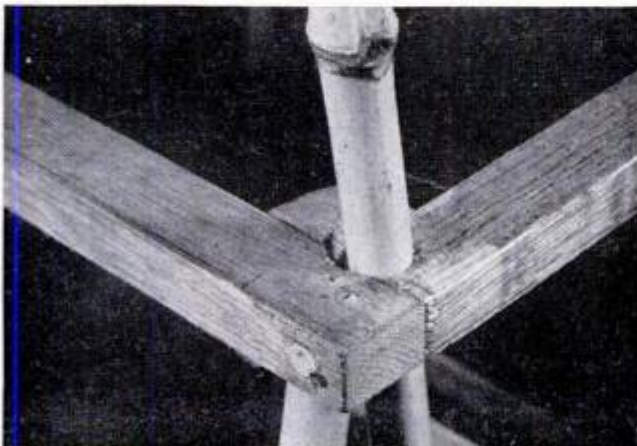




Diagonal brace is inserted in sheet-metal bracket fitted to chair leg. Wood screw prevents slipping



Chair-back posts are passed through seat frame and fastened to leg braces. Screw anchors post to frame



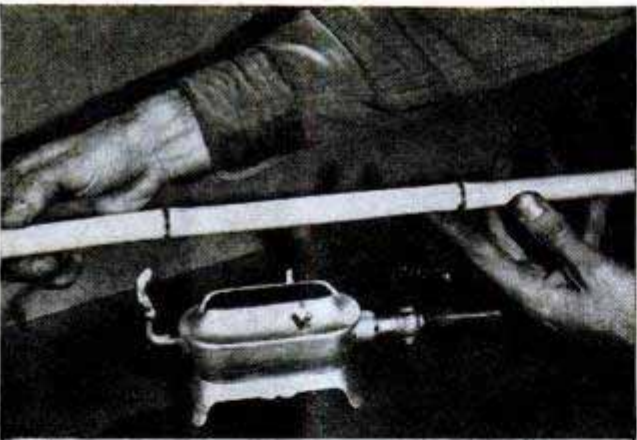
Bamboo Chair



After fabric is tacked to chair frame, bamboo edging is fitted around seat, photos above. The mitered bamboo edging is backed with half-round molding



Use spur bit, above, for drilling large holes. If screw-tipped bit is used, first drill pilot hole. Preheat stems over low flame, below, before bending them

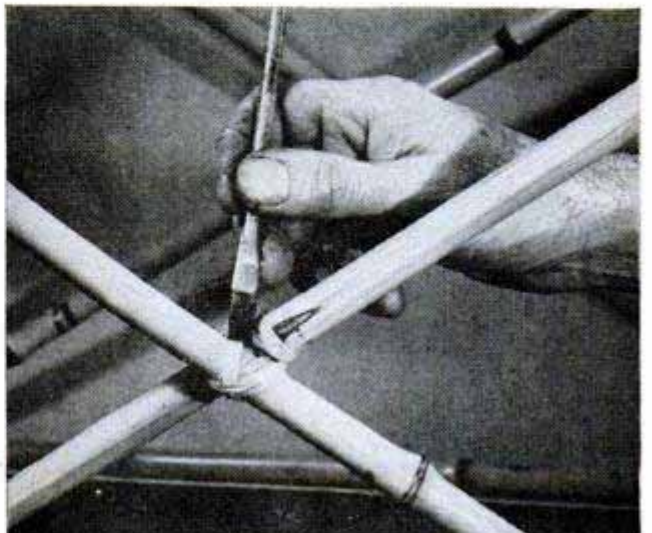


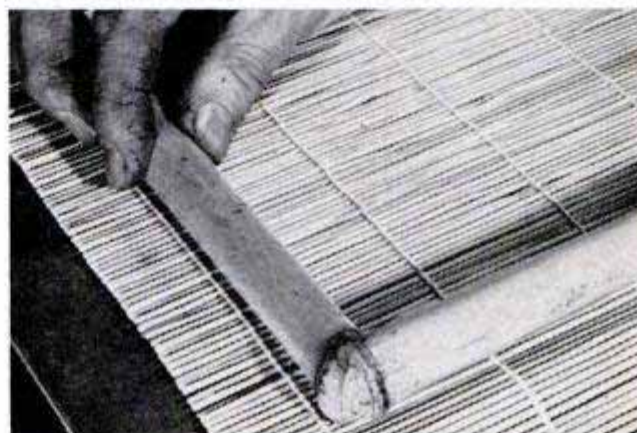
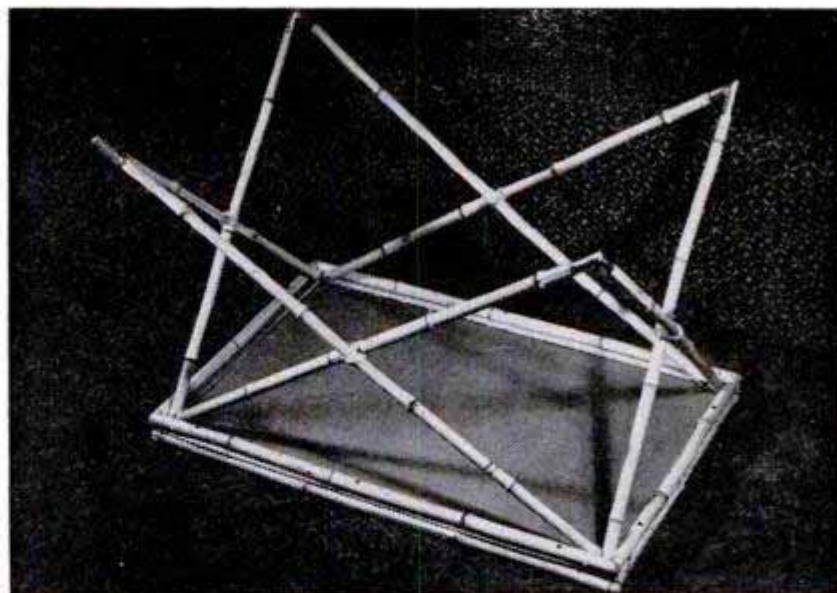
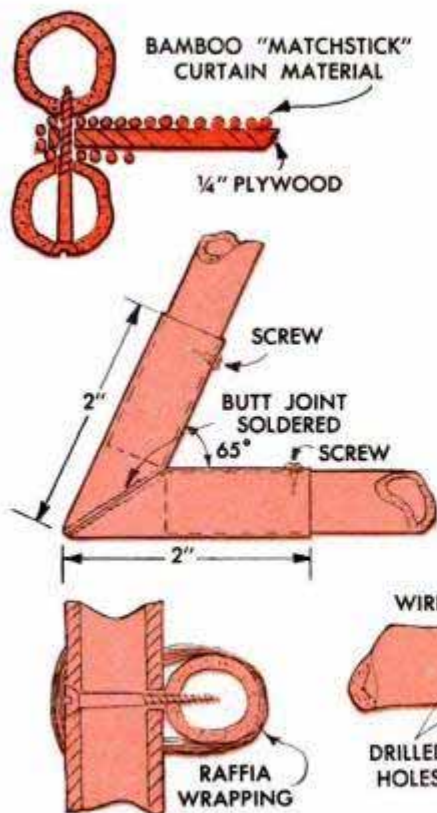
gluing the bamboo joints, be sure the surface of the stock has been scraped to clean the hard "skin" from contacting surfaces.

Bamboo chair: Including a seat frame of oak, this comfortable chair weighs a mere 4½ lb. The cross bracing and careful joinery, detailed on page 153, give the chair its rigidity. Each chair leg is set in a blind hole bored in the seat frame. Note that the holes must be bored at an angle to splay the legs.

The diagonal braces are fastened to the legs with sheet-metal brackets. The metal, which may be cut from empty tin cans, is bent around the leg, as in detail A. Then the ends are soldered together or fastened with the small wood screw which anchors the bracket sleeve to the leg. A second piece of sheet metal is bent to form a ferrule for the end of the brace. The ferrules are joined to the leg sleeves by soldering or fitting with interlocking tabs. Before soldering, the end of the ferrule should be trimmed to fit snugly against the side of the leg sec-

Below, left, rotary file being used to concave end of bamboo stem for neat butt joint. Raffia binding is coated with shellac or clear lacquer, as below

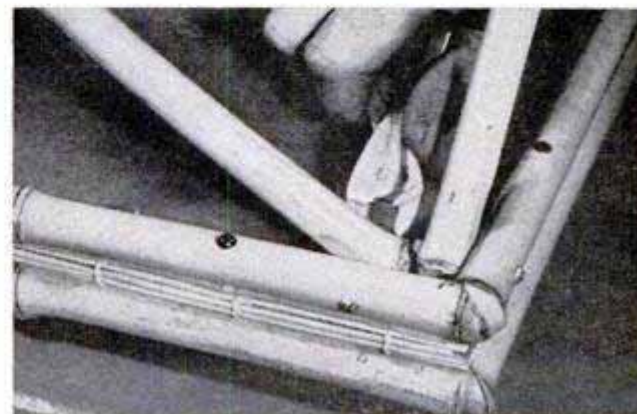




Corners of bamboo table-top frame, above, are mitered and joined with splines, below, or loops of wire



Ends of coffee-table legs are bolted to the lower sections of the table-top frame, as pictured below



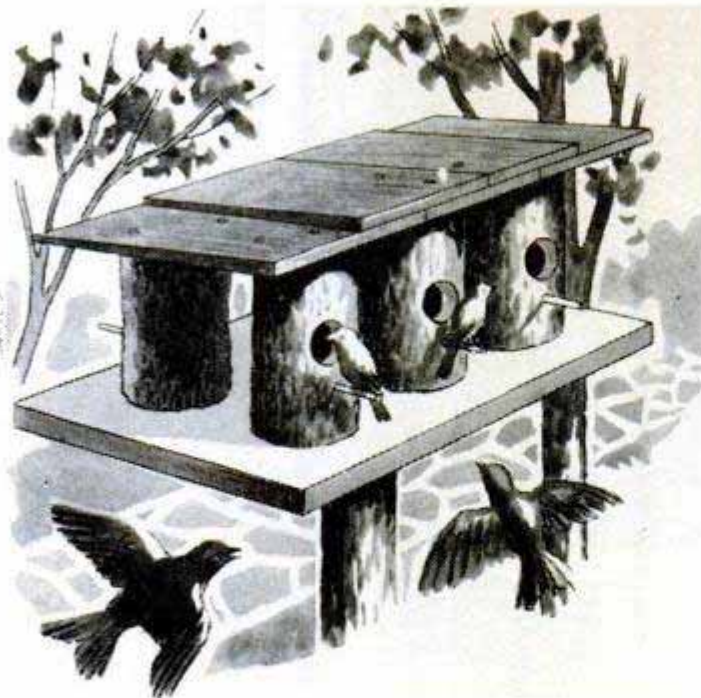
tion. The metal may be painted or wrapped with rattan, raffia or suitable cord. If rattan is used, it is softened by soaking in water for a few hours. Then it is applied wet and, when dry, is given two or more coats of white shellac or clear lacquer. The upper end of the brace is fastened to the chair frame as in detail E.

The back posts are passed through the seat frame and joined to the diagonal braces, C, with dowel sections and wood screws. The vertical and horizontal sections of the back are joined with dowels and glue, as in detail B. The seat, F, is padded, covered and then finished with an edging of split bamboo.

Coffee table: Featuring a plywood top covered with bamboo-curtain material, this interesting coffee table has diagonally braced legs. The $\frac{1}{4}$ -in.-plywood table top measures $17\frac{3}{4} \times 29\frac{3}{4}$ in., and after it has been covered with the curtain material, it is framed with a double row of bamboo stems. The latter are approximately $\frac{3}{4}$ in. in diameter and are fastened to the plywood with screws driven up through the bottom row of stems.

On the original coffee table, each leg was made of two lengths of bamboo; one $24\frac{1}{2}$ in. long and the other $32\frac{1}{2}$ in. long. These support the table at a height of about 20 in., so if you wish to lower the table use somewhat shorter leg sections. Note that the two sections of each leg are joined by a sheet-metal foot as in the center detail. When cutting and bending the sleeves to form the foot, be sure to round the metal where the foot will rest on the floor. ★★★

Bluebirds Attracted to "Apartment" House Rid Garden of Cutworms



Bluebirds attracted to this unique "apartment" house will help considerably in reducing the cutworm population in a garden. The apartments are 10-in. sections cut from a small log, each of which is hollowed out and drilled to provide a 1½-in. "door" in the side. The sections can be hollowed out by drilling a series of holes close together in a circle and then completing the job with a chisel. The sections then are nailed to a base, preferably ¾-in. waterproof plywood, that is large enough to allow ample shelf space on all sides. If a pitched roof is desired, tops of the sections are sawed at an angle, after which shingles are applied as shown. The house is then mounted on a tall pole.

Fred Cornelius, El Paso, Tex.

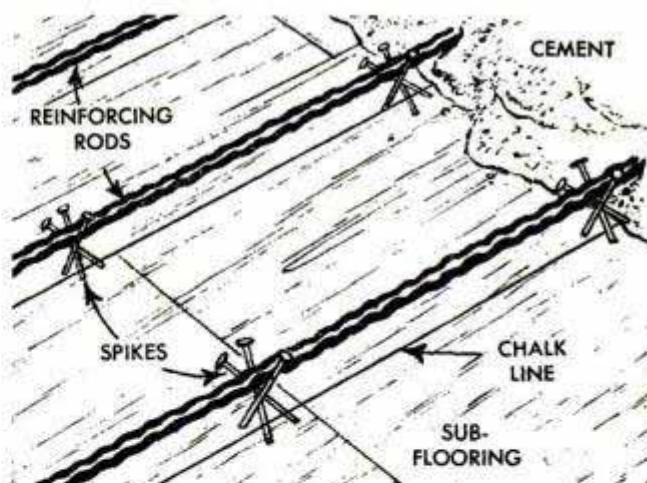
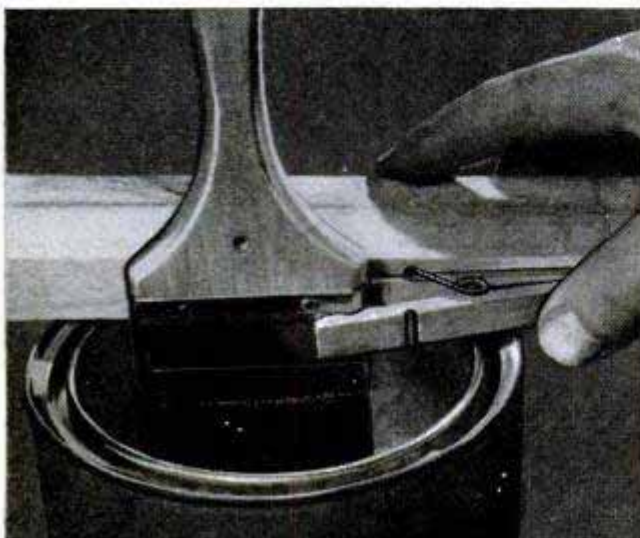
Wallpaper Removed Easily When Soaked Thoroughly

Wallpaper removal can be made easier if the paper is soaked thoroughly with warm water before beginning. Use a large sponge, paintbrush, mop or hand sprayer to wet the paper, going over the surface as many times as necessary to soak it. To avoid marring the wall, pull off as much of the paper as you can, using a wide putty

knife to get under it when necessary, and being careful not to dig the blade into the plaster. After the paper is off, all traces of paste must be removed by washing the wall with a paint cleaner dissolved in warm water. Rinse with clear warm water and let dry. Before applying the new paper, patch all cracks and holes.

Simple Paintbrush Holder

A spring-type clothespin screwed to a wooden crossbar will be found handy for suspending a paintbrush in a can of thinner. By fitting several clothespins to a crossbar, a number of brushes can be supported individually in a row of cans. This provides an excellent means of storing brushes so that they retain their original shape.—Ken Murray, Colon, Mich.



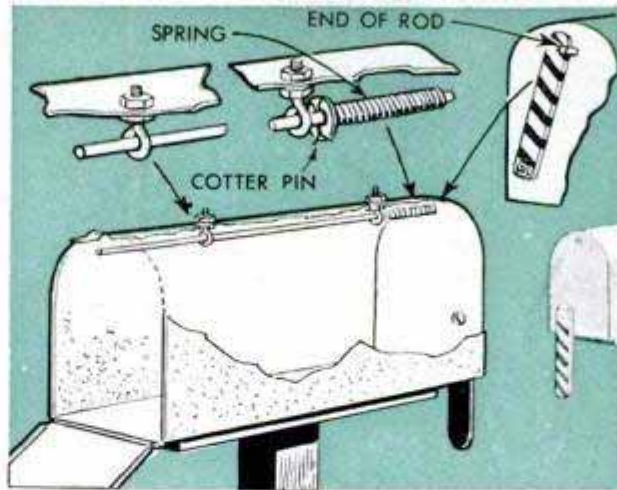
Spikes Support Reinforcing Rods

Reinforcing rods for a concrete floor that is poured over a wooden subfloor can be supported at the proper height by spikes. First, chalk lines are run on the subfloor to indicate positions of the rods, and then the spikes are cross-driven over them at intervals as indicated.

☐ An old toothbrush, with all except the first three rows of bristles trimmed off, makes an excellent comb cleaner.

Signal Automatically Indicates Mail Delivery

Set manually each time you remove mail from a rural-type mailbox, this signal automatically drops when the postman opens the box. In the closed position, the arm is raised out of sight behind the box. The simple operating mechanism consists of a small rod, 1 in. longer than the box, supported by two eyebolts in the top of the box. When the door of the box is closed, it pushes the rod through the back of the box to support the arm in the upright position. When the door is opened, an expansion spring pushes on a washer held in place on



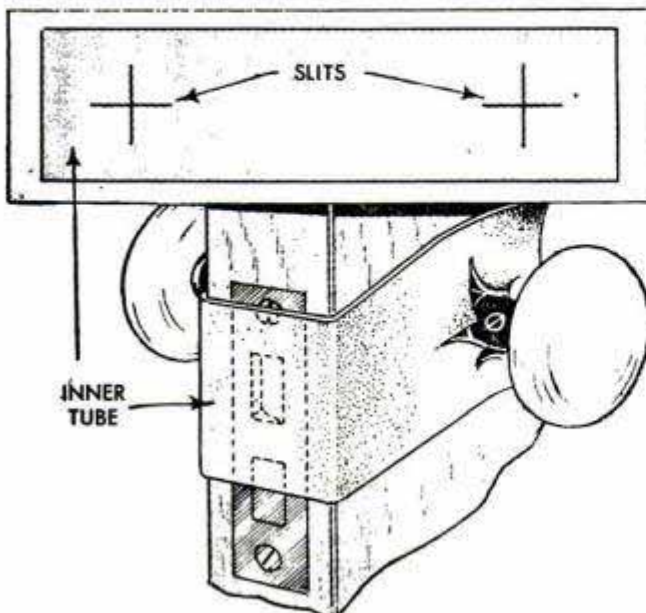
the rod by means of a cotter pin, moving the rod forward and allowing the arm to drop.—W. S. Head, El Cajon, Calif.

Success With New Nursery Stock Depends on Proper Care

When young trees or plants arrive from the nursery, there are several important factors to be understood if they are to flourish. Should the trees or plants arrive frozen in their package, do not open. Place the package in the cellar or other cool, protected place, or cover heavily with earth until they have thawed, after which they may be planted safely. Do not plant if the surface of the ground is thawed, but still frozen at root level. Do not pamper young stock planted in the fall with any kind of protective covering. Many make the mistake of wrapping burlap, straw or corn stalks around the young trees, and are surprised in the spring to find the trees dead.

Young trees, even the peach, generally can withstand temperatures as low as 30 deg. below zero when dormant, but will freeze in much higher temperatures if not entirely dormant. Where a protective covering is used, the trees take longer to enter the period of dormancy than do unprotected trees. Thus a sudden freeze may catch protected trees before dormancy and kill them. Avoid late cultivation and fertilization that may stimulate the young stock to put out new growth which will retard dormancy. Should frosts be sharp and frequent in early spring, hold off fertilizing or cultivating, for a sudden cold snap may destroy or damage the stimulated trees.

Rubber Shield Prevents Door From Locking Unexpectedly



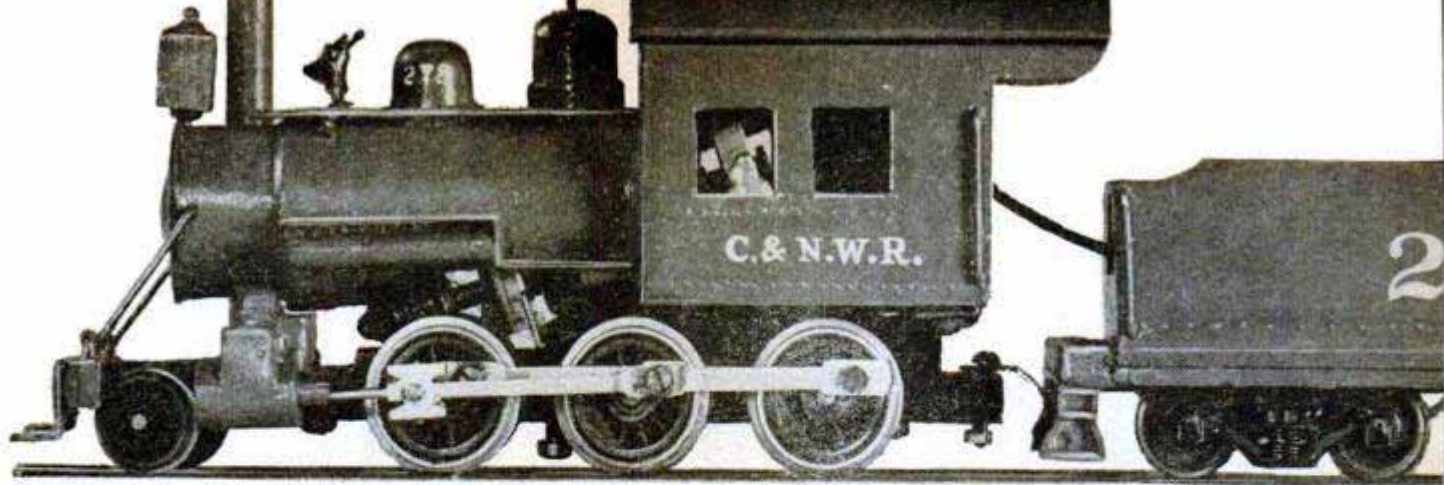
Used in some hospitals to prevent bed-ridden patients from being locked in their rooms accidentally, this shield, which is cut from an inner tube, also can be used around the home. It will keep children from locking themselves in the bathroom, and prevent doors from being locked when slammed by a gust of wind.

Jeanne Stasack, Chicago.

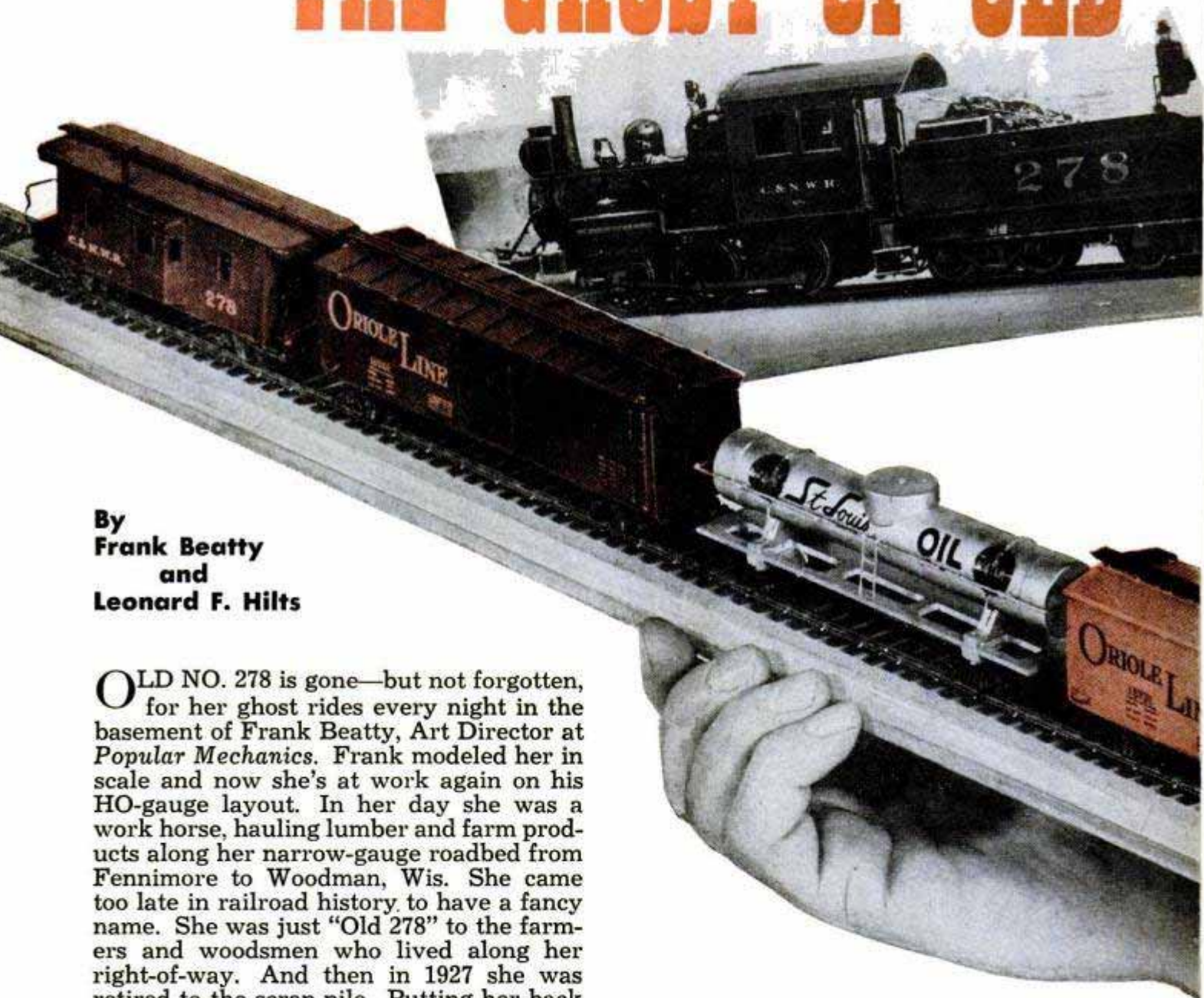
Nail Substitutes for Drill

If a twist drill of the correct size is not at hand for making pilot nail holes in hardwood, a substitute can be improvised from one of the nails. Clip the head from the nail and file the burrs from the clipped end to keep it from wobbling in the chuck. Use this as you would any standard drill.

Martin Mantell, Hazleton, Pa.



THE GHOST OF OLD

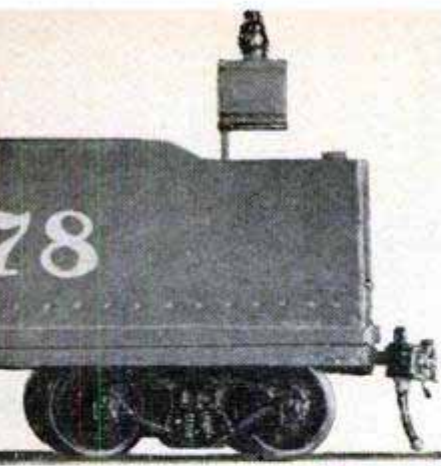


By
Frank Beatty
 and
Leonard F. Hilts

OLD NO. 278 is gone—but not forgotten, for her ghost rides every night in the basement of Frank Beatty, Art Director at *Popular Mechanics*. Frank modeled her in scale and now she's at work again on his HO-gauge layout. In her day she was a work horse, hauling lumber and farm products along her narrow-gauge roadbed from Fennimore to Woodman, Wis. She came too late in railroad history to have a fancy name. She was just "Old 278" to the farmers and woodsmen who lived along her right-of-way. And then in 1927 she was retired to the scrap pile. Putting her back on the "high iron" cost about \$16 and three weeks of spare-time work.

Main frame: To model Old 278, start with the main frame cut according to the full-size, side-view pattern from $\frac{7}{16} \times \frac{7}{16} \times 3\frac{1}{16}$ -in. channel brass. A wedge-shaped

Built in 1915, No. 278 was a narrow-gauge coal-burning locomotive modeled after a similar type of engine which had been operating for some years on Eastern railroads. The line from Fennimore to Woodman, Wis., over which she operated, was abandoned by the C. & N. W. No. 278 was scrapped in 1927



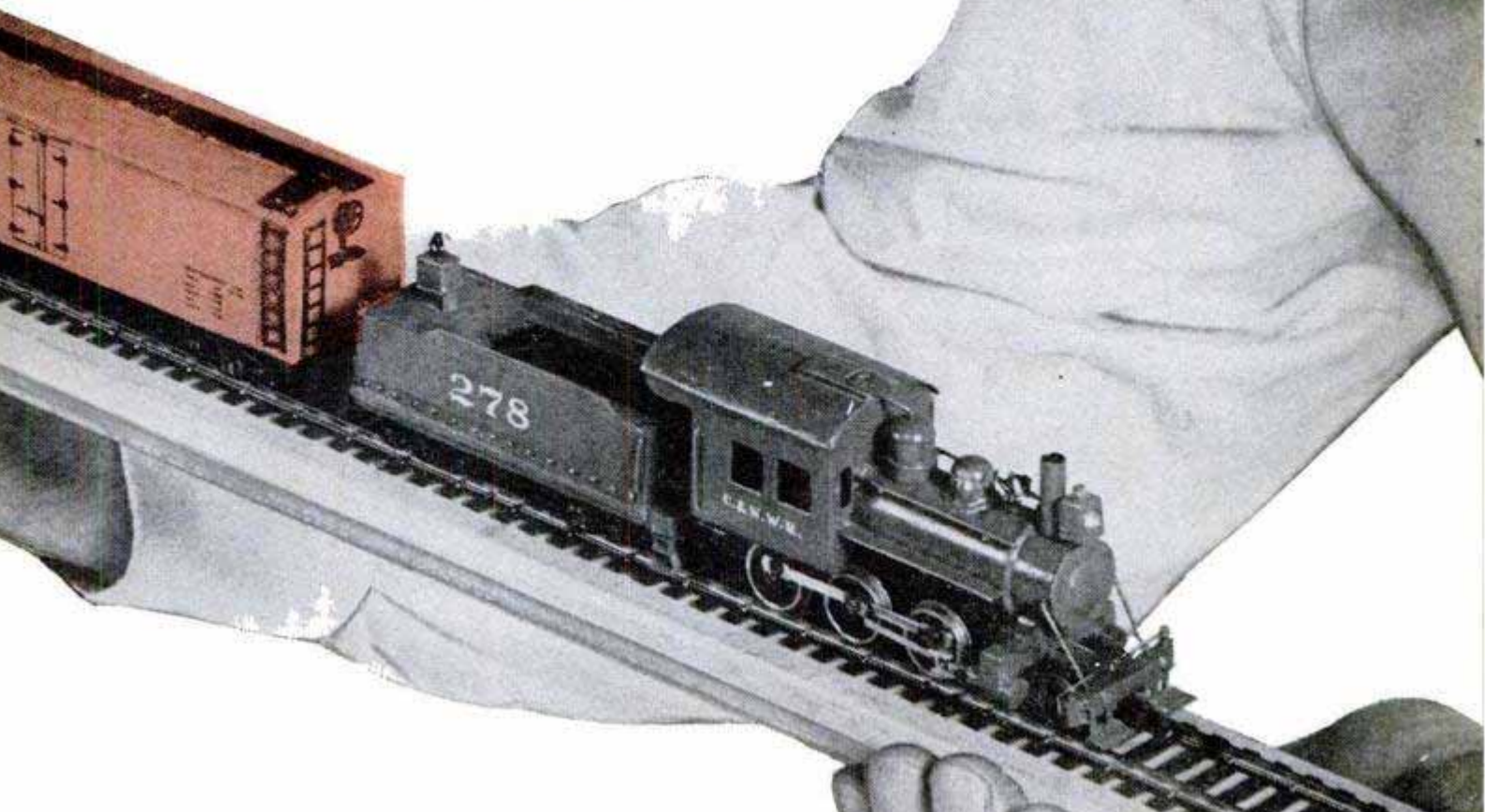
WIM
Book for
Boys

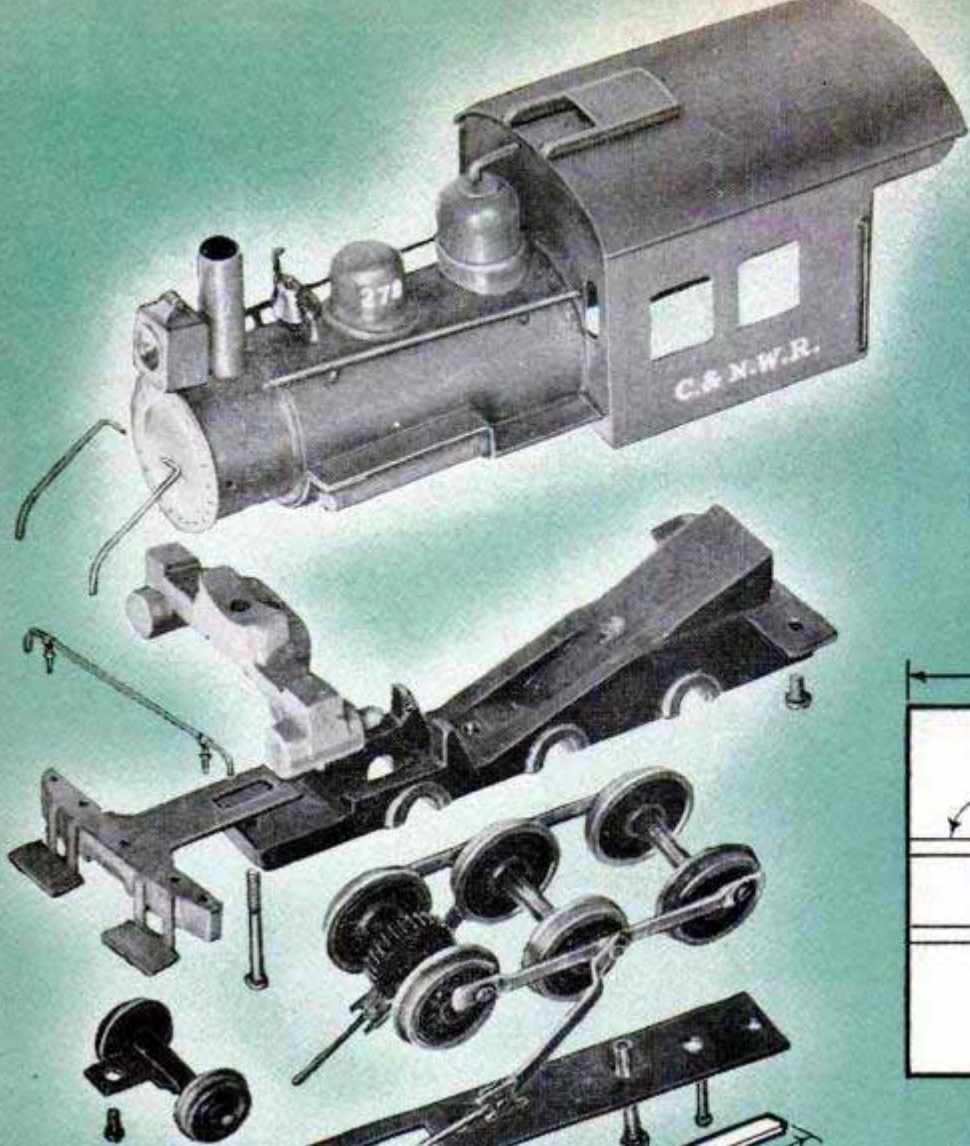
Build this HO-gauge scale model of an historic Chicago and Northwestern R.R. locomotive for your layout. Full-size engine and tender plans are in this issue. Scale drawings for the cars will appear next month

No. 278

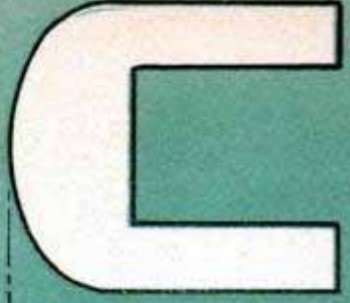
wooden block, which is included in the side-view pattern, is fitted into the channel brass to complete the motor mount. Including this block, the main frame is $\frac{3}{4}$ in. high. The axles float in grooves cut across the bottom of the main frame, and one half of a $\frac{5}{16}$ -in. washer is soldered over each axle opening. A $\frac{3}{16} \times \frac{9}{16}$ -in. opening is cut into the frame over the front axle to clear the gear wheel. As shown, a $\frac{1}{4} \times 1\frac{1}{16}$ -in. sheet-brass cab-mounting plate is cut at the back of the main frame. (All sheet brass used is 24 or 26 ga., half-hard.) A $\frac{7}{16} \times 2\frac{7}{8}$ -in. bottom plate is cut from sheet brass and drilled for screws as shown. The motor-mounting screw passes through the frame and threads into the motor. The hole at the back of the bottom plate takes an 0-80 nut and bolt which joins the engine to the pulling bar. The three remaining holes take 2-56 screws which are tapped into the main frame. The drive wheels are mounted in their slots with the insulated wheels on the left side and are held in place by the bottom plate.

Front-end assembly: The cylinder block is machined from solid brass, $\frac{7}{16} \times \frac{1}{2} \times 1\frac{3}{8}$ in., following the layout in the plans. The cylinder heads, of $\frac{1}{4}$ -in. brass rod, $\frac{3}{8}$ in. long,

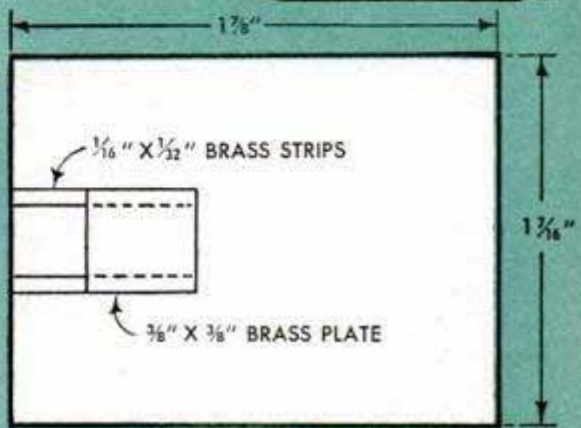
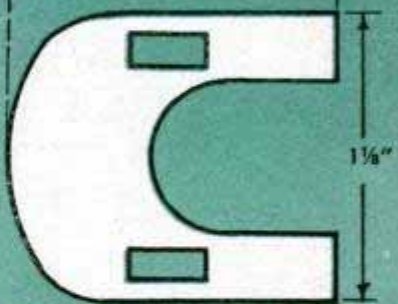




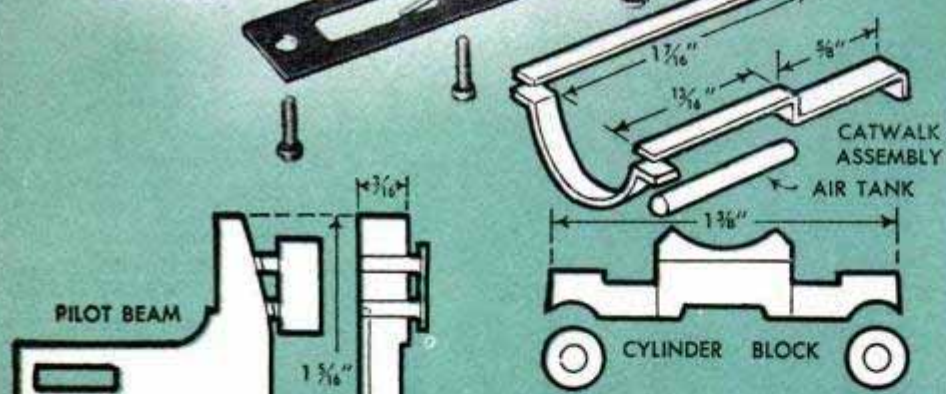
CAB BACK



CAB FRONT

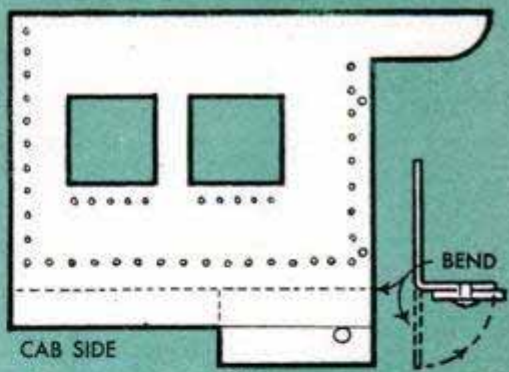


CAB ROOF

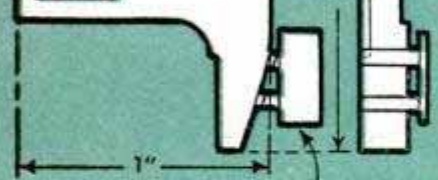


CATWALK ASSEMBLY

CYLINDER BLOCK



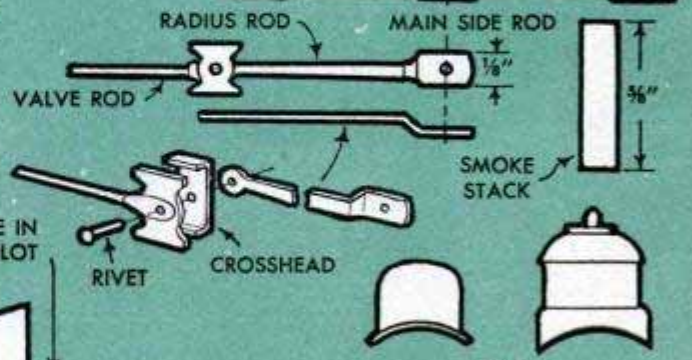
CAB SIDE



PILOT BEAM



WOODEN BLOCK



RADIUS ROD

MAIN SIDE ROD

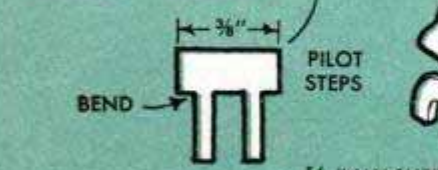
VALVE ROD

SMOKE STACK

RIVET

CROSSHEAD

DOMES



PILOT STEPS

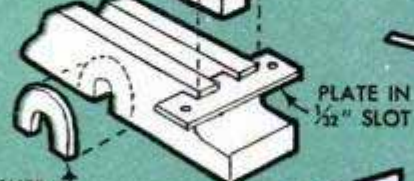
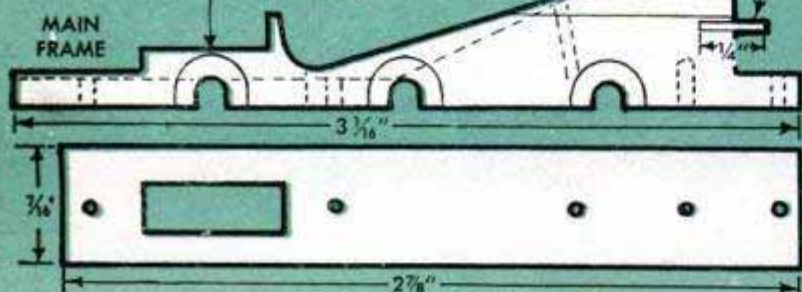
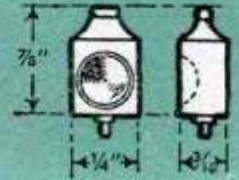


PLATE IN 1/32" SLOT

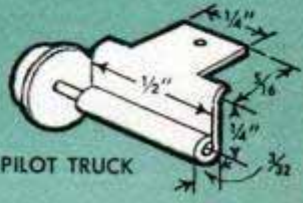
3/16" WASHER SOLDERED



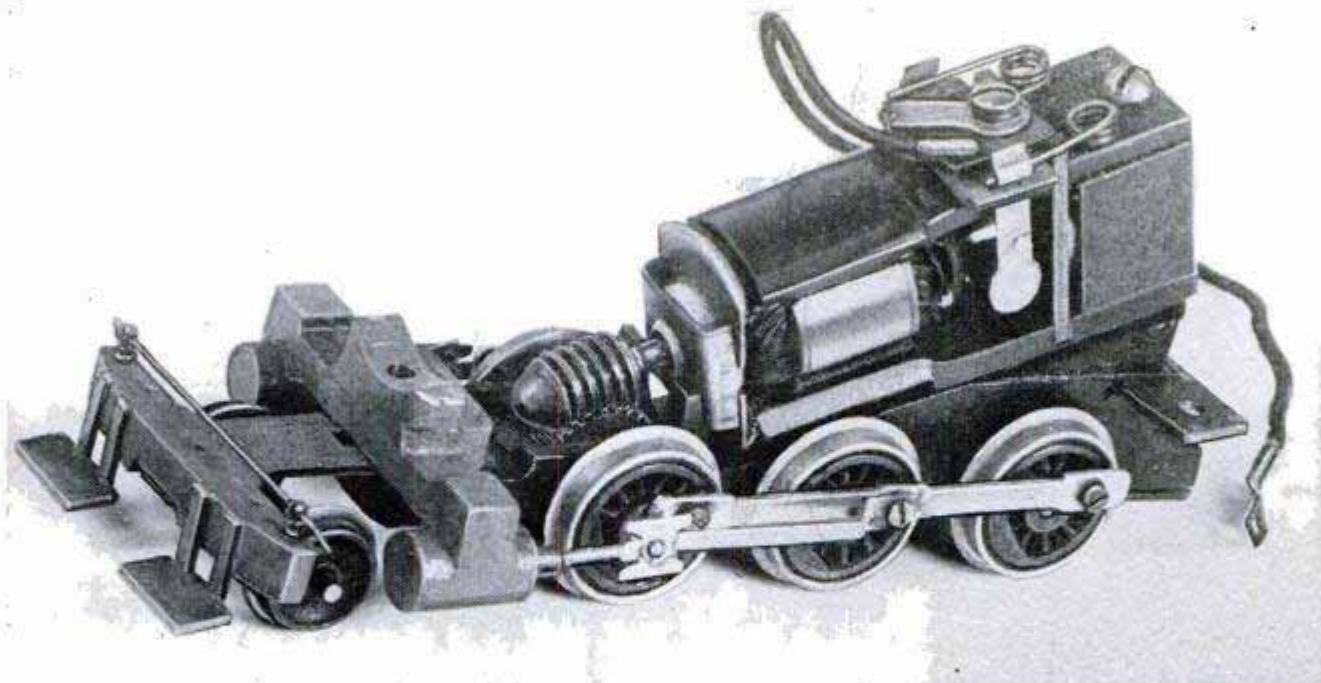
MAIN FRAME



HEADLIGHT



PILOT TRUCK



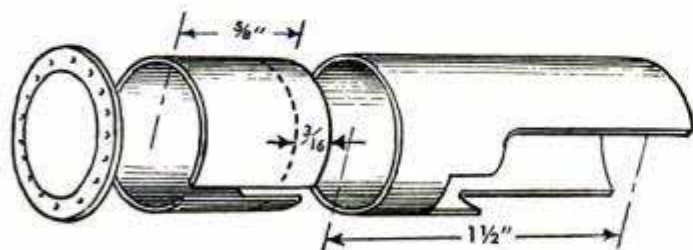
are drilled to receive $\frac{1}{16}$ -in. i.d. tubing, which projects from the head about $\frac{1}{8}$ in. The cylinder heads are then soldered to the cylinder block. Next the pilot beam is shaped from $\frac{3}{16} \times \frac{3}{16} \times 1\frac{5}{16}$ -in. brass, with a notch in the top for the sheet-brass pilot-beam bracket and one in the bottom for the pilot-truck mount. The pilot steps are cut from sheet brass, bent and soldered to the beam. The pilot truck is held in place with an 0-80 screw. The pilot beam is drilled at this time, photo detail on opposite page, for the handrail and the two braces which run to the boiler. To assemble the front end, a long 2-56 screw is put through the front of the main frame, the pilot-beam bracket, the cylinder block and tapped into a hole in the boiler. For rigidity, an 0-80 screw can be tapped down through the back of the cylinder block into the main frame.

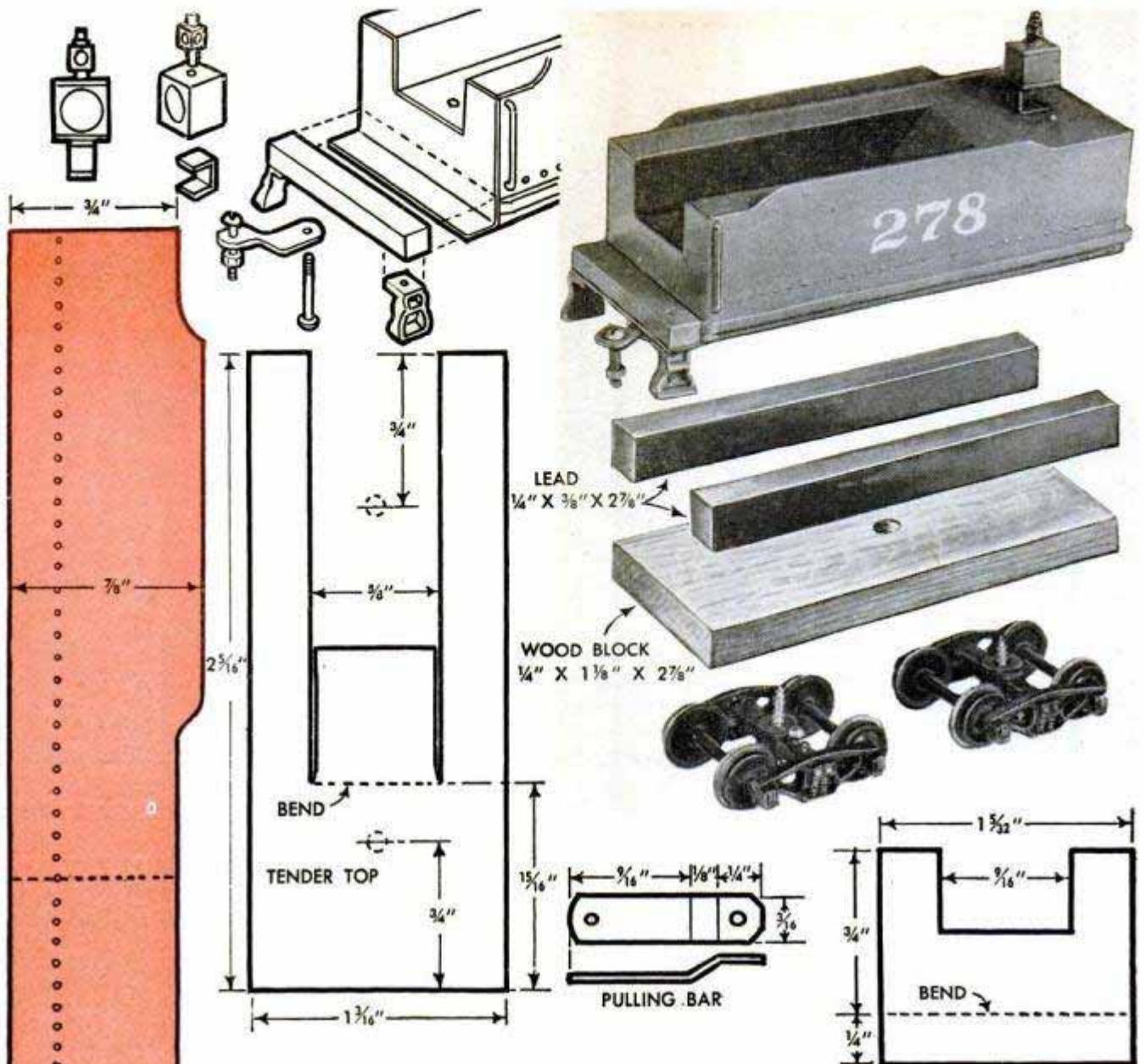
Mounting the motor: The motor is laid on the main frame so that its gear meshes with the drive-wheel gear. It is secured in place by the screw through the frame ahead of the rear axle. Now the engine should be test run. If the worm gear is too tight, the

screw under the front of the motor should be turned in. This will raise the motor and relieve the friction.

Boiler: The large section of the boiler is $\frac{3}{4}$ -in. brass tubing, $1\frac{1}{2}$ in. long. The small section is the same tubing, $\frac{5}{8}$ in. long, slit lengthwise to permit it to be fitted inside the larger section with a $\frac{1}{16}$ -in. overlap. The joining surfaces are tinned and sweat soldered. The boiler front is a circle of sheet brass $\frac{3}{4}$ in. in diameter. To make it convex, place over a $\frac{7}{16}$ -in. bolt hole and tap with a ball-peen hammer. The rivets in it are simulated by denting it from the inside with a center punch. The boiler fittings are put on after cab is joined to the boiler.

Engine cab: Using the full-size templates, cut the sides and roof from sheet brass. Bend the lower edges of the side panels as shown and solder a piece of brass to the bent section to increase its thickness so that it can be tapped for a 1-72 screw. Place the "rivets" in the cab sides and then solder the four side panels together and curve the roof over them. Block up the boiler and cab and solder them together.





Boiler fittings: The domes may be purchased from any model-supply house, and are held in place by small screws from the inside of the boiler. The bell-and-hanger assembly is purchased and screwed into a tapped hole. The stack is $\frac{1}{8}$ -in. i.d. brass tubing, $\frac{5}{8}$ in. long, soldered in place. The head lamp may be purchased or made as shown. Weight should be added to the engine now by pouring molten solder or type lead into the front of the boiler and under the front of the cab roof. The motor must not contact this lead or a short will result. Now the catwalks are made from sheet brass and soldered to a brass strap which runs under the boiler. This assembly is soldered to the boiler, and the air tank, a $1\frac{3}{16}$ -in. length of $\frac{1}{8}$ -in. brass rod, is attached under the left walk. The piano-wire handrails and braces are added after the superstructure is mounted on the frame.

Drive-wheel linkage: Parts should be of German silver or aluminum. The radius rod, valve rod and crosshead link are purchased already assembled. The main side rods are $1\frac{13}{16}$ in. long and are screwed to the drive wheels at a point opposite the balance weights. The radius rods are attached to the drive wheels by the same screw. Care must be taken to see that the linkage works smoothly.

The tender: Exploded details show construction of tender. Type-lead strips are screwed to a wooden floor, after which the sides are cut from sheet brass, using the full-size template, and wrapped around the under assembly. Small pins driven through the brass sides into the wooden floor secure the sides and also show as rivets. The tender top is soldered in position with the center bent down to the floor. The

Material List

Locomotive

- 1 d.c.-60 motor
- 1 pr. 48" drive wheels, geared
- 2 pr. 48" drive wheels, ungeared
- 1 pr. standard car wheels
- 1 pc. channel brass, 7/16" x 7/16" x 3-1/16"
- 6 5/16" washers
- 1 wooden block, 1/2" x 1/2" x 1-5/16"
- 3/4" i.d. brass tubing, 2" long
- 1/8" i.d. brass tubing, 5/8" long
- 1/16" i.d. brass tubing, 1/2" long
- 6" piano wire
- 1 pc. solid brass, 3/16" x 3/16" x 1-5/16"
- 1 pc. solid brass, 3/16" x 1/2" x 1 3/8"
- 7 2-56 screws
- 2 1-72 screws
- 3 0-80 screws
- 1 0-80 nut and bolt
- 1 bell-and-frame assembly
- 2 engine domes
- 1 headlight
- 2 handrail posts
- 1/4" brass rod, 3/4" long

Sheet brass for engine and tender, 24 or 26 ga.

Tender

- 2 lead blocks, 1/4" x 3/8" x 2 7/8"
- 1 wooden block, 1/2" x 1 1/8" x 2 7/8"
- 1 wooden block, 1/8" x 3/8" x 1-5/32"
- 2 4-wheel trucks
- 2 brass blocks, 3/16" x 3/16" x 1"
- 1 light
- 1 pr. steps
- 1 HO-gauge coupler

tender front, shown in the lower-right-hand corner of the detail, is cut and bent, and the wooden platform is glued into the bend. The tender steps, which are bought, are attached, and the front assembly is then soldered in place. A small strip of brass is soldered around the body of the tender below the rivets to add more detail. Two truck bolsters, which are brass pieces 1/8 x 3/16 x 1 in. tapered at the ends, are now located across the bottom of the tender, 3/4 in. on center from either end. The trucks are screwed to these. The rear coupler is purchased, while the pulling bar is cut from sheet brass. The motor lead wire passes through the tender floor and is screwed to the front truck. Note that the insulated wheels of the tender are on the right side. Handrails, a ladder and the back-up lamp are now put on and the engine and tender painted a standard black.

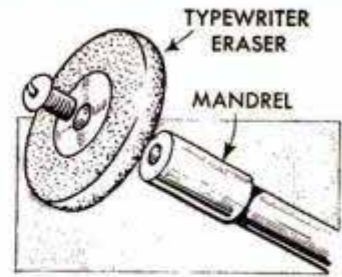
Next Month: Full-size plans for four cars, No. 278's rolling stock, will be shown. ★★

Plans—SS United States

Complete plans, consisting of three large sheets, and a kit containing all tiny fittings for the 36-in. model of the SS *United States* now are available. These may be obtained by sending \$1.50 for the plans and \$15.50 for the kit to the Popular Mechanics Book Dept., 200 E. Ontario St., Chicago 11.

Burnishing Wheel for Hand Grinder

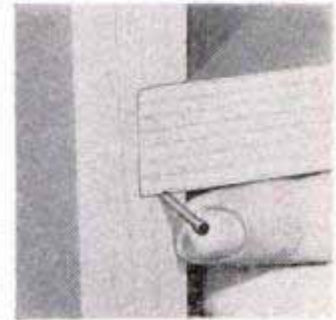
By placing a typewriter eraser on a mandrel as indicated, one metalworking craftsman makes a burnishing wheel for use in his portable electric grinder. The erasers come in four grades and may be used over and over again without appreciable wear.



John A. Comstock, Wellsboro, Pa.

Nail in Groove Anchors Shelves

To anchor a shelf securely in a grooved side panel, drive a finishing nail between the shelf and the side of the groove, as indicated in the photo. The nail is driven straight into the groove and grips both pieces of wood, thus bracing them against side stresses.



R. F. Donovan, Guttenberg, N. J.

Oil Barrier Stops Slugs and Snails

While tin cans and waxed cartons pressed into the soft earth around small plants have proven effective in keeping out most crawling insects, they present no barrier to slugs and snails. However, if a 1/2-in. band of heavy oil or grease is spread around the rim of the can or carton, neither snails nor worms will cross it.

Clinton Hull, Costa Mesa, Calif.

Cans Protect Campfire Stakes From Spreading Flames

To prevent a campfire from burning stakes that support cooking utensils, use cans to shield the lower ends as shown. After punching holes in the bottoms of the cans, invert them and force stakes through the holes and into the ground. However,

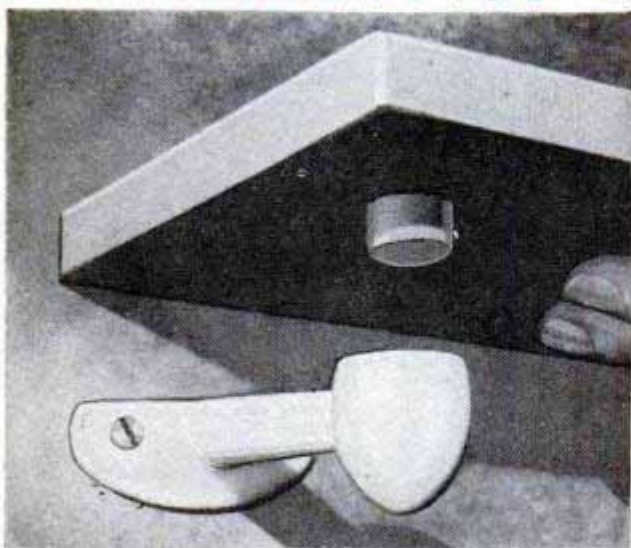


if the ground is rocky or partly frozen, set the stakes inside large cans which are filled with rocks to hold them upright.

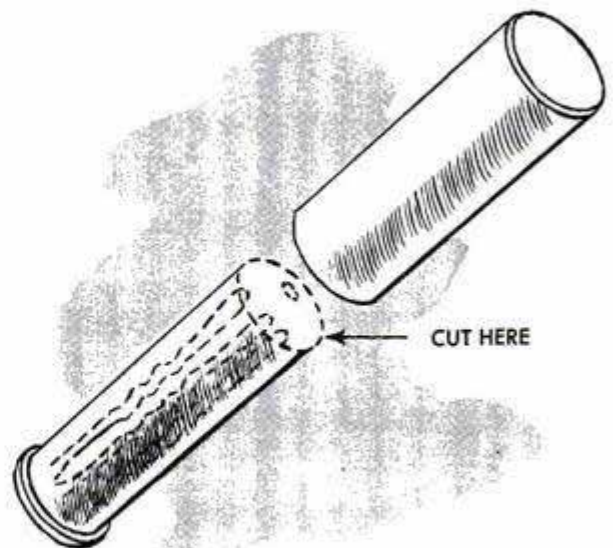
Solving HOME PROBLEMS



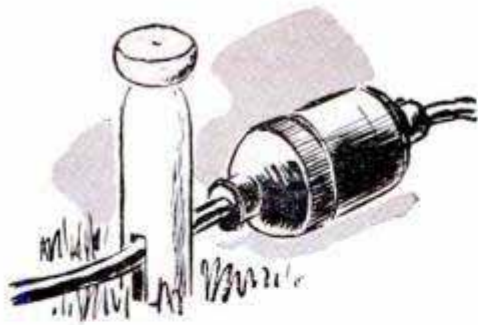
CROQUET STAKES that must be taken up after each game can be reset quickly if they are drilled to receive a $\frac{3}{8}$ -in. pointed dowel. With this sharp end, they may be quickly pushed into the ground



NEAT, BATHROOM-SHELF brackets can be made from plastic towel-rod holders. Trim the inside of the base flat and attach the shelf with dowel stubs



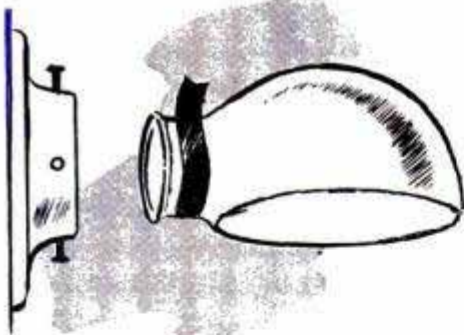
A WORN-OUT POCKET inhaler can be converted to a bobby-pin case by cutting off the rounded top, as indicated above, and dressing the edges with a file



CLOTHESPIN driven across an electric cord near the socket will prevent disconnections while using an electric lawn mower or when vacuuming the car



SHAVING BRUSHES dry best when hung with bristles down. Suction cup screwed to handle allows brush to be hung out of the way under shelf when drying

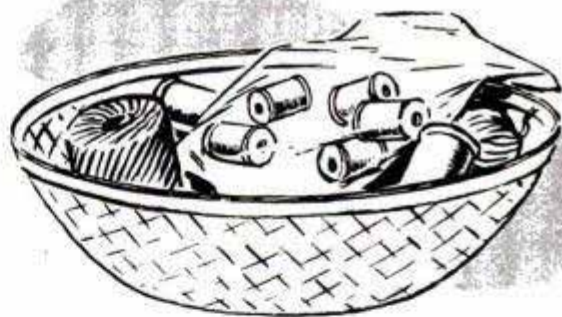


WHEN VIBRATION tends to loosen set-screws on heavy glass shades, a piece of rubber tape will hold them secure



ALUMINUM AND OTHER metal trim on kitchen cabinets won't stain clothes brushed against it if given two coats of thinned white shellac

SCREEN-DOOR PULL hangs broom from wall to keep bristles straight in storage. Mounted at angle, pull bears against opposite sides of handle to support weight of broom

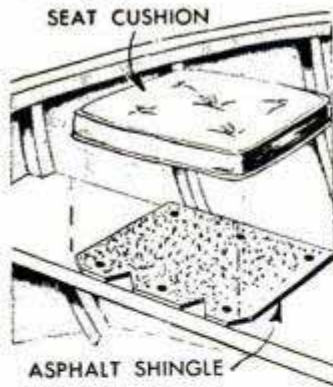


SMALL, TRANSPARENT plastic bags are fine containers for spools of thread in a sewing basket. Thread colors are visible for easy selection and spools have no space in which to unwind

WHEN WINDING newly purchased yarn into a ball, use wrapper in which it comes as a core. When it is necessary to reorder, you will have all of the color and weight specifications right at hand



Shingle Anchors Boat-Seat Pad



To prevent a rowboat seat cushion from sliding about or falling to the bottom, tack an asphalt shingle to the wooden boat seat with the rough surface up. If the seat is made of metal, so that the shingle cannot be tacked in place,

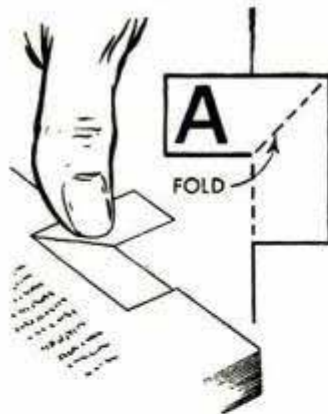
the cushion may be secured by attaching to it cloth ties or leather straps with buckles to be fastened under the seat.

Lawn-Party Ash Trays From Coffee Cans

To protect your neatly trimmed lawn from being littered with cigarette butts at your next lawn party, provide the guests with sand-filled ash trays. Collect a number of 1-lb. coffee cans, give them a coat of bright enamel to blend in with the colors of your other trimmings and decorate them with decals. Then fill them with fine sand. They will be eye-catching enough to remind your guests to use them.

Jack Ferrari, Milwaukee, Wis.

Tab Formed Out of Page Margin Serves as Bookmark



To mark a page of a book or magazine for future reference, simply tear or cut the margin, fold and press flat as indicated to form a projecting tab. If the tab is to be used quite often, it should be pasted flat. Similar tabs marked with letters of the alphabet

or numbers can be provided in the same way for catalogues and directories.

Carl S. Bates, Chicago.

Inch Scale on Bench Saves Time

A scale in inches marked on your workbench top near one edge provides a "ruler" that is always at hand. Use India ink and lay out the scale in the desired divisions of an inch. Two coats of shellac will protect the markings. If the wood of the bench is dark, paint a white strip on which to draw the scale, and then coat with shellac.

★ FLOOR FAN

Want to do something about the hot weather that is coming? It's easy. Relax and serve cold drinks around this end table with the built-in breeze

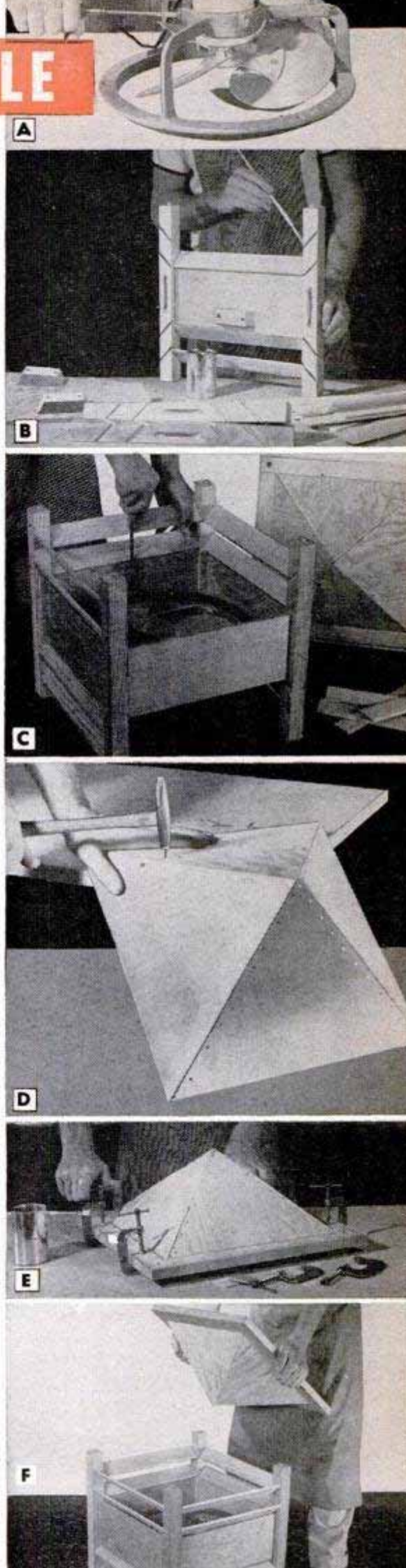
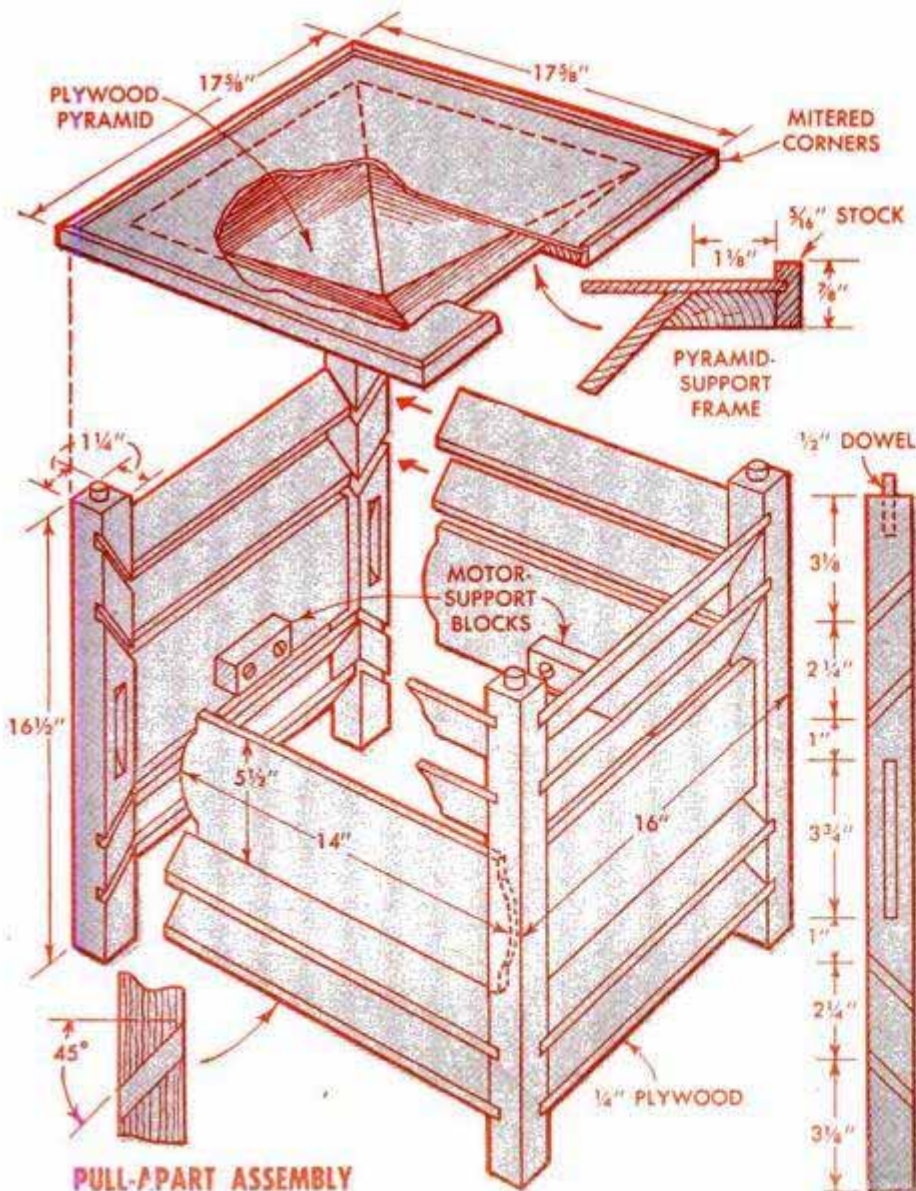


By Bertram Brownold

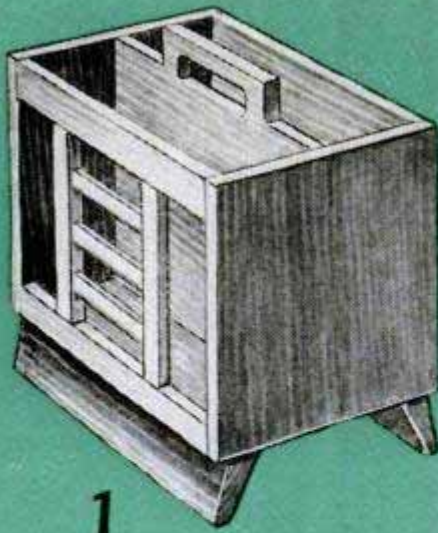
WITH ALL ITS advantages of good air movement, the circulating floor fan is still an extra piece of furniture in a sometimes overcrowded living room. If this is the case in your home, let the fan do double duty by building it into an occasional table. The fan motor is mounted on a standard 14-in. bracket, detail A, that can be purchased at most electrical-supply stores. The table, exclusive of a pyramid-shaped air deflector, is made of 25 parts; 4 legs, 4 side pieces, 16 louver slats and the top. The dimensions for these parts are shown in the pull-apart diagram, and they are assembled with glue. After legs have been grooved and slats and side pieces cut to size, two sides are assembled, detail B. The motor-support blocks, in addition to being glued, are screwed to the side pieces. The two assembled sides are now joined together with the remaining side pieces and slats. The motor bracket is then installed, motor down and fan blades up. Holes are drilled in the frame of the motor bracket so that it may be screwed to these support blocks. The last items to be assembled are the table top and the deflecting pyramid. The latter consists of four plywood triangles, each having a base of 14 in. and a height of 9 in. The sides are beveled so they fit together smoothly when assembled and wire nails

DOUBLES AS END TABLE

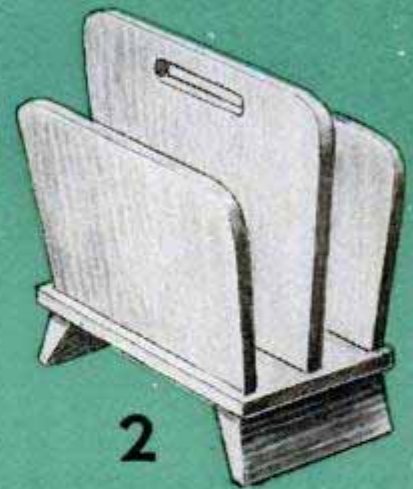
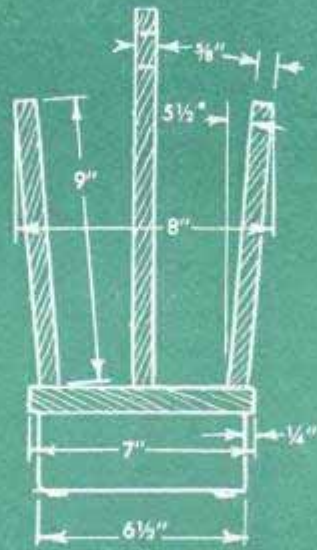
are used to join them. The table top is a square of $\frac{1}{4}$ -in. plywood, the edges of which are glued in grooves cut in four edging strips that are mitered at the corners. A frame that fits inside the edging to support the pyramid, as shown in the pull-apart detail, is glued to the underside of the table top along with the pyramid, detail E. The assembled top section is doweled and glued to the legs, as shown in detail F. A switch for the fan is attached to the outside of the cabinet. Much of the final appearance of the table depends on the type of wood used and the way in which it is finished. If you want it as a piece of living room furniture, the top should be made of plywood faced with one of the hardwoods such as mahogany or walnut. The side panels can be made of the same material, but the louver slats should be of solid wood, because the edge grain is visible. In this case, the louvers and the legs should be stained to match the top as closely as possible. Another method of finishing the table is to use one of the new plastic laminates to cover all surfaces. In this way, the table could be made of the most common woods and yet be given an "expensive" look, since the laminates are available in many rare and unusual wood grains. ★ ★ ★



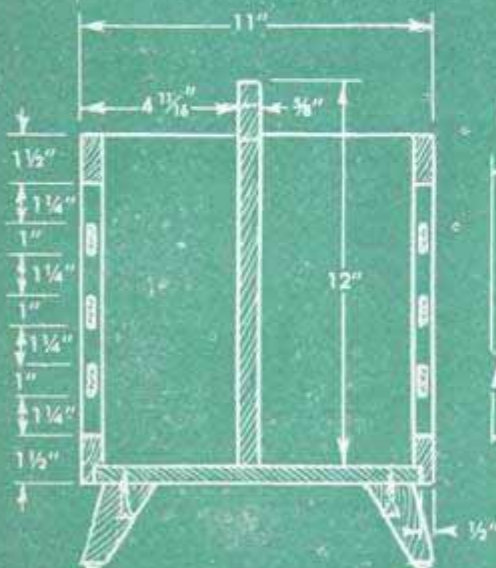
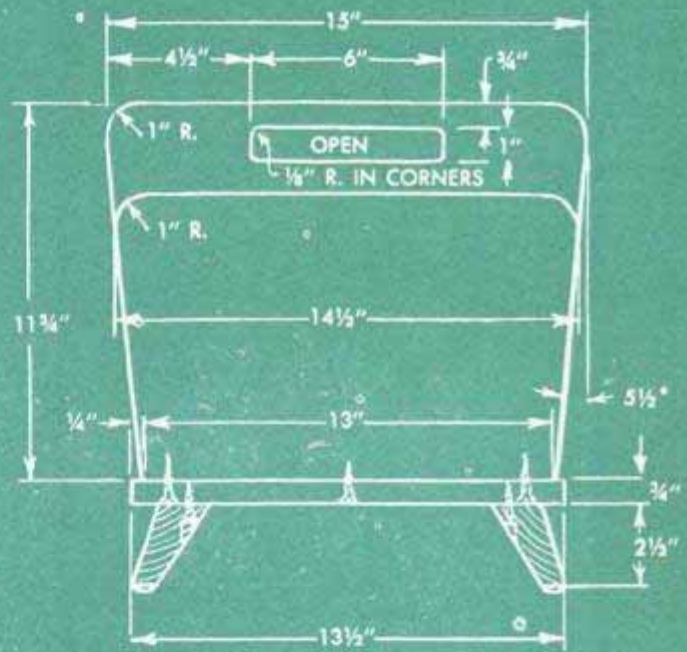
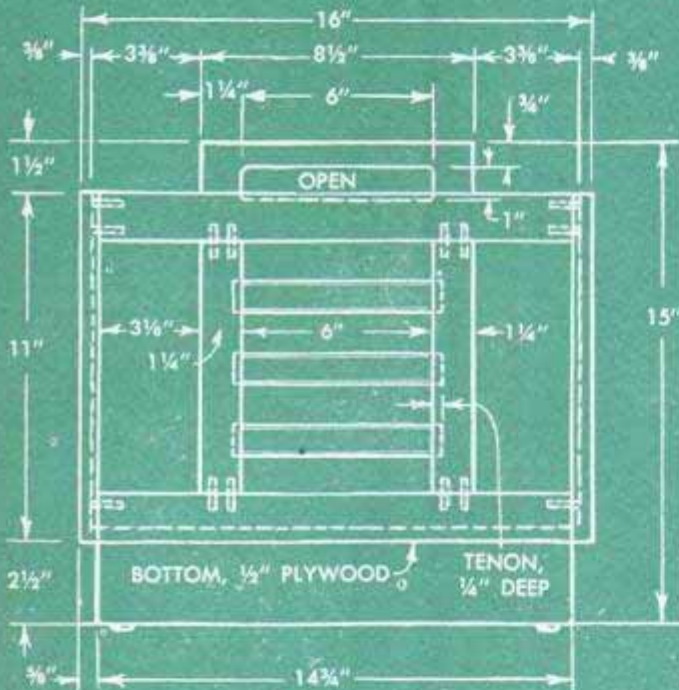
PLAN of the MONTH...



1



2



DETAIL OF LEG



POSTS ARE MORTISED $\frac{1}{4}$ " DEEP TO RECEIVE ENDS OF SLATS. POSTS, RAILS AND ENDS ARE JOINED WITH $\frac{3}{16}$ " DOWELS. ENDS ARE GROOVED FOR CENTER DIVIDER. ALL JOINTS ARE GLUED.

To fill the need in practically any modern interior, furniture designer John Bergen this month presents these attractive magazine stands, one of which is combined with a small table mounted on angled supports. Stand No. 1 has plywood ends and center partition, with one or both sides slatted as shown. The simplest of the stands, No. 2, features finlike sides and a center partition secured with glue and screws to a plywood base. Upright supports for the combination stand-table, No. 3, are attached to the base and top frame with half-lap joints. Mitered joints of the top frame are reinforced with wooden splines, while crossrails are joined to uprights with $\frac{1}{4}$ -in. dowels. Note that the edges of the plywood top are rabbeted to fit rabbeted edges of the frame. The bottom fits a groove cut in the lower front crossrail of the base and also a rabbeted edge cut in the bottom crossrail at the base of the uprights. Lacing is done with cotton twine

Magazine Stands *Modern Furniture*

MATERIAL LISTS

Plywood

- 2 pcs.— $\frac{5}{8}$ " x 11" x 11"—Ends
 1 pc.— $\frac{5}{8}$ " x 12" x 15 $\frac{1}{4}$ "—Center partition
 1 pc.— $\frac{1}{2}$ " x 10 $\frac{1}{4}$ " x 14 $\frac{3}{4}$ "—Bottom

Lumber

- 4 pcs.— $\frac{5}{8}$ " x 11 $\frac{1}{2}$ " x 14 $\frac{3}{4}$ "—Top and bottom rails
 4 pcs.— $\frac{5}{8}$ " x 11 $\frac{1}{4}$ " x 8"—Uprights
 6 pcs.— $\frac{1}{4}$ " x 1" x 6 $\frac{1}{2}$ "—Slats
 2 pcs.—1 $\frac{1}{2}$ " x 3" x 14 $\frac{3}{4}$ "—Feet

Miscellaneous

- 3 $\frac{1}{16}$ "-dia. dowel
 4 $\frac{5}{8}$ "-dia. glides

Plywood

- 2 pcs.— $\frac{5}{8}$ " x 14 $\frac{1}{2}$ " x 9"—Sides
 1 pc.— $\frac{5}{8}$ " x 15" x 11 $\frac{3}{4}$ "—Center partition
 1 pc.— $\frac{3}{4}$ " x 7" x 13 $\frac{1}{2}$ "—Bottom

Lumber

- 2 pcs.—1 $\frac{1}{2}$ " x 3" x 6 $\frac{1}{2}$ "—Feet

Miscellaneous

- 4 $\frac{5}{8}$ "-dia. glides
 13—# 10-1 $\frac{1}{4}$ " flat-head wood screws

Plywood

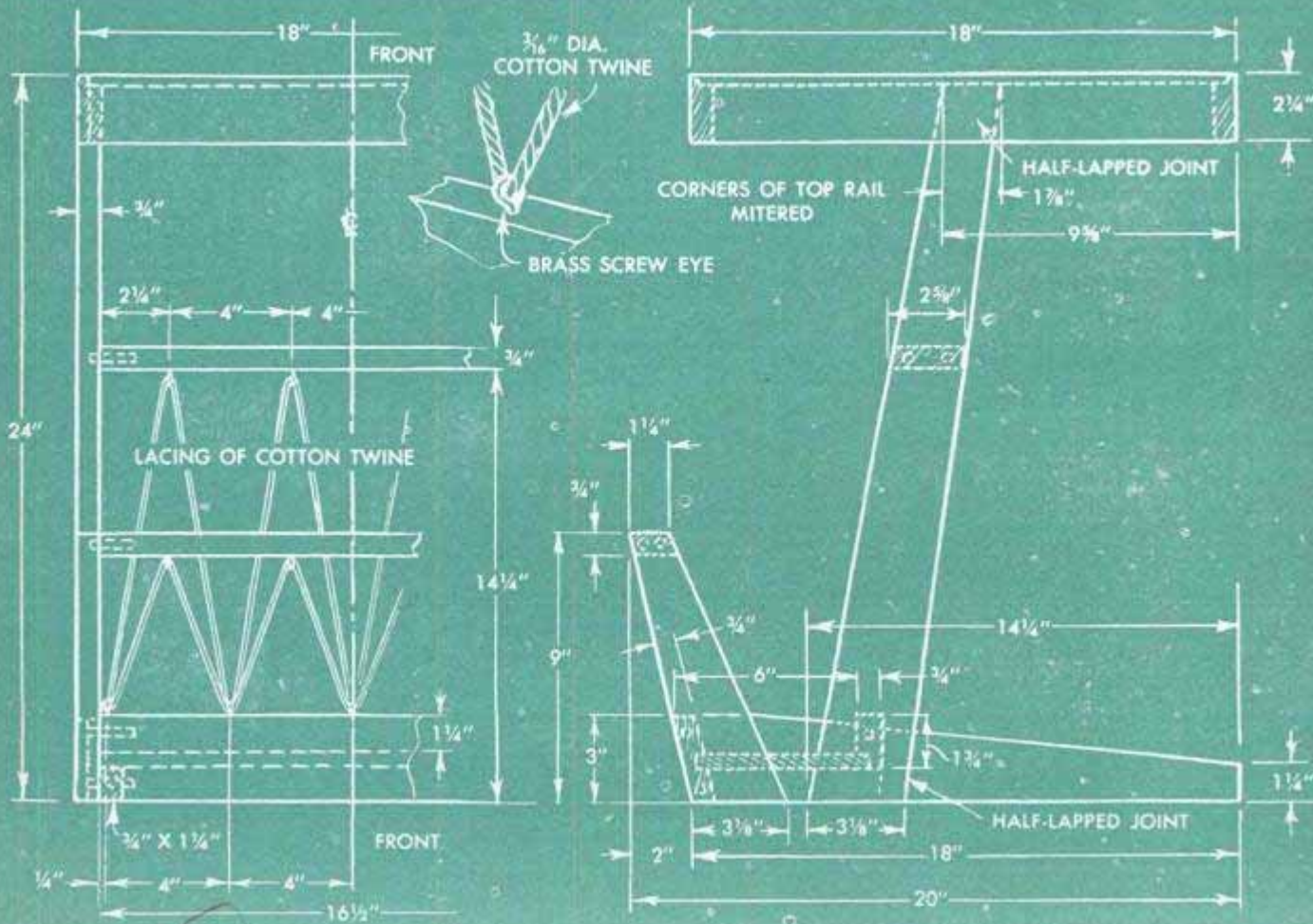
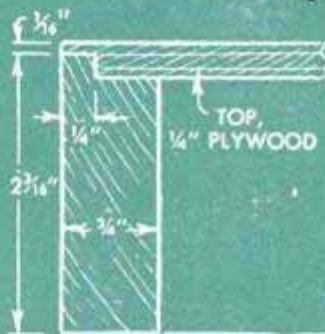
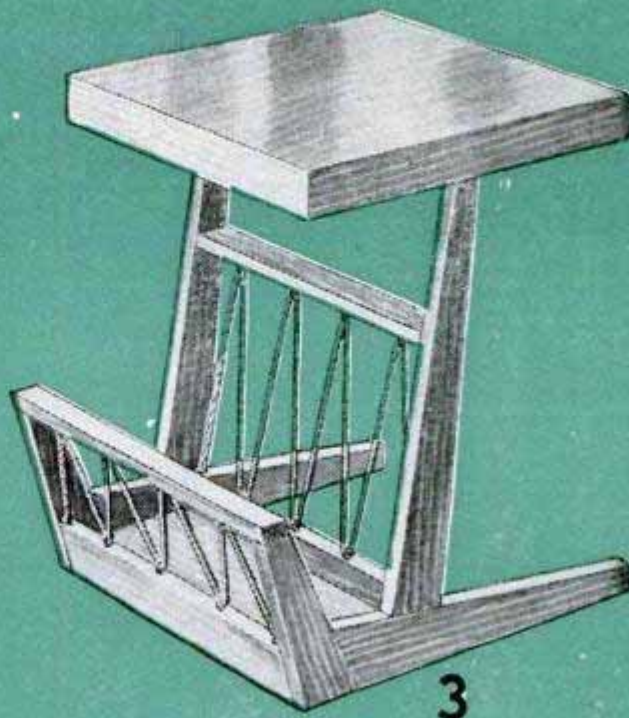
- 1 pc.— $\frac{1}{4}$ " x 18 $\frac{1}{8}$ " x 18 $\frac{1}{8}$ "—Top
 1 pc.— $\frac{1}{2}$ " x 4 $\frac{5}{8}$ " x 16 $\frac{1}{2}$ "—Bottom

Lumber

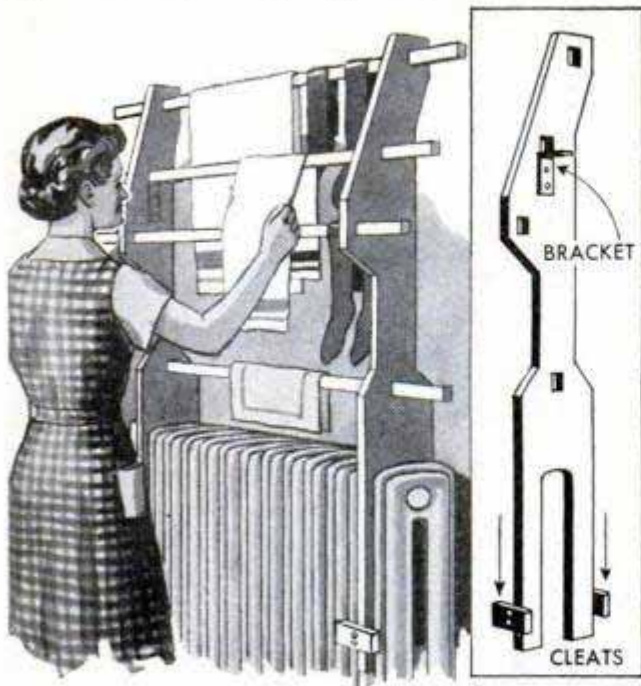
- 4 pcs.— $\frac{3}{4}$ " x 2- $\frac{3}{16}$ " x 18"—Top rail
 2 pcs.— $\frac{3}{4}$ " x 3 $\frac{1}{8}$ " x 24 $\frac{1}{2}$ "—Center uprights
 2 pcs.— $\frac{3}{4}$ " x 3 $\frac{1}{8}$ " x 9 $\frac{7}{8}$ "—Front uprights
 1 pc.— $\frac{3}{4}$ " x 2 $\frac{5}{8}$ " x 16 $\frac{1}{2}$ "—Top crossrail
 1 pc.— $\frac{3}{4}$ " x 1 $\frac{3}{4}$ " x 16 $\frac{1}{2}$ "—Bottom crossrail
 1 pc.— $\frac{3}{4}$ " x 3 $\frac{1}{4}$ " x 16 $\frac{1}{2}$ "—Bottom front crossrail
 2 pcs.— $\frac{3}{4}$ " x 3" x 16 $\frac{1}{8}$ "—Side bases
 1 pc.— $\frac{3}{4}$ " x 1-11 $\frac{1}{16}$ " x 16 $\frac{1}{2}$ "—Top front crossrail
 2 pcs.— $\frac{3}{4}$ " x 1 $\frac{1}{4}$ " x 5 $\frac{1}{2}$ "—Bottom cleats

Miscellaneous

- $\frac{1}{4}$ "-dia. dowel
 4 $\frac{5}{8}$ "-dia. glides
 10 ft.— $\frac{3}{16}$ "-dia. cotton twine
 18 brass screw eyes



Clothes Held Over Radiator By Wooden Drying Rack



This rack utilizes the rising heat from a radiator to speed the drying of small articles. The side panels are cut and fitted as shown in the illustration, with the dimensions determined by the size of the radiator. The crossbars can be made from either $\frac{3}{4}$ -in. dowels or square stock.

Dr. J. Roberts, Bangor, North Wales.

Infrared Lamp Heats Asphalt Tile

Asphalt tiles usually are heated with a blowtorch to make them pliable for installing over a concrete floor and for cutting to fit corners and around pipes. An easier method of heating which also eliminates any danger of fire is to use an ordinary infrared bulb in a large reflector. The lamp is used to heat the tiles until they are sufficiently pliable to assume the contour of the floor when laid in the mastic.—Glen F. Stillwell, Manhattan Beach, Calif.

Ice-Filled Jar in Basket Chills Food for Picnic

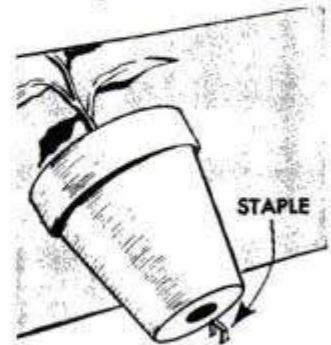
If you have been disappointed on a picnic in discovering that some foods had become unpalatably warm and, in some cases, spoiled, you'll appreciate this stunt for chilling foods in the basket while en route. A basket with solid-metal sides is best for the purpose, although an open-weave basket will be suitable if lined with several layers of newspapers for insulation. Take a $\frac{1}{2}$ -gal. fruit jar and fill it with ice cubes or crushed ice. Next, partly fill the jar with a concentrated fruit juice or tea made double strength to offset dilution by

water from the ice. If carrying tea, be sure to cool it before pouring over the ice. Then place the jar in the center of the basket and pack all the perishable foods around it. In this way, the ice not only helps preserve the foods but also makes possible the addition of a cool, refreshing drink.

Blanche Campbell, Las Vegas, Nev.

Staple Anchors Flowerpot on Sill

If you wish to place potted plants on a window sill for an occasional airing and sunning, they may be prevented from sliding off by anchoring them with staples driven into the sill. The staples should be small enough to engage the drain openings on the bottoms of the pots in the manner indicated.



Camp Water Supply Strained Through Punctured Pail

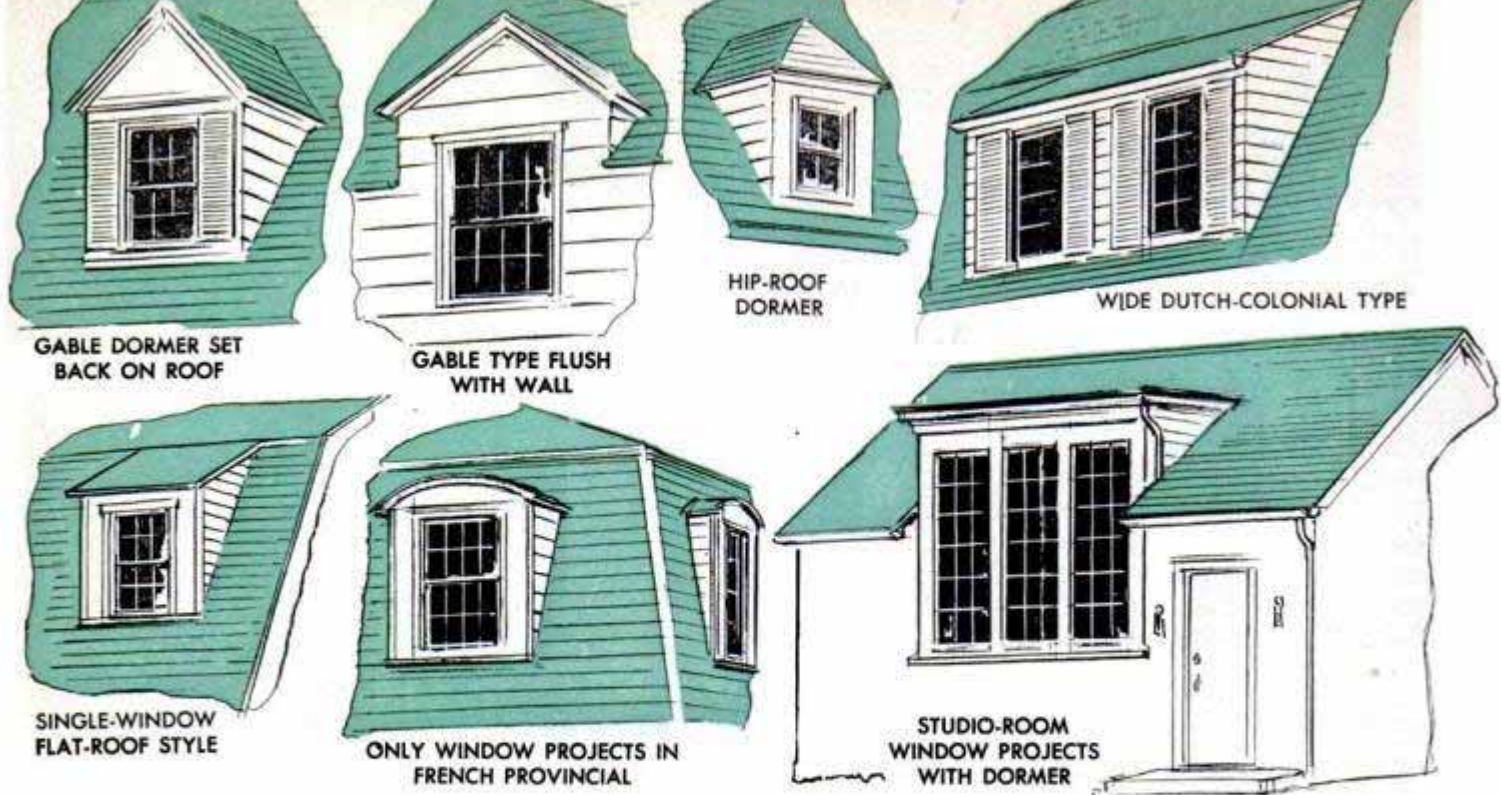
Sportsmen and campers, who are often obliged to obtain drinking water from a brook or a spring, will find it a simple matter to eliminate any floating sticks or leaves by punching a row of holes near the rim of the dipper or pail that is used for the purpose. The pail is lowered into the water until the holes are covered, and allowed to fill through the holes.



Window-Cleaner Spray Used To Apply Insecticide

When applying insecticide solutions to house plants or to single plants in the garden, it is economical to use a small window-cleaner spray. In addition to being easier to direct in a small area, it will spray the solution as fine droplets which spread quickly, while a regular sprayer atomizes much of the liquid into the air where it is wasted.





How to Install DORMERS

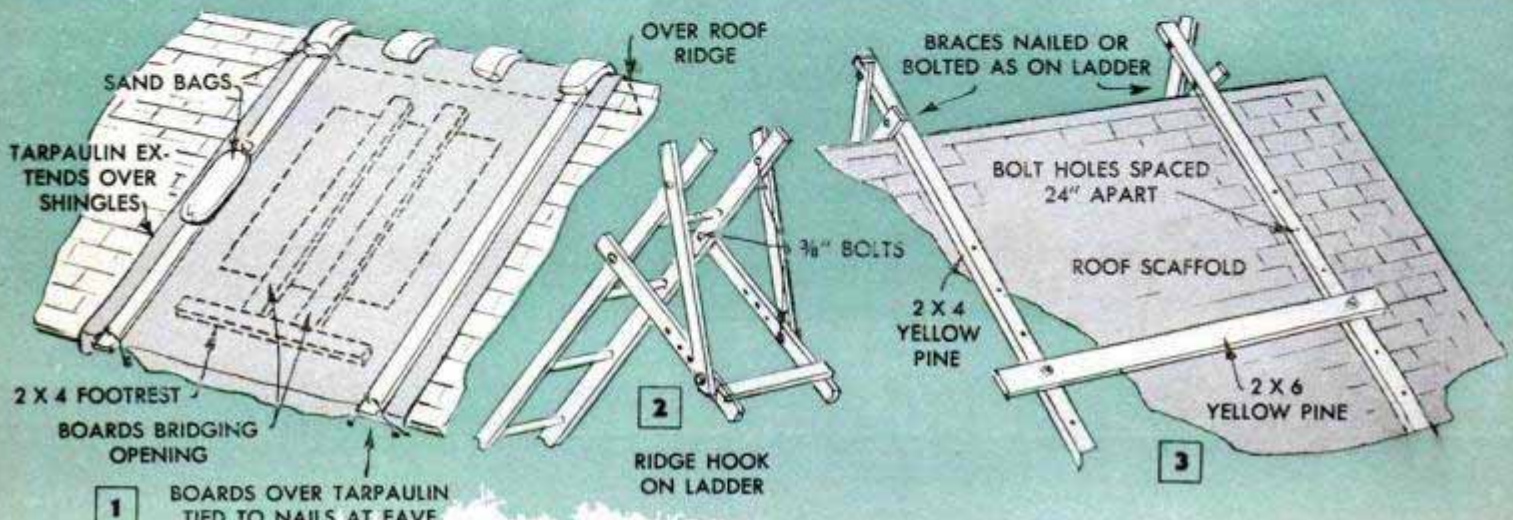
IN ADDITION to the obvious advantages of increasing usable floor space and providing adequate ventilation for upstairs rooms, dormers also improve the appearance of a house when properly designed and installed. However, location or styling of the dormers can detract from the lines of the house and, therefore, should be given careful consideration. One effective way to plan your dormers is to sketch various types and sizes of dormers on tracing paper taped over a photograph of the house. Then judge for yourself which dormer lends itself best to your installation.

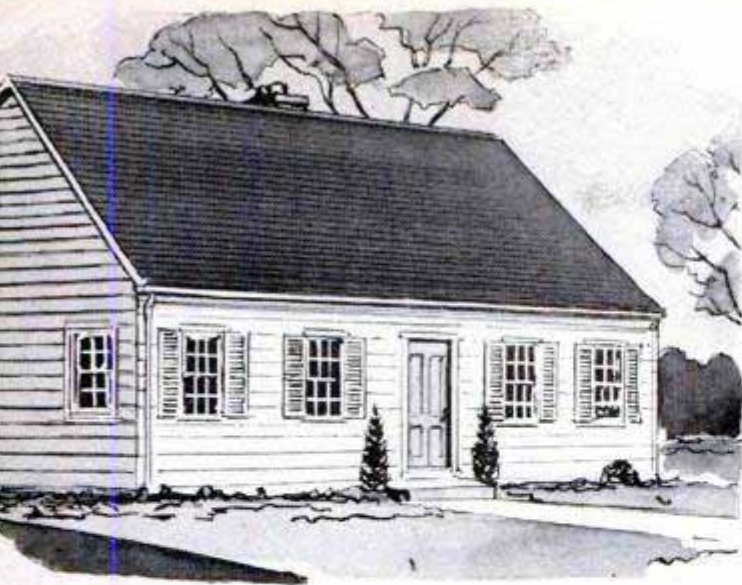
Precautions when starting: It's wise to have a large waterproof tarpaulin on hand before starting to install a dormer, so you can cover the roof opening or unfinished dormer overnight or when rain is probable. The tarpaulin should extend over shingles on either side of the opening and over the roof ridge. The opening is bridged with

boards and the tarpaulin held down by sandbags and narrow boards, as in Fig. 1.

Remove shingles first: After measuring the location of the dormer from the roof edges, remove the shingles where the opening is to be made. You can start loosening shingles from a ladder set against the eave, a ladder hooked over the ridge, Fig. 2, or from an improvised roof scaffold, as in Fig. 3. When using a ladder set against the eave, provide footrests by nailing 2 x 4 cleats to the roof as the shingles are removed.

Strips of asphalt shingle are easy to remove after prying up the nails as in Fig. 4. Use a wooden block as a fulcrum to avoid damaging the shingles. Nails in wooden shingles are cut with a flat tool having a sharp V-notch at one end. It is pushed up under shingles and struck with a hammer to sever the nails. Remove shingles a foot or so beyond the limits of the opening to be made and cut the roofing paper a few





For house expansion and for appearance, dormers are important. Here is the step-by-step procedure for opening the roof, framing, sheathing, roofing and finishing

An example of what dormers can do for the appearance of a home having a large, unbroken expanse of roof. They also give light and air to attic rooms

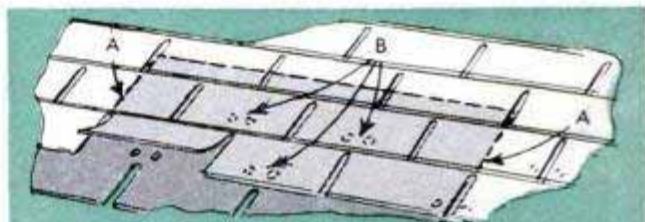
By E. R. Haan

Below, when opening up roof, shingles can be saved for use on dormer roof. Nails are lifted from roof without damaging shingles by using block as fulcrum

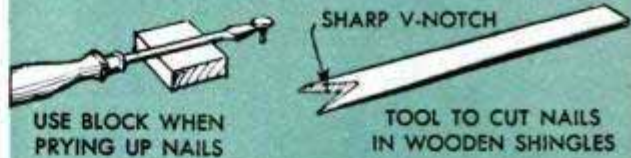
inches from the edges of the shingles, Fig. 5.

Cutting the opening: Start cutting the roof boards with a keyhole saw after boring holes to start. As soon as the kerf is long enough, use a crosscut saw. Cut closely along the rafters at each side of the opening, sawing on the side toward the opening, and remove the cut boards with a pry bar. The opening should extend the width of a roof board past the point where double headers are to be located top and bottom.

Next, cut the rafters that bridge the opening, as indicated by the dotted lines in Fig. 5. The lower edge of the upper double header should come at ceiling height as in Fig. 6. It's best to install headers on edge, marking the rafters with the aid of a level. Cut the header piece from the same size stock as rafters. Nail the rafters at the sides of the opening to one header first, then nail the header to the cutoff ends of the rafters. Install the second header piece the same

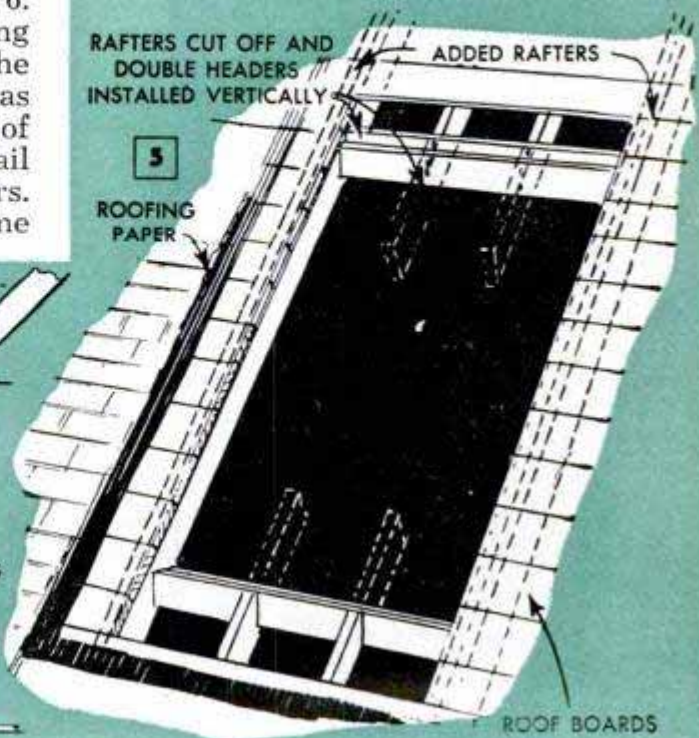


SHINGLE STRIP TO BE REMOVED. LOCATE EDGES "A," THEN PRY UP NAILS OR TWO ROWS AS AT "B"



USE BLOCK WHEN PRYING UP NAILS

TOOL TO CUT NAILS IN WOODEN SHINGLES



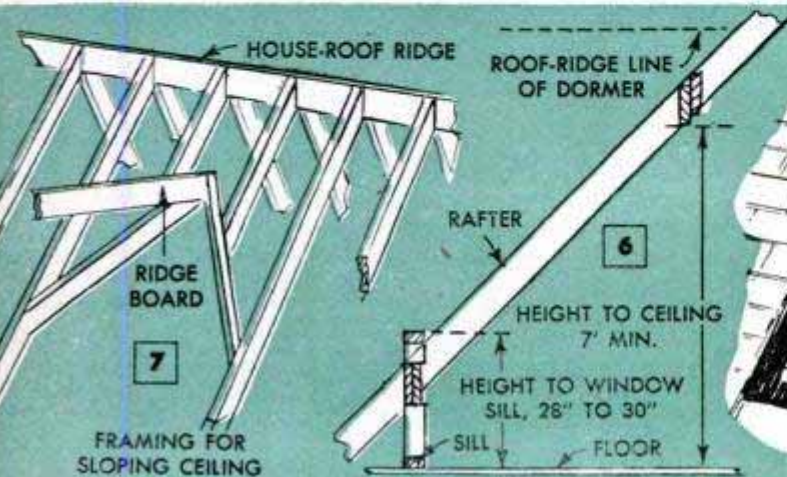
RAFTERS CUT OFF AND DOUBLE HEADERS INSTALLED VERTICALLY

ADDED RAFTERS

5

ROOFING PAPER

ROOF BOARDS



6

7

FRAMING FOR SLOPING CEILING

STUDS AND
RAFTERS
SPACED
16" ON
CENTERS

DOUBLE
HEADER

8

FRAMING DETAILS OF
GABLE-TYPE DORMER

1 X 4
RIDGE BOARD

2 X 4
PLATES ON
ROOF
BOARDS

2 X 4
RAFTER
PLATE

2 X 4
FOOTRESTS

9

GAMBREL OR
DUTCH-COLONIAL
TYPE DORMER

10

WINDOW IN
WALL TOP
PROJECTS
ABOVE EAVE

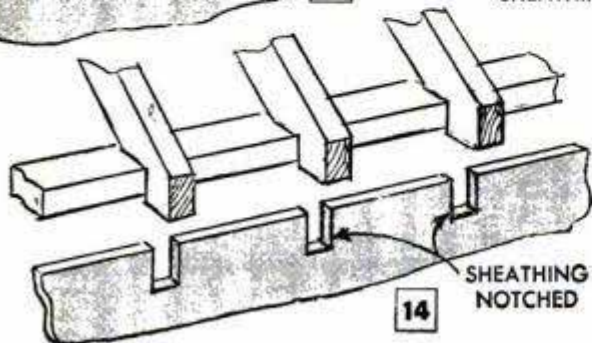
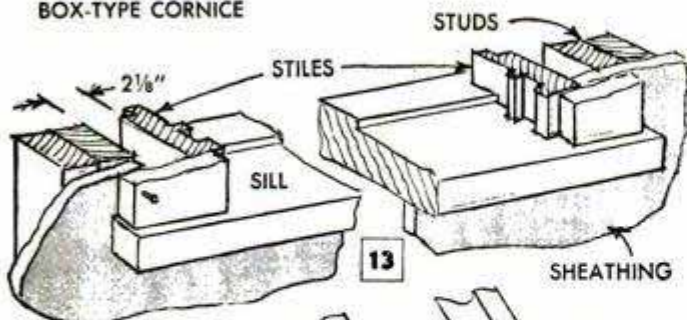
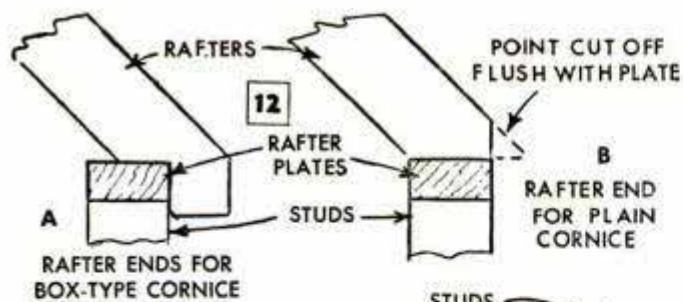
11

HIP-ROOF
DORMER

way, dropping it as necessary. The two pieces comprising the lower header should have their top edges flush, at a location where the window will come about 30 in. above the floor. If the ceiling of a dormer is to be sloping, the top header is arranged as in Fig. 7.

Wall framing: Framing of a gable-type dormer is shown in Fig. 8, and the same procedure, with only slight differences, is followed on other types shown as in Figs. 9, 10 and 11. Use 2 x 4 stock for both the wall framing and rafters, although large roof spans may require 2 x 6 rafters. First add a reinforcing rafter to each of the rafters at the sides of the opening as indicated by dotted lines, Fig. 5. These project 3 or 4 ft. beyond the double headers. Next, nail plates on the roof boards along the sides of the opening, nailing into the rafters underneath, Fig. 8. Also nail temporary footrests on the roof, which can extend over the shingles but should not be nailed through them.

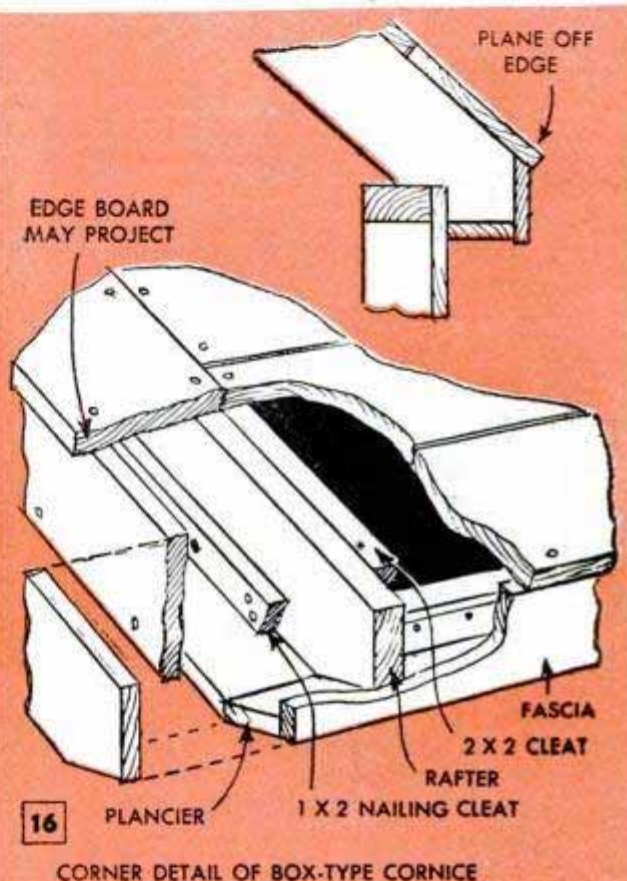
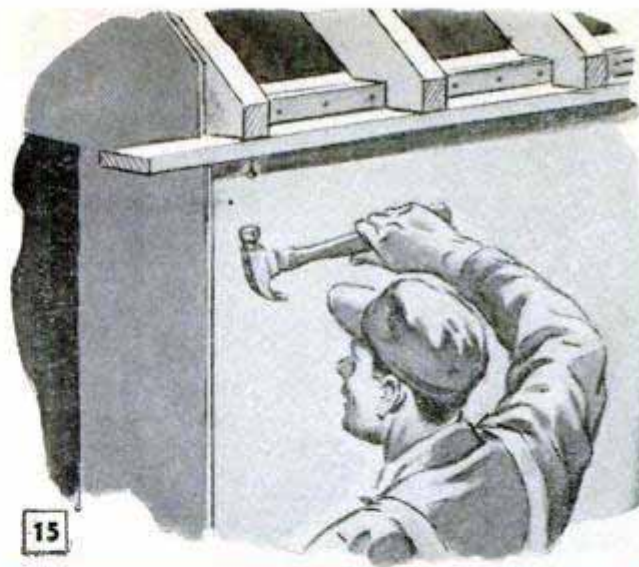
Start the wall framing by installing the double corner posts with a double header above them. Toenail the lower ends of the posts to the roof plates and temporarily brace this framework with a board from the top of the window header across to the upper roof header. The rafter plates are next. On the gable-type dormer their top edges should be at the same level as the underside of the upper header in the roof, which is ceiling height. The rafter plates are cut at an angle at one end to fit roof plates to which they are nailed. Nail the plates to the front framing while the corner posts are checked with a level to assure getting them plumb. Now, with skeleton framing in place, mark the plates for the



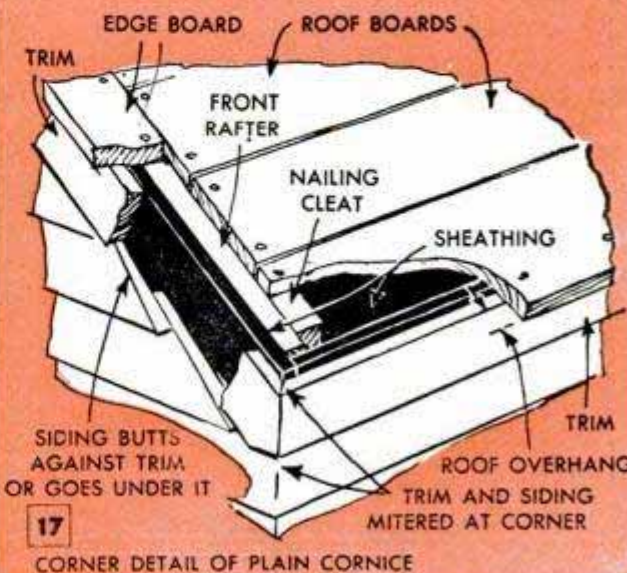
studs which are spaced 16 in. on centers. Drive nails through the top plate into the studs and toenail the studs to the roof plate.

Roof framing: Next proceed with the roof framing, starting with the 1 x 6 ridge board nailed between the roof plates at the point where they meet, in line with the center of the dormer. Support the front of the ridge board temporarily so it is level and above the exact center of the dormer. Then take careful measurements of the rafters so they can all be precut. Nail them in place after marking the ridge board and the rafter plates to locate them 16 in. on centers. If you are making a box-type cornice, the rafters are notched and extended beyond the walls, Fig. 12-A, but for plain cornices the rafters are cut off flush with the plate as in detail B. Framing the gambrel-dormer roof as in Fig. 9 is the simplest and most rigid type of construction, but requires the installation of a false ceiling. To save this extra work, the center rafters may be butted against the header and the outer rafters mounted flush with the lower edge of the header.

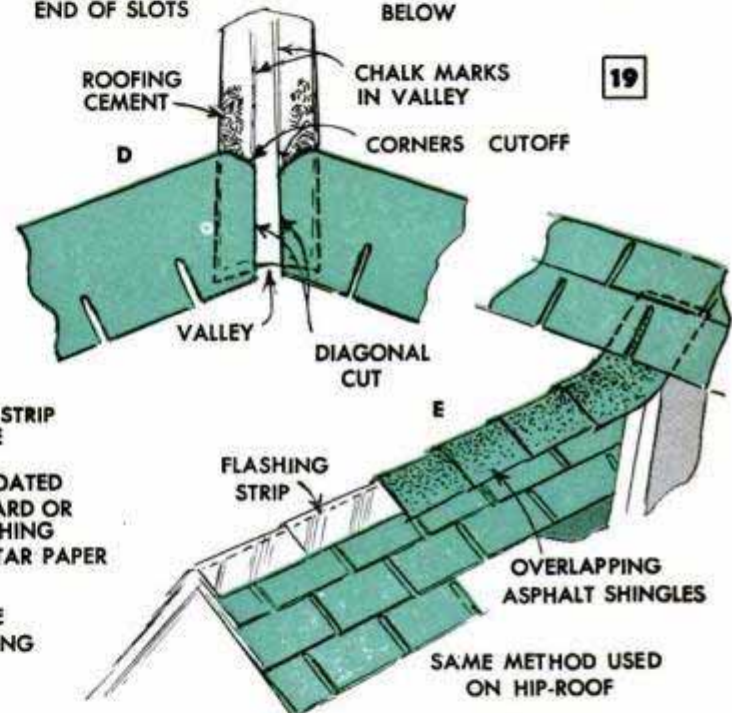
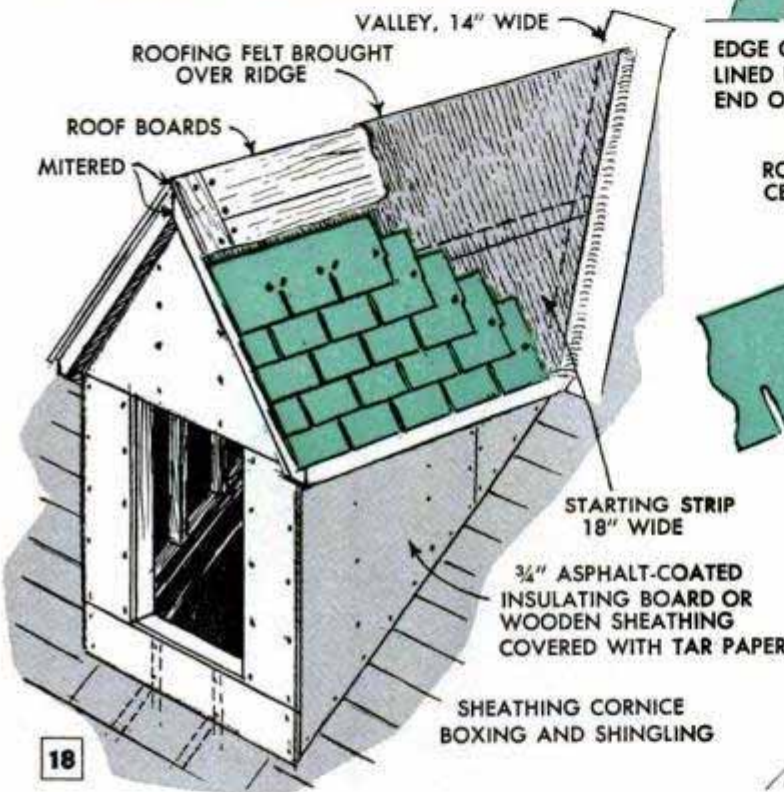
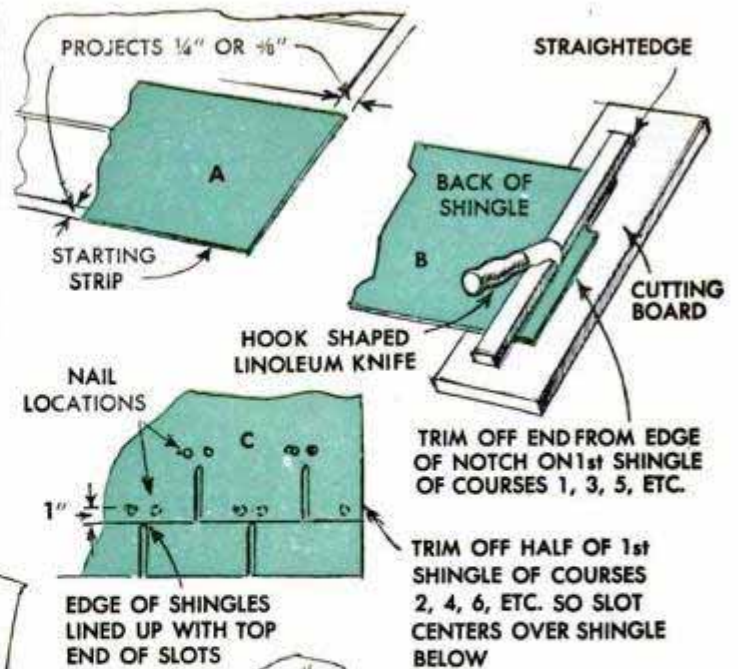
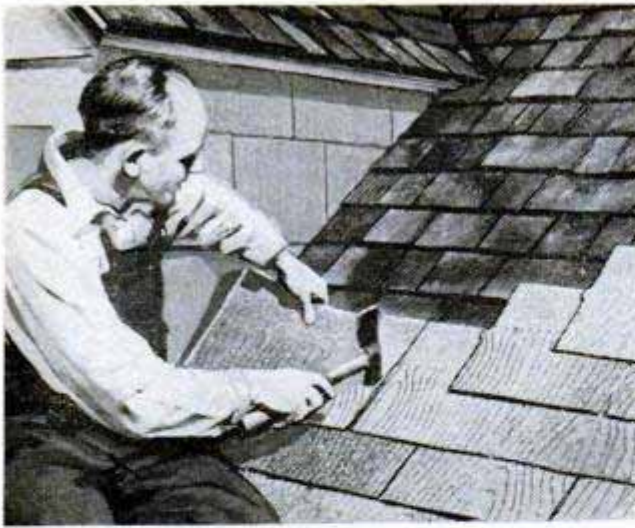
Window framing: After the sides and roof are framed, nail the ceiling joists, spacing them 16 in. on centers, and install the window framing. The window opening is centered and should be 4 1/4 in. wider than the window frame at the stiles, thus providing a 2 1/8-in. space from each stile to the frame as in Fig. 13. Usually the rough framing consists of double studs at the sides and a double header at the top. In Fig. 8 only



CORNER DETAIL OF BOX-TYPE CORNICE



CORNER DETAIL OF PLAIN CORNICE



single studs are shown because of their proximity to the corner posts to which they are nailed with short blocks at the center.

Sheathing: The roof is sheathed and shingled before sheathing the walls, the roof boards projecting over the edges of the siding and trim. On roofs with box cornices, apply the wall sheathing first, then add the cornice and lastly the roof. You can use wooden sheathing or composition sheathing board for the walls. The top edge of side-wall sheathing is notched, Fig. 14, to fit over the rafters, or the rafter notches may extend $\frac{3}{4}$ in. over the plate so that the sheathing can be inserted.

Cornice construction: Rafter ends for box-type cornices must be identical. Mark the rafters along their top edges using a straightedge. Mark for vertical cuts by using a level or miter gauge, and for the bottom horizontal cuts by using a square. The

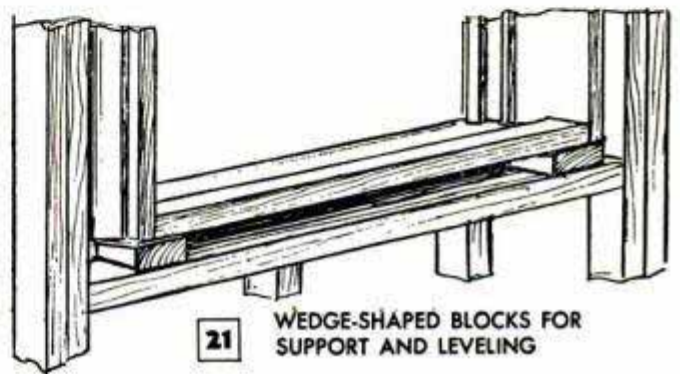
bottom board, or plancier, of the side cornice, Figs. 15 and 16, should extend at the front a distance equal to the width of the board. The side of the cornice (fascia) has its top edge beveled at an angle to fit snugly under the roof sheathing, which may project beyond it an inch or so. The side and front cornices are joined, as in Fig. 16. The edge board—also called drip edge—is nailed to the end rafter while the other roof boards butting against it are nailed to a 2 x 2 cleat nailed along the inside edge of the rafter. Dormer roof boards will fit snugly against the house roof boards if sawed at the correct angle and bevel. Construction of a plain cornice is shown in Fig. 17.

Shingling: First lay a 14-in. sheet-metal valley where dormer and house roof meet, Fig. 18, bending it with a straightedge so it lies flat on both roofs. Lay roofing felt on the roof in overlapping strips, the higher

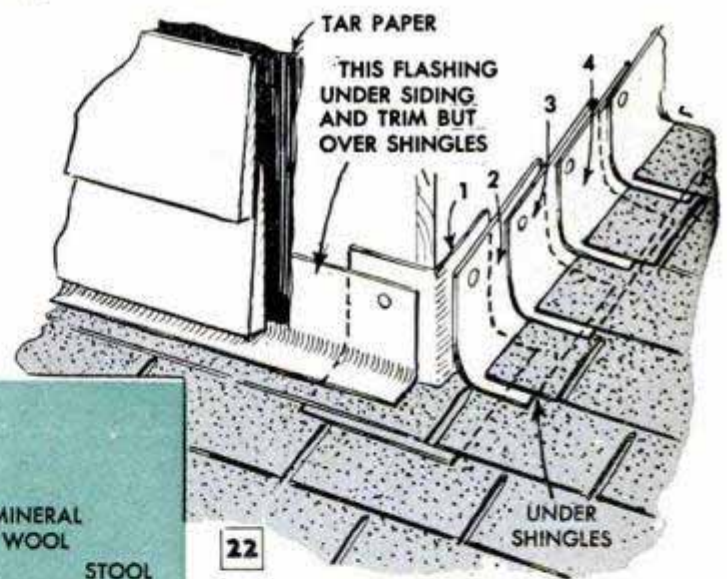
one covering 4 or 5 in. of the lower one. Then space a "starting" strip along the roof, as in Fig. 19-A, letting it project $\frac{1}{4}$ or $\frac{3}{8}$ in. Sometimes regular strip shingles are used instead of a starter strip, the shingles being placed upside down so that the slots are on top. The first shingle of the bottom course and other alternate courses is trimmed, detail B, to eliminate the half slot, or notch, at the end. Cut shingles from the back side with a linoleum knife or heavy pocketknife. Cutting is easier, especially on hot days, if you keep the knife blade moistened with kerosene. You can use the edge of a shingling hatchet or a pair of tin snips instead of a knife. Use a straightedge and cut the shingles on a board to prevent damaging them. The first shingle of the second and alternate courses is trimmed so the slot comes halfway over the shingle below, detail C. Two nails are driven about an inch above and on either side of each slot. Mark the valley by snapping a chalk line to indicate where the shingles must be cut diagonally, detail D. This detail also shows how the top corners of shingles at the valley are cut at an angle to shed water. Nails should not be driven through the sheet metal, the ends of the shingles being cemented to the valley. Shingle courses are continued to the ridge, the nails of the last course being covered with the capping, which consists of a flashing strip and individual shingles overlapped, as in detail E. The last capping shingle is brought upward and under a shingle course of the house roof. When wooden shingles are used, courses overlap to expose about 5 in. to the weather. The shingles are spaced $\frac{1}{4}$ to $\frac{3}{8}$ in. apart. Keep the side edges of the shingles at least $1\frac{1}{4}$ in. from the edges of shingles in the course below. Drive the shingle nails



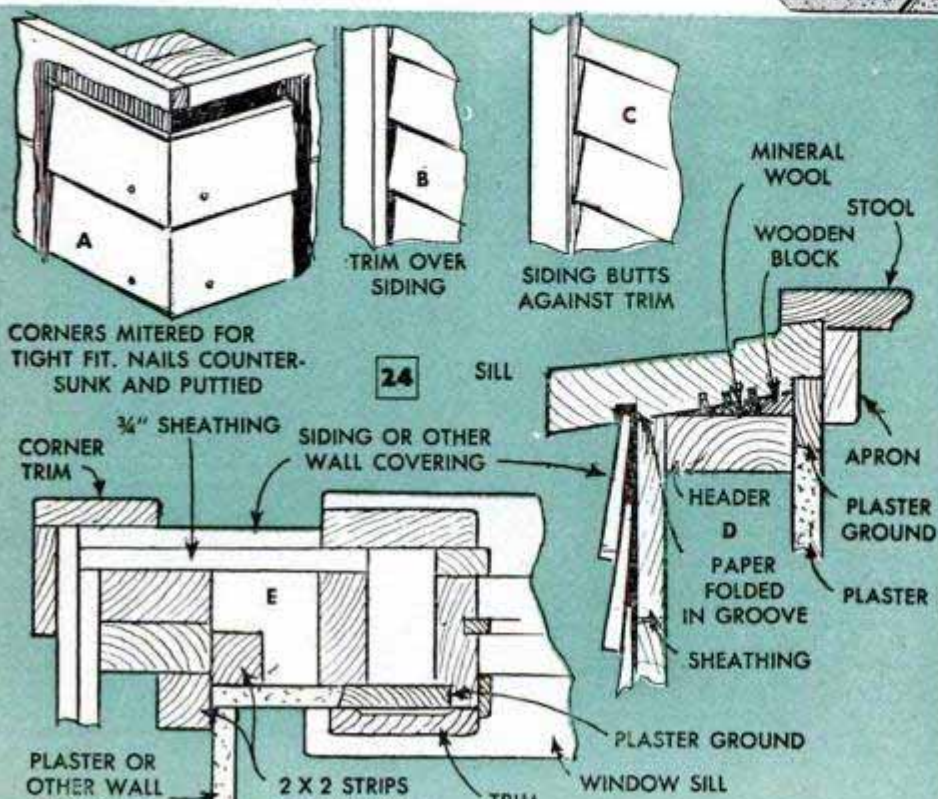
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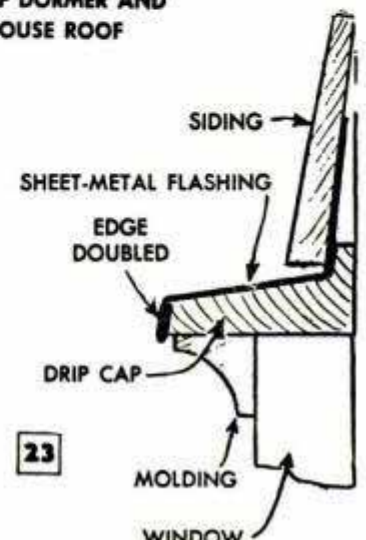
21 WEDGE-SHAPED BLOCKS FOR SUPPORT AND LEVELING



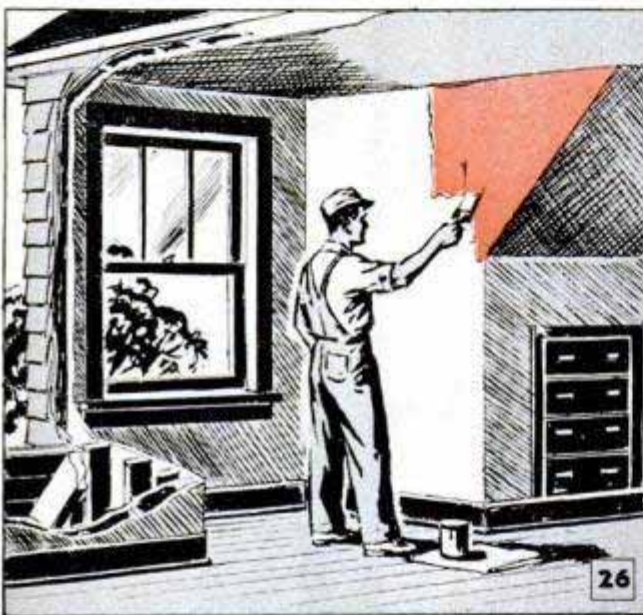
22 FLASHING AT JOINTS OF DORMER AND HOUSE ROOF



24



23



about 6 in. above butt ends of the shingles and not closer than $\frac{3}{4}$ in. from the edges.

Installing window frames: Set the window frame in the opening so that the stiles are $2\frac{1}{8}$ in. from studs, Fig. 13. Drive wooden wedges between the sill and the header as shown in Figs. 21 and 24-D to get the frame plumb and hold it securely in position while nailing the outer trim. Before nailing, check the window frame with a level, as in Fig. 20.

Flashing to prevent leaks: After reshingling the house roof to the front of the dormer, add a sheet-metal flashing strip along the dormer. The strip should be at least 8 in. wide and bent centrally to come over the shingle nails, as in Fig. 22. Fasten the upper edge to wooden sheathing or to studs under insulating-type sheathing. Also apply a flashing strip over the drip cap at the top of the window, as in Fig. 23. Use "metal shingles" where the dormer sides join the house roof, Fig. 22, starting at the front corners. Note that flashing piece No. 1 is applied before the front flashing strip and

NAILS TO USE

- 20d COMMON NAILS: Rafters to double headers and vice versa; roof plates to rafters underneath
- 16d COMMON NAILS: Rafter plates to ends of studs
- 10d COMMON NAILS: Reinforcing rafters or any double studs fastened together; toenailing studs, rafters, joists, etc.
- 8d COMMON NAILS: Wooden wall and roof sheathing, outside trim (countersunk and puttied)
- 8d ALUMINUM NAILS: Siding and exterior trim
- 8d FINISHING NAILS: For interior trim
- $1\frac{3}{4}$ " LARGE, FLAT-HEAD, GALV. NAILS: For insulation-type sheathing
- $\frac{7}{8}$ " or 1" WIDE, FLAT-HEAD, GALV. NAILS: Asphalt shingles on roofing boards
- 3d GALV. SHINGLE NAILS: For wood shingles

is bent around the corner. Bring the roof shingling over flashing piece No. 1, which should lie flat on the roof about 4 in. beyond the dormer. Flashing piece No. 2 overlaps No. 1 and is similarly covered with the next shingle course. The same procedure is followed for pieces 3 and 4.

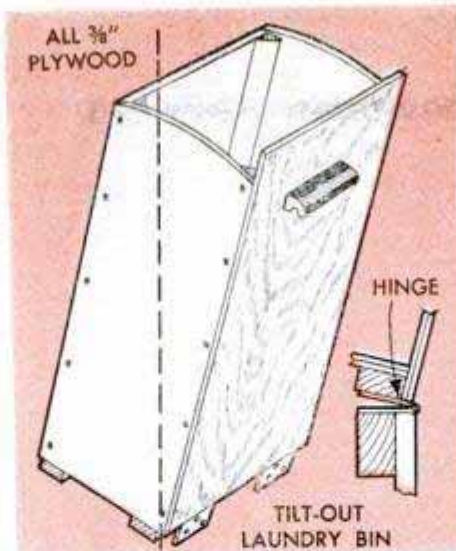
Application of siding: Outside wall covering should match that of the house or harmonize with its styling. If wooden sheathing is used, it is covered with tar paper before applying siding, clapboard or shingles. Siding at outside corners can be neatly mitered, Fig. 24-A, with the joining edges embedded in calking compound. Siding may be covered with trim, detail B, and spaces between the siding and trim tamped with mineral wool and calked. Another method is to butt the siding against the trim, detail C, the lower edge of the siding being kept about $\frac{1}{2}$ in. above the roof to prevent absorption of water. It's best to use aluminum nails as they need not be countersunk and puttied to prevent rust spots. Siding under a window fits into the groove on the underside of the sill, detail D, and is pushed up tightly against a folded edge of the sheathing paper.

Finishing the inside: It's advisable to insulate walls and ceiling of a dormer, using a vapor-barrier insulation. Fig. 25 shows batt-type insulation being installed. When insulating, stuff mineral wool between the window sill and the header, Fig. 24-D. The inside wall may be finished with wallboard or plasterboard. If the wall is to be plastered, apply plaster grounds along all edges of the window, details D and E of Fig. 24, and along the floor edge of walls. These grounds come flush with the plaster. Apply perforated-metal corner beads at outside corners before plastering, and strips of metal lath along inside corners.

After plastering, install trim around the windows. A plywood subfloor is installed, over which any type of finish floor may be laid. Baseboards are applied after laying the finish floor. Fig. 26 shows an inside view of the finished dormer. ★ ★ ★

Built-in Bins Utilize Waste Space in Rooms

Installed as built-in units under shelves and counters, tilt-out bins similar to the one shown will convert waste space into extra storage facilities in the kitchen, bathroom, halls and other passageways of a home. Built to dimensions required by a particular installation, each bin is made from $\frac{3}{8}$ -in. plywood reinforced in the corners with three-cornered wooden cleats. The back, sides and bottom of the unit are assembled with glue, nails and screws driven in from the outside, while the front panel is attached with glue and finishing nails. The bin thus formed is then hinged at the lower end to



the bottom framing member. The front panel may be finished with varnish or painted to match the surrounding walls as desired.—Hi Sibley, Nuevo, Calif.

Calcimine Removed From Wall With Paint Cleaner

Before a calcimined wall or ceiling is painted, the calcimine must be completely removed. Dip a large sponge into a pail of warm water in which paint cleaner has been dissolved. Keep the sponge well filled with water. Begin on the ceiling, then do the top of the walls and finally work down

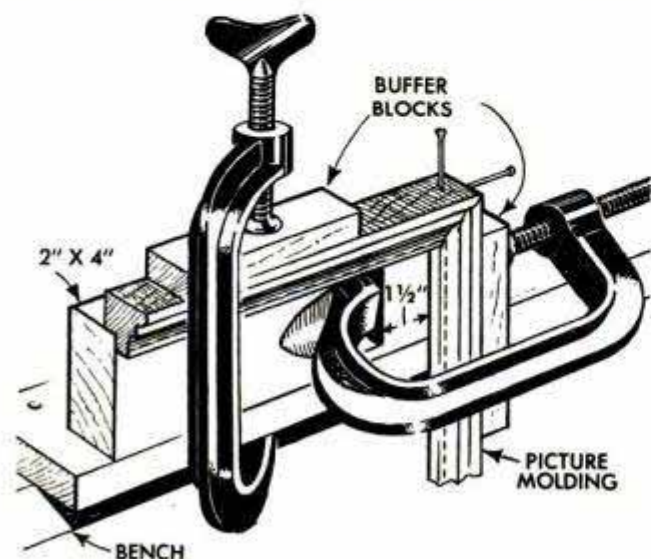
the walls. Calcimine comes off smooth plaster easily. Bits of calcimine remaining in rough-textured surfaces, even after careful washing, usually will not harm subsequent paint coats. After washing, let the surface dry thoroughly, and before painting, fill all cracks.

C-Clamps and Scrap Wood Form Jig to Simplify Picture Framing

Assembling a picture frame becomes an easy job when this simple jig is used. It consists of two C-clamps and a short length of 2 x 4 squared at one end, in which a depression similar to a screw pocket is cut near the same end to take one jaw of a clamp. The first step in setting up the jig is to nail a short board to a table or bench top, allowing one side to overhang at least

1 in. This will provide a grip for the other clamp. Next, the 2 x 4 is placed edgewise on the overhanging edge of the board so the squared end is flush with the end of the board, and nailed in place. Then two pieces of molding are joined over the end of the 2 x 4, blocks used to prevent marring and the clamps adjusted as shown.

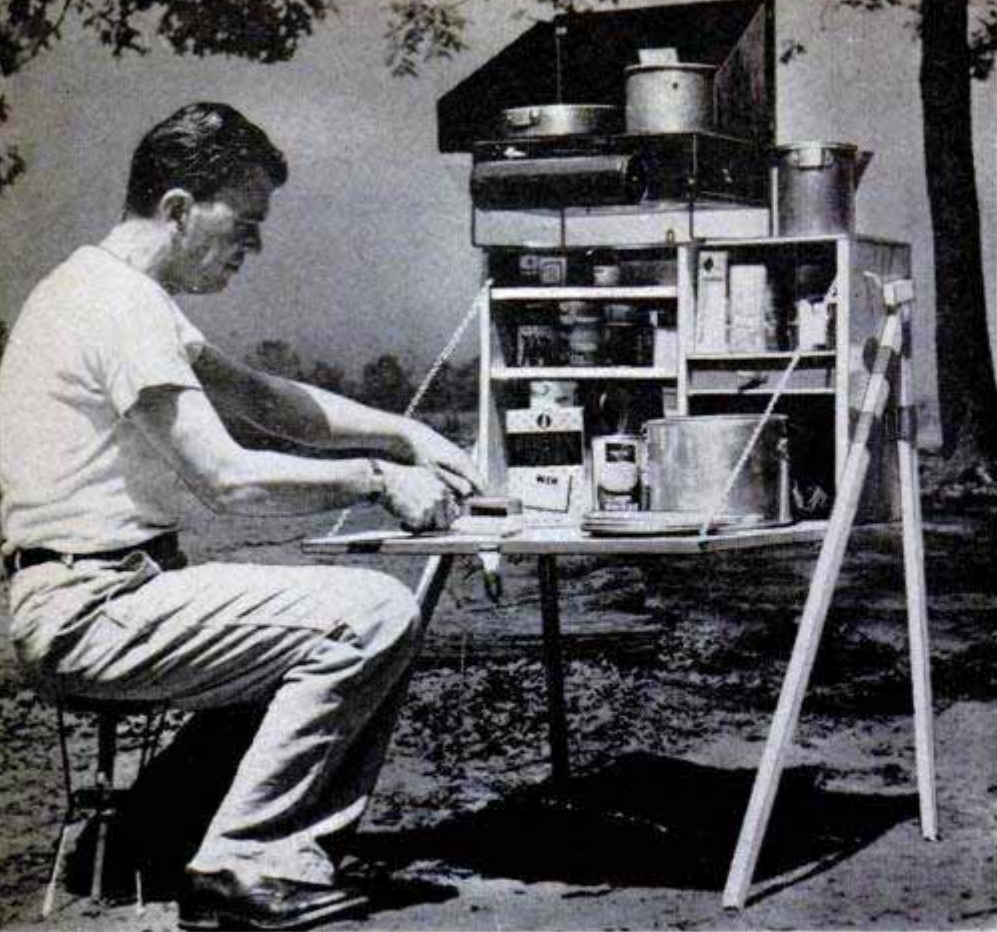
Perry W. Trout, Kansas City, Mo.



Method for Increasing Capacity Of Electrical Outlet

To rewire an electrical outlet for a home freezer or cooling unit that is to be plugged into a circuit having wires that are too small, connect the old wires together and pull in a new heavier wire to serve as the other side of the line. This will eliminate pulling out the old wire, which usually is difficult in old houses, and replacing it with heavier wire. The new wire, which may be a twin-conductor cable with its wires connected at the ends to provide a single conductor, can be run through a different path if necessary.

Hugh Lineback, Stillwater, Okla.

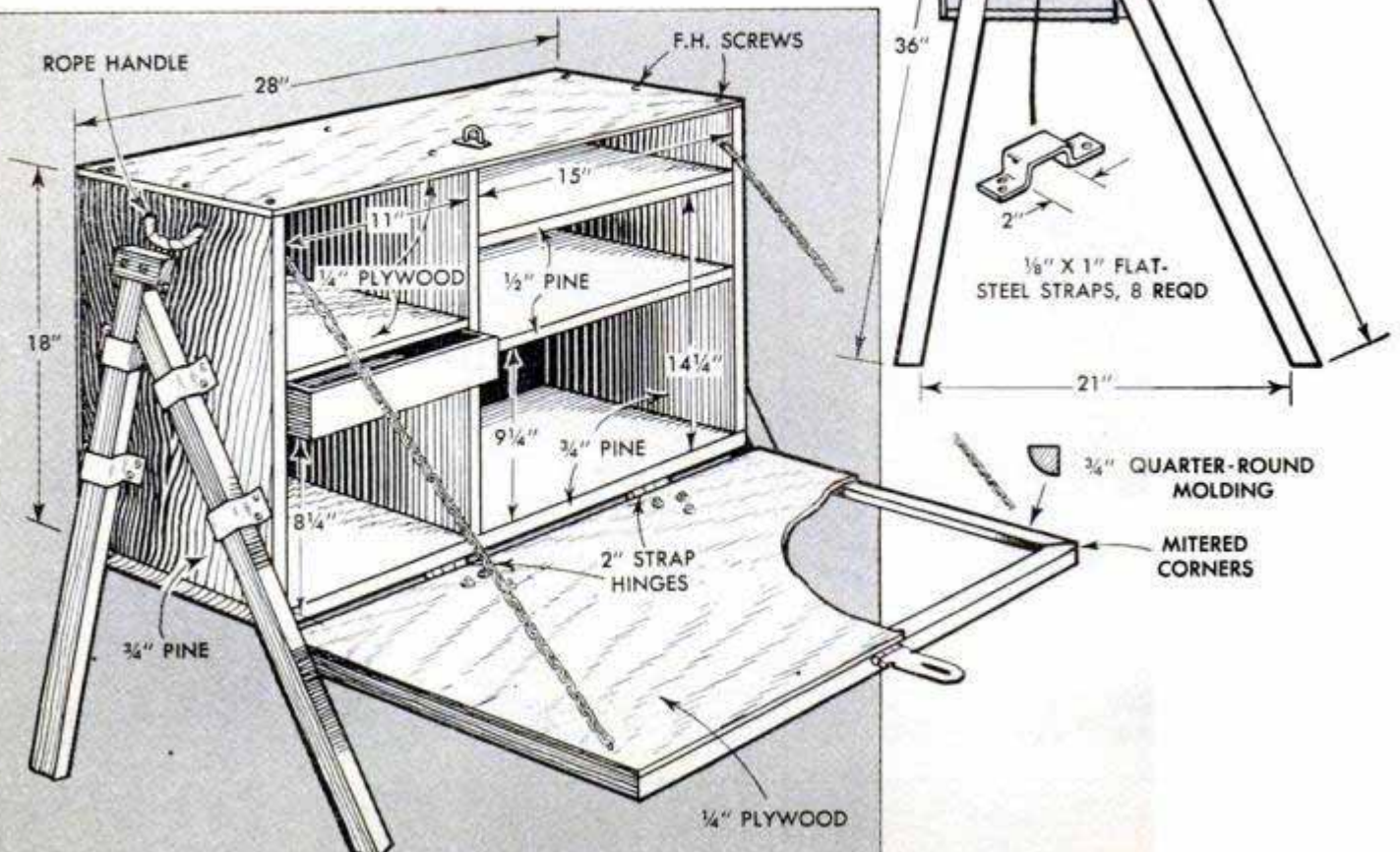


CAMPER'S CABINET KITCHEN

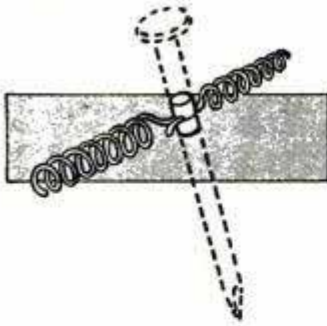
By Paul F. Runge

Being the camp cook is a real pleasure when everything you need is right at your finger tips. Note how the hinged front of the portable cabinet opens to provide a worktable at a convenient height

THERE WAS A TIME when camping out meant roughing it, and eating camp food was a test of endurance. That picture has changed considerably and camping has become the art of living as comfortably as possible under all kinds of conditions. For family camping, this compact portable kitchen will provide the answer to the problem of a place for everything. It also can be used by hunters and fishermen who are going to spots that are accessible by car. The cabinet is designed to hold a cooking kit, eating utensils, and enough canned and dehydrated foods to feed six people for a week. Removable legs make it easy to stow the cabinet in the trunk of your car.



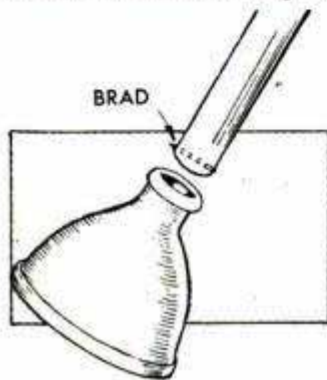
Repairing Broken Heater Element



Broken electric-heater elements can be repaired with a slotted section cut from a shingle nail. The slot is filed three quarters of the way through the nail, and the slotted segment is then cut from the body of the nail. The ends of the broken heating element are cleaned and then inserted in the slot, which is hammered close around them. This makes a solid repair job which will last indefinitely.

A. S. Kallenborn, San Carlos, Calif.

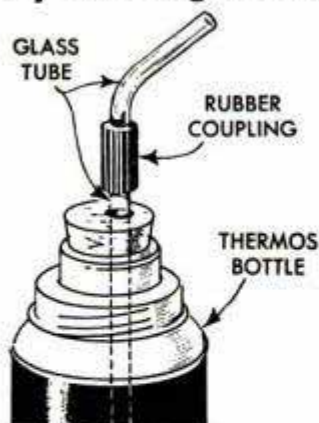
Worn Force Cup Nailed to Handle



If you have difficulty in keeping a rubber force cup on the handle once the socket has become stretched and deteriorated, drive a brad or thin nail through the handle near the end. Cut the ends of the nail so that they project about $\frac{1}{8}$

in. and file them to sharp points. Then, using a twisting motion, force the end of the handle into the socket.

Cool Water Provided for Invalid By Altering Vacuum Bottle



By altering a vacuum bottle to provide a ready source of cold drinking water for an invalid, the comfort of the patient can be increased and some of the time spent caring for him can be saved. Drill the bottle cork so that a glass drinking

tube can be inserted loosely through it. With a short length of rubber tubing couple a curved and a straight glass drinking tube. Insert the straight tube in the bottle so that it reaches almost to the bottom. The patient drinks from the curved tube.

☛ Moles can be discouraged by putting moth balls or crystals in their runways.



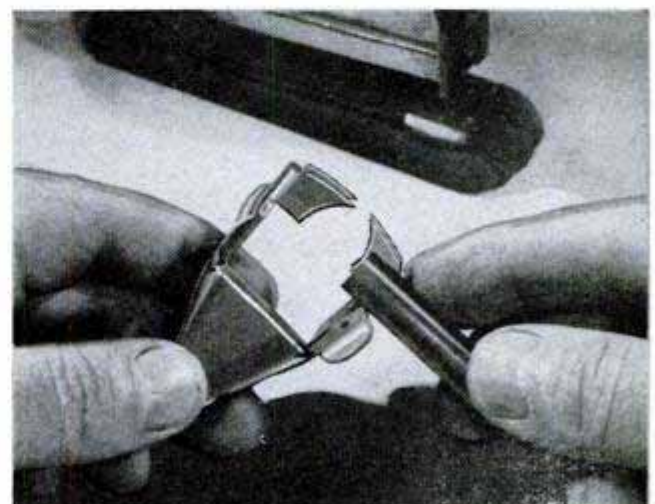
Shelves Installed on Bassinet Keep Baby Supplies Handy

Fitted to the underside of a bassinet of the type shown, one or two shelves will provide a handy storage place for diapers and blankets as well as other frequently used baby supplies. After the outside length and width of the carriage are measured, a piece of $\frac{1}{2}$ or $\frac{3}{8}$ -in. plywood is cut to the same measurements and then notched at both ends to fit over the legs. A single shelf may be rested upon the main leg braces. However, if there are, as in most cases, additional braces located higher up, a second shelf may be added in the same way.

Kathryn M. Wilson, Pontiac, Mich.

Disposal of Staples Made Easy When Remover Is Magnetized

If you use a staple remover frequently, you'll appreciate this kink for magnetizing the tool so it will collect the staples as they are removed, instead of letting them scatter over the desk and floor. This is done by rubbing the tool with a permanent magnet. After a cluster of staples has formed, it can be removed easily and disposed of. Repeat the action as often as is necessary.





CAR-TOP SLEEPER

By Joe Ott



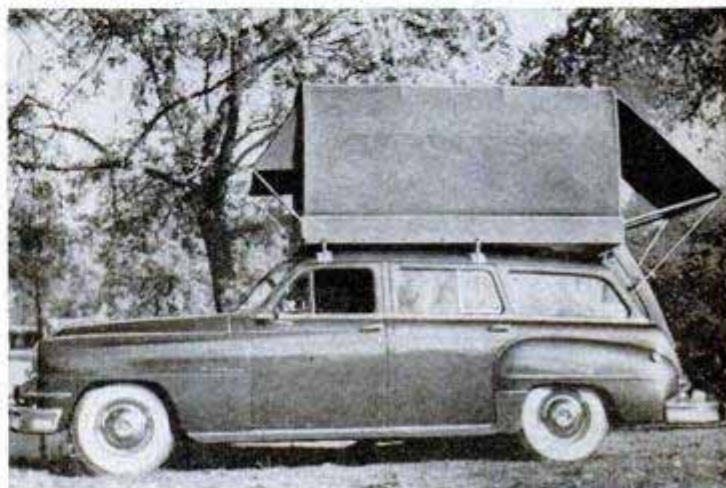
After car has been parked, remove cover and raise folding frames, or bows. Insert the lugs at the ends of the expansion bar in the elongated holes in frame

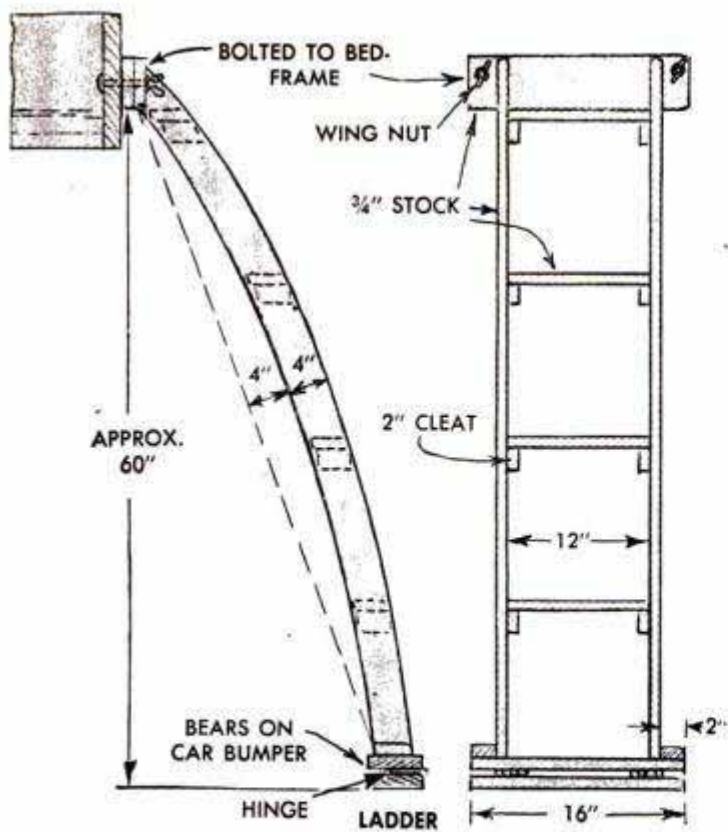
Front awning over screened window is held firmly in place by cords which are tensioned by springs attached to free ends. Springs hook into screw eyes



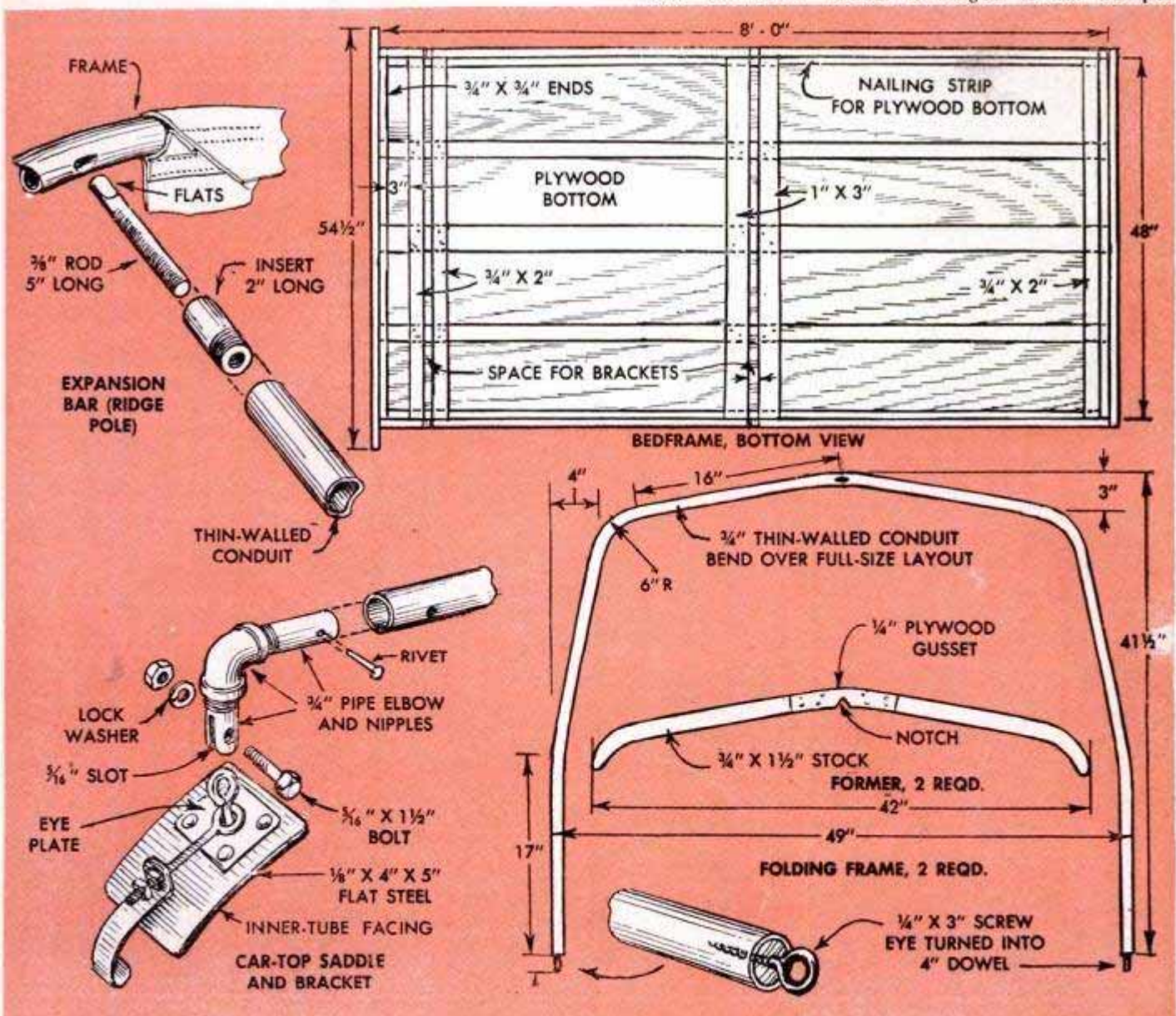
WITH THIS weather-tight sleeper installed on your car top you can take to the back roads on fishing and hunting trips or vacation without any worry about where to put up overnight. As pictured, the unit accommodates a three-quarter (48-in.) mattress of the innerspring type, but by increasing the over-all width about 6½ in. it takes a full-size mattress. The bedframe, detailed on the opposite page, is a simple, shallow box having a plywood bottom reinforced with three equally spaced slats. The latter rest on five cross cleats spaced to provide channels for the tubular supports. Before cutting material

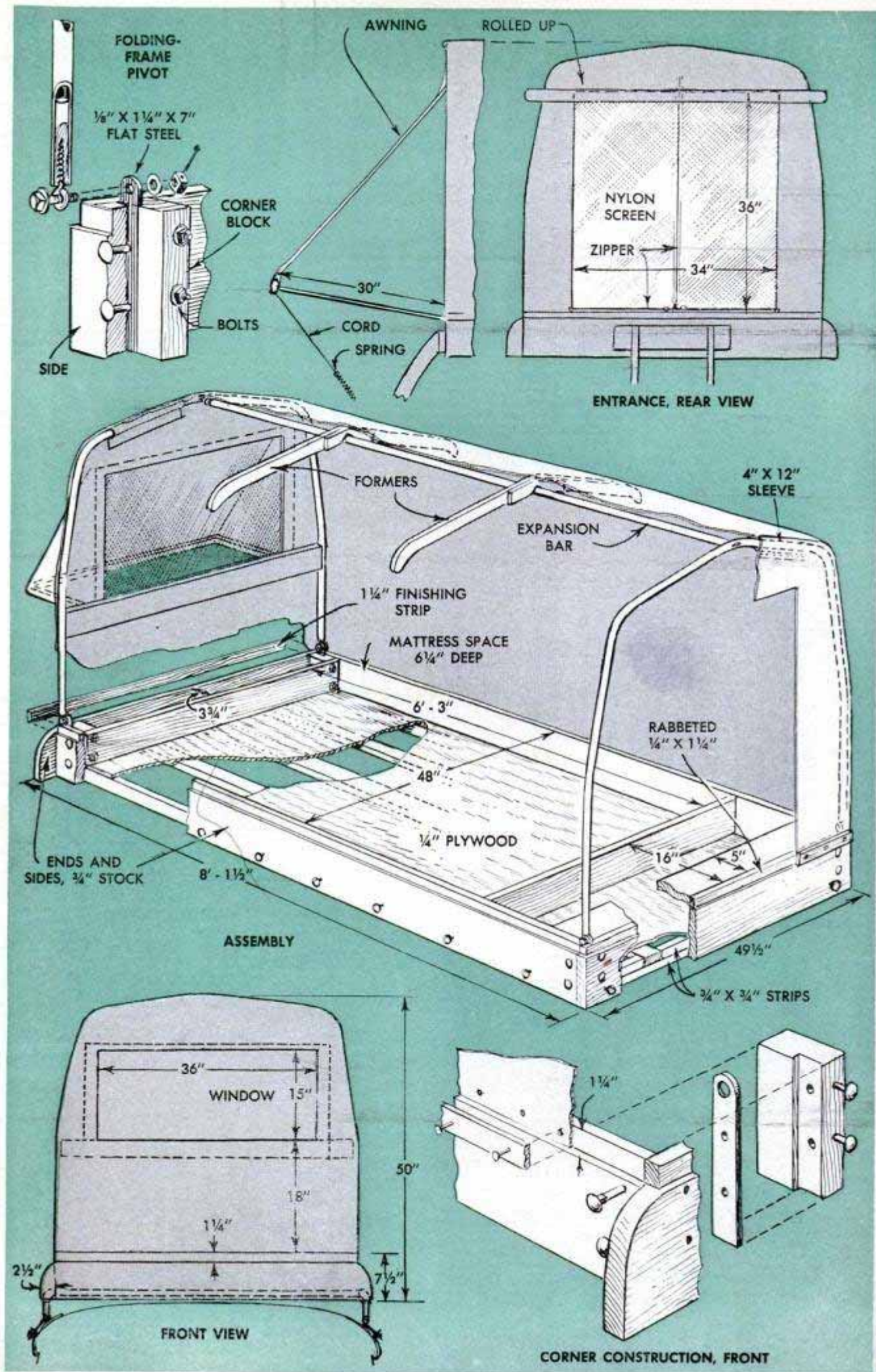
Lower end of canvas fly is supported by wooden arms. Protruding heads of nails driven into ends of arms enter holes in frame and wooden bar in fly





Ladder leading to entrance has curved stiles to fit over car trunk. Ladder is hinged to car bumper





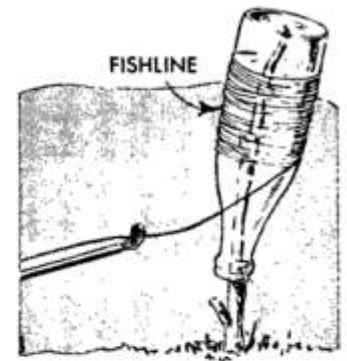
note especially the construction at the front and rear corners detailed on page 184. Flat steel lugs that fit between the rabbeted corner blocks and the sides of the box are held rigidly in place by two bolts which pass through the side of the box, the lug and the block. Two additional bolts are used to draw the block tightly into the corner. In the assembly, waterproof glue is used on all meeting faces of the parts. Note also that the ends of the plywood bottom are supported on filler blocks fitted between the slats as in the center detail on the opposite page. The slats are clinch-nailed to the cross cleats and the latter are butt-joined to the sides with screws and glue. Be sure that they are correctly spaced.

Before cutting parts for the car-top saddles, brackets and tubular supports, lift the bedframe onto the car and block it up to the correct height so that you can determine the varying lengths of the slotted pipe nipples which slip over the eyebolts on the saddles. The metal saddles are bent to the contour of the car top and faced with sponge rubber or pile fabric to prevent marring. The $\frac{3}{4}$ -in. pipe nipples which serve as studs are inserted in the ends of the tubular supports as in the lower left-hand detail on page 183. They should be shouldered in a lathe to a snug, press fit. After fitting, the parts are riveted or welded. The conduit supports are held tightly in the channels by $\frac{1}{4}$ -in. bolts which pass through both cleats and the metal tube.

The folding frames, or bows, are lengths of thin-wall conduit bent over a full-size layout to insure duplication. The formers, or half bows, are of $\frac{1}{2}$ -in. plywood with curved ends. Note that each unit is notched on its lower edge to fit over the expansion bar, or ridge pole. The hardwood plugs at the lower ends of the frames should be turned to a tight fit. Screw eyes turned into the plugs provide a means of pivoting the frames so that they fold easily. Construction of the expansion bar, or ridgepole, is shown in the center left-hand detail on page 183. As dimensioned, the ladder fits the station wagon pictured. Be sure to take measurements on your own car before cutting parts. Note that the lower end of the ladder is hinged to a separate piece of stock bolted to the car bumper, and that it is attached at the top with bolts and wing nuts so that it can be swung down when opening the car trunk. Have the canvas top, fly, awning and waterproof canvas cover made to fit the frame by a professional upholsterer. The cover is attached, as in the upper photo on page 182, by means of a cord passing through grommets in the corner and a row of screw eyes on each side and across the ends of the bedframe. ★ ★ ★

Rewinding Dried Fishline

A wet fishline can be dried quickly and uniformly if wrapped around a bottle and placed in the sun. To rewind the fishline, simply slip the bottle over a branch or a stick that has been stuck in the ground so it will permit the bottle to rotate easily as the line is rewound on a reel. A tall, slender jar or can may be used in place of the bottle if necessary.



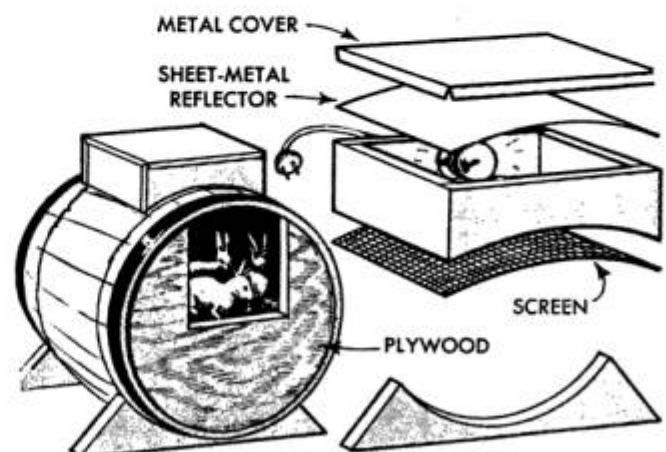
Pocket Minnow "Bucket"

Stream fishermen using live baits find that a flat or oval-shaped half-pint bottle is just the thing for carrying live minnows. The bottle is filled about half full of water and carried in a hip pocket. Four to six small minnows can be carried for several hours in this manner as the uncorked bottle permits free entrance of air and movement aerates the water.

Rabbit Brooder Made From Keg

Raising baby rabbits in the winter is no problem if you use an inexpensive brooder like the one shown. It is made from a nail keg and is heated by an electric-light bulb. The keg is supported horizontally by two feet cut as indicated and screwed in place. A lamp housing constructed of $\frac{1}{2}$ -in. plywood is mounted over a 7 x 7-in. opening in the upper side of the keg. Size of the bulb, which should be shielded with sheet metal, is determined by the amount of heat required. The open end of the keg is closed with a plywood disk screwed in place for easy removal when the straw nesting has to be replaced. A 5 x 5-in. entrance is cut in the disk as shown.

Arthur A. Stevens, Canby, Ore.





The first thing to do after floodwaters recede is to have the car towed to parking space for reconditioning

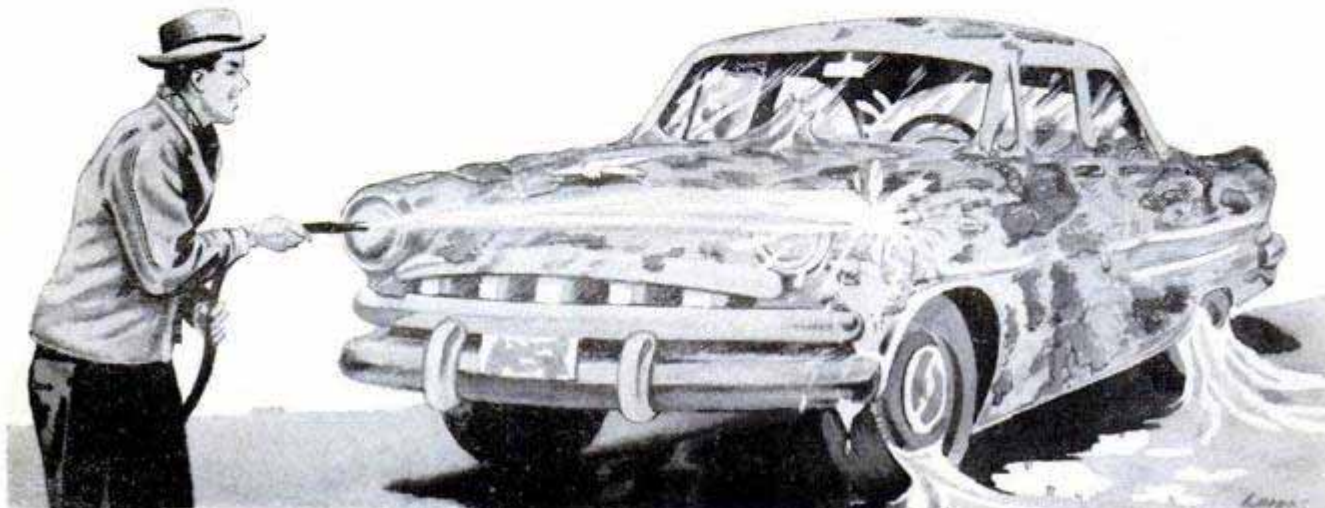
REDUCING FLOOD DAMAGE

By Ed Packer

SHOULD YOU ever be forced to abandon your car to a sudden, swirling flood, the receding waters may leave it looking something like the cars in the photos above and on the opposite page. Often the prospects for salvage and repair appear pretty discouraging, especially if the windows have been broken and the interior of the car half filled with water-borne sand, silt and other debris left in the wake of floodwaters. But while you're viewing the "wreck," keep in mind the chances are good that damage to the vital mechanical parts is comparatively slight and, that by follow-

ing a step-by-step procedure you can put the old bus back on the road as sound and good as ever.

The first thing to do is have the car towed to a garage or parking space where facilities for cleaning are available. When possible to reach the plug, drain the differential before permitting the car to be moved. This will get rid of all the silt-laden water that may have found its way into the differential housing. Remove the battery immediately and take it to a service station for reconditioning, as the electrolyte may have been contaminated by impure water. If so,





Montgomery photos

Cleaning up a convertible can appear discouraging, but chances are that car still is mechanically sound

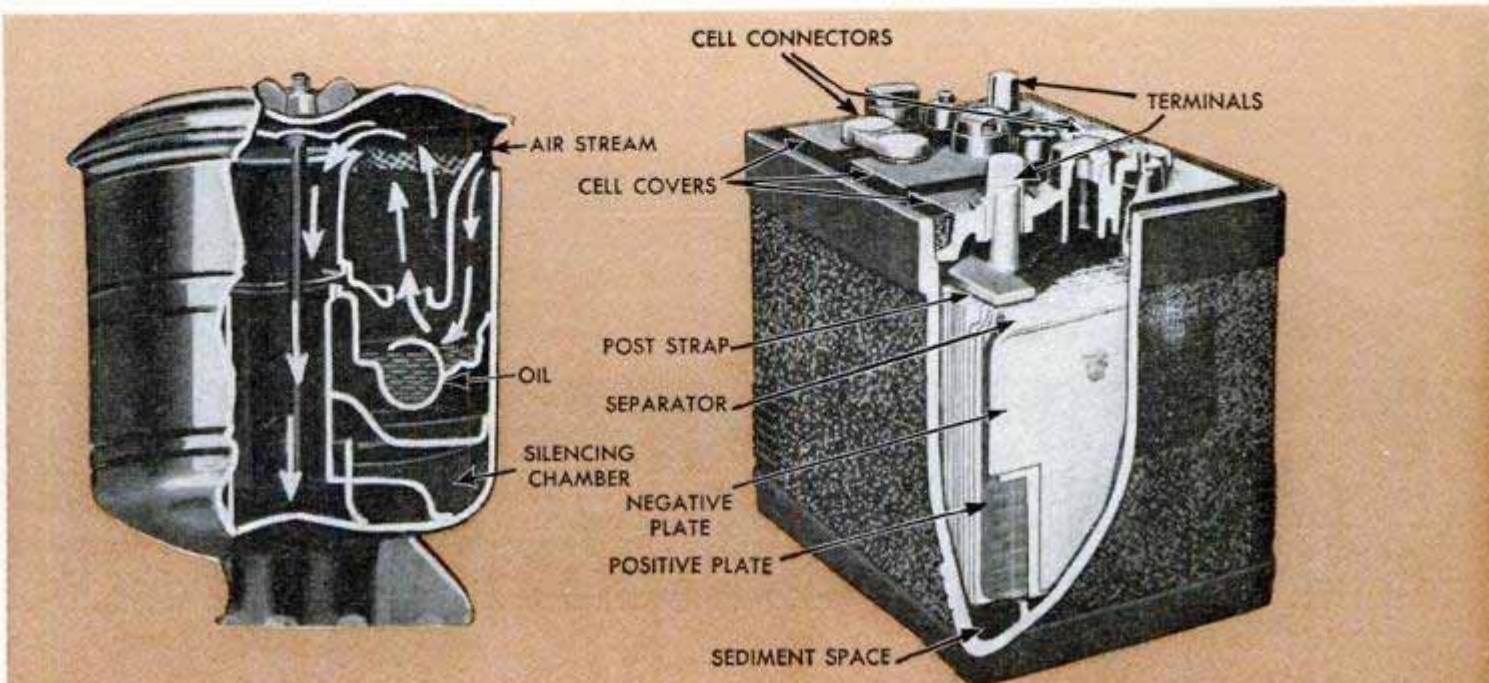
TO YOUR CAR

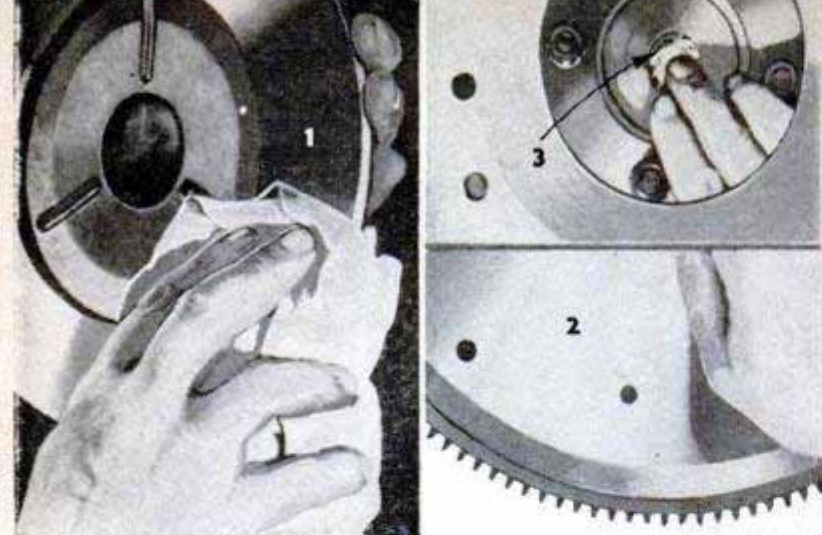
it will have to be replaced and the battery recharged. If possible avoid moving any part of any mechanism, including the windows and steering wheel, until the car has been parked where the cooling system, crankcase, transmission (conventional type) and the fuel pump and fuel tank can be drained. In addition, it's a good idea to drain the hydraulic-brake system, including the master cylinder and also the steering gear.

The best way to flush away mud and other debris is to connect a hose, without

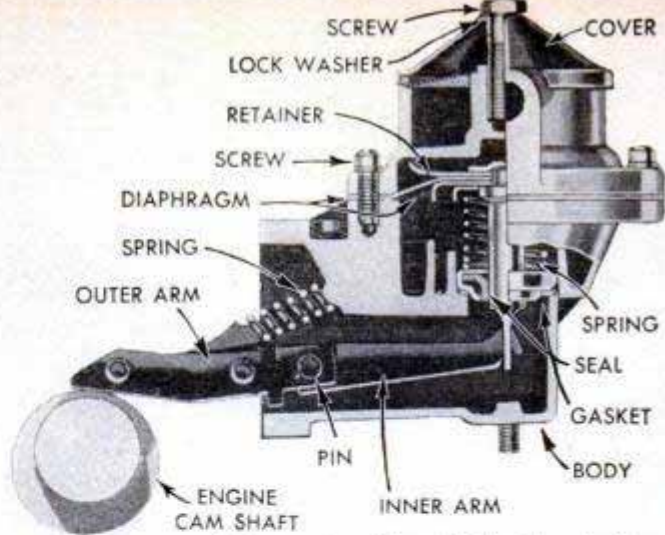
a nozzle, and adjust the water pressure to give a full curving stream. Open the doors and trunk and take out the seat cushions. Wash the cushions and then invert them on sawhorses so they will drain and dry quickly. Then hose the car inside and out, leaving the doors open until fabric is dry.

At this point, if it is at all possible, have the car towed to a service station or garage where facilities will be available for reconditioning the mechanical parts. If any quantity of water ran out of the crankcase when it was drained, it can be safely assumed that, even though the water displaced the oil in the pan, the oil pump still contains a quantity of gritty silt carried in



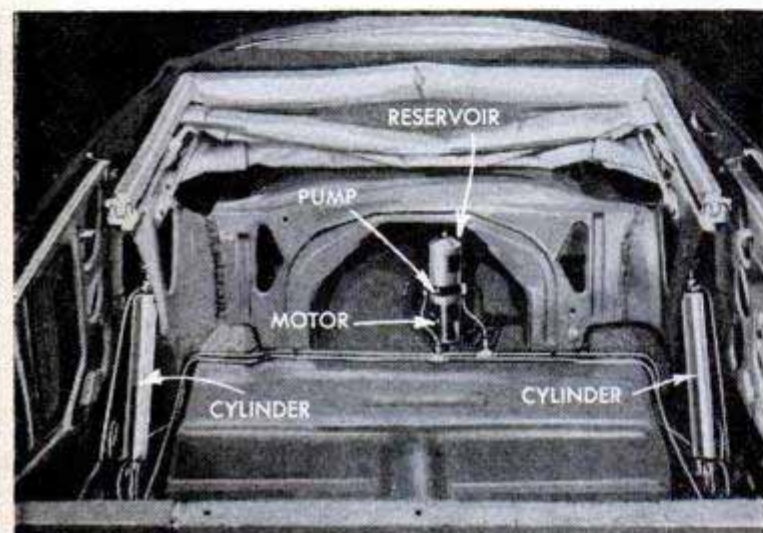


Do a careful job on the clutch, especially on the pressure plate, flywheel and pilot bearing, parts 1, 2 and 3

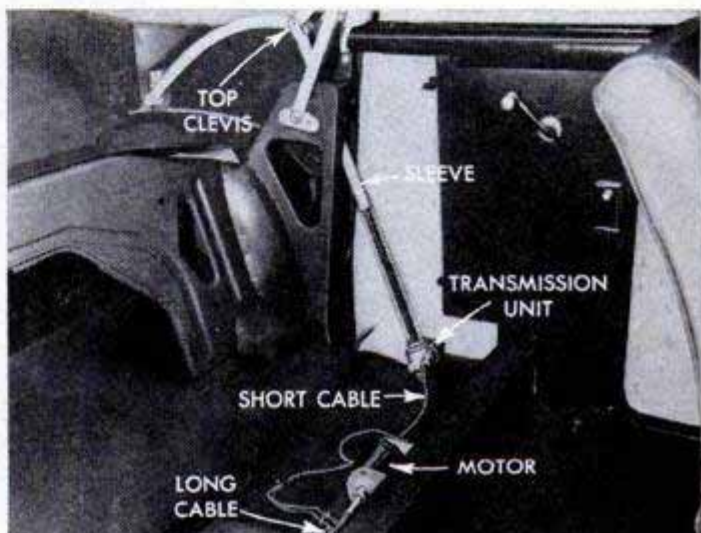


Photos courtesy Plymouth Div. Chrysler Corp.

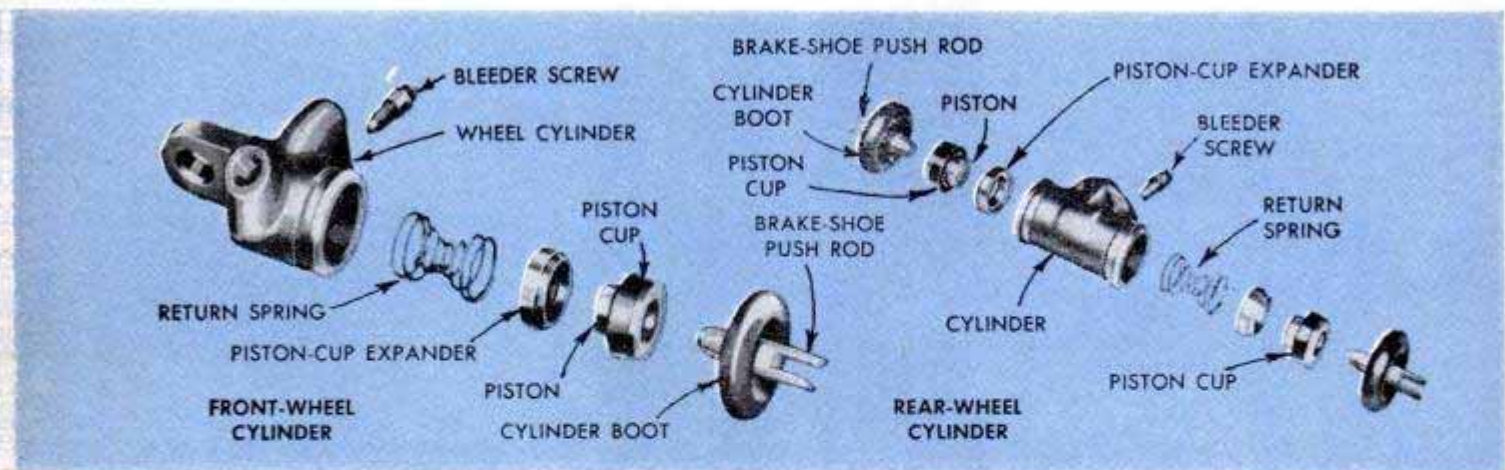
It isn't likely that fuel pump will be affected even though submerged. It is cleaned easily if necessary



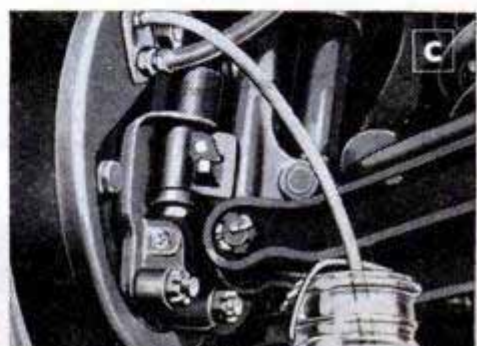
Hydraulic lifts for convertible tops may not need servicing. Check after car has been reconditioned



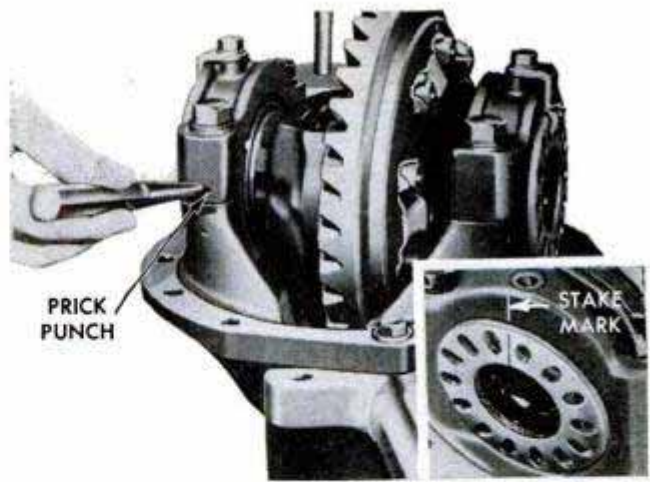
Dismantle the electrical lift for convertible top and clean and dry all the parts. Then relubricate the transmission unit



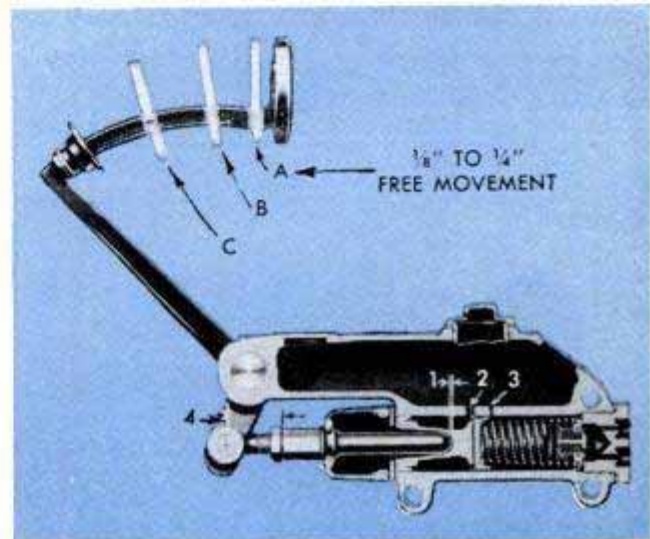
Leave reconditioning and servicing of hydraulic brakes to your serviceman as he will have special equipment required. Dismantled master and wheel cylinders are shown above. Below, bleeding air out of brake lines



by the floodwaters. There is always the possibility that this may have found its way to wear surfaces of the crankshaft and possibly the camshaft by incorporation with the displaced oil. In this case it will be necessary to drop the oil pan and remove the valve cover so that the interior of the engine can be washed thoroughly and the oil passages blown out with compressed air. Lacking other equipment, an ordinary paint-spray gun filled with kerosene does a good job of washing the crankcase and valve chamber. While carrying out this procedure don't forget to remove the oil filter, blow out the oil lines leading to it and renew the filter cartridge. Blow out the fuel and hydraulic-brake lines. Clean the oil pump and inlet screen thoroughly to assure removal of all gritty substances. If the engine was submerged, even for a short time, there's reason to suspect that water may have entered the cylinders through the air cleaner. Because of this possibility it's a wise precaution to open the engine, remove any water present and dry the upper cylinder walls and tops of the pistons. Coat the cylinder walls and pistons with light oil. Pour a small quantity of light oil on top of each piston. It will creep past the rings and coat the lower cylinder walls to prevent rust and provide initial lubrication when starting the engine for the first time after reconditioning. Be sure to use a new gasket when replacing the cylinder head. Dismantle the carburetor and blow it out with compressed air. Clean the air cleaner thoroughly before replacing it. Replace the oil pump and oil pan and fill the crankcase to the recommended level with special break-in oil, such as that used in new cars. Fill the transmission and differential with a half-and-half mixture of kerosene and No. 20 crankcase oil. All parts of the ignition system and also the generator and starter should be dismantled and thoroughly cleaned and dried out. Some parts, such as the armatures and field coils of the starter and generator, parts of the distributor, also the condenser, spark coil and voltage regulator can be dried quickly in an oven at 160 deg. When reassembling the generator and starter be sure that the brushes are correctly installed and don't forget to lubricate the bearings of both units. Be sure to place a few drops of light oil on all moving parts of the starter gear. To prevent rust, all parts of the distributor assembly subject to wear should be coated with light oil. Clean the breaker points and wipe light oil on the breaker-arm and governor-weight springs. Clean and dry the vacuum chamber before reassembling the distributor. When assembling, make sure that the wick in the oiler, located just beneath the distributor body, is clean and



When removing differential gear make prick-punch marks to insure returning parts to proper position



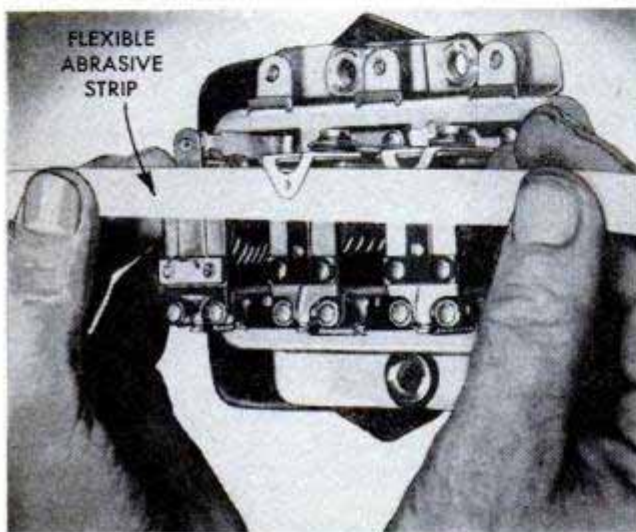
Adjust free movement of the brake pedal after servicing brakes. Recommendations vary from $\frac{1}{8}$ to $\frac{1}{2}$ in.

well saturated with light oil. Also, it's a good idea to coat such parts as the governor weights and the upper end of the spindle with light oil while assembling. Remove all the spark plugs, clean them and readjust the points. Pull the wires from the distributor cap and blow out each terminal socket. Examine the voltage regulator carefully for embedded sand and other foreign particles that might interfere with its operation. Brighten the contact points with a fine abrasive strip which is made especially for this purpose. If the unit has been damaged in any way, by water or otherwise, it is best to replace it. As the final step on the electrical system, dismantle the horn, clean the parts thoroughly and brighten the contact points. After the battery has been installed it may be necessary to adjust the tone of the horn by releasing the lock-nut, No. 3, and turning the adjusting screw, No. 2, as in the lower left-hand photo on page 191.

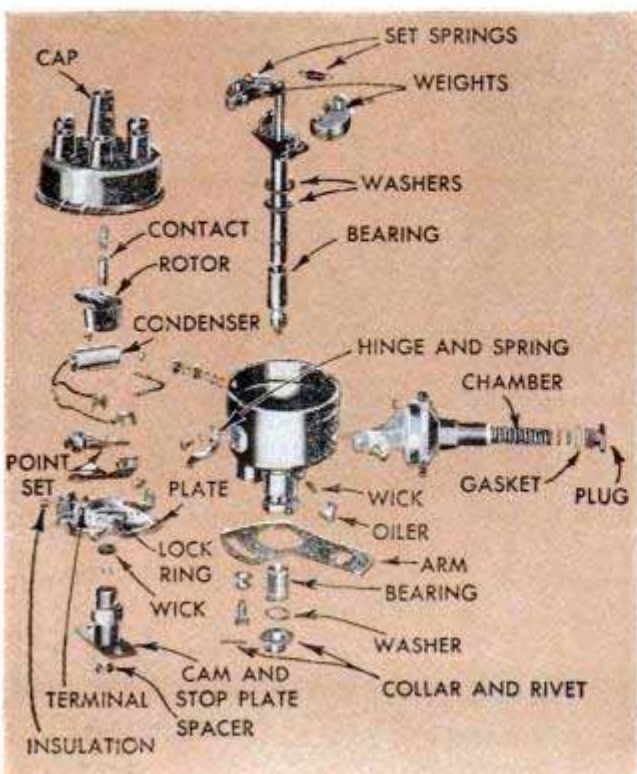
The clutch (conventional disk type) is one of the most vulnerable parts of the car to flood damage. In some instances it is possible to recondition it satisfactorily fix



When generator and starter are removed it may be necessary to clean commutators. Use fine sandpaper



All parts of electrical system, including voltage regulator, above, and distributor, below, must be thoroughly reconditioned. Relubricate all the wear parts



simply by slipping it lightly after the engine is started. Often this procedure will generate sufficient heat to dry the disk and clear rust from the machined surface of the flywheel. However, careful auto mechanics will not be entirely satisfied with this rather slipshod method. They will prefer to dismantle the clutch and go over it piece by piece. Special attention should be given to the condition of the disk, as water absorption may cause swelling and distortion which in turn will result in unsatisfactory operation. If the disk shows water damage in any appreciable degree it is advisable to replace it. Clutch parts operate dry, without oil, and rust will attack the machined surfaces of the flywheel, the splined shaft and pressure-plate springs if not checked immediately. Remove rust that may have formed, rub a film of oil on the pressure-plate springs and clean and lubricate the pilot bearing before reassembling the clutch.

Before starting the engine, flush the cooling system thoroughly and direct a hard, thin stream of water through the radiator core from the back to remove any mud or sand that may have lodged in the core. Fill the system with soft water or antifreeze if required.

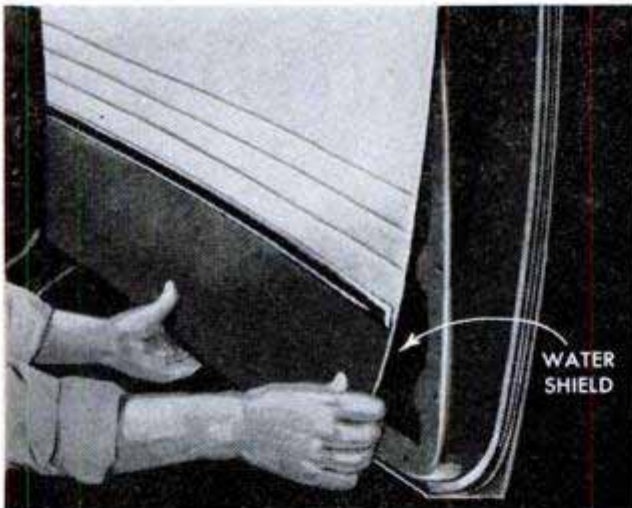
Next, install the battery and then jack up the car, blocking under the axles so the wheels can turn freely. Before switching on the ignition, turn the engine over several times with the starter to assure that oil from the pump reaches the bearings. Then start the engine, shift to high gear and allow it to run slightly above idling speed (about 25 m.p.h.) for 20 to 30 minutes. Immediately after starting the engine note whether the speedometer is operating and also keep a close check on the oil-pressure gauge and the ammeter. If neither of the latter instruments registers, then it is best to stop the engine and investigate the cause. If the fault is in the instruments, they should be replaced. After running the engine with the transmission in high gear for the specified time, stop it and immediately drain the transmission and differential. After draining thoroughly, refill with regular oil of the specified viscosity. Usually this flushing procedure can be considered adequate. However, if there is any reason to suspect that this treatment may be insufficient, then it's good insurance to dismantle both the transmission and differential and do a more thorough job of reconditioning. If this is done, it's a good idea to prick-punch the parts of the differential gear as in the upper photo on page 189. This precaution will assure that the parts are reassembled in their proper relationship. Always install new gaskets on any units that are disassembled.

If your car is a convertible having a cloth top which is raised and lowered electrically or hydraulically, then the power unit will, of course, require attention along with the other mechanical parts. In the electrical unit, the motor should be removed, cleaned and dried out. All other parts must be inspected and cleaned and, where necessary, relubricated. The hydraulic unit is less susceptible to flood damage. Unless it has been damaged mechanically by floating debris, then it probably will be safe to leave it for trial later on when you have the car ready for service. If service is required to recondition the unit, it will pay to have the job done by a serviceman, who will have equipment required for complete overhaul. This also is true of the wheel brakes which will require special equipment for filling the master cylinder and lines and bleeding the system to assure proper operation. The brakes may require relining. Have the serviceman adjust the brake-pedal travel to the correct amount recommended by the manufacturer of the car, as this distance varies.

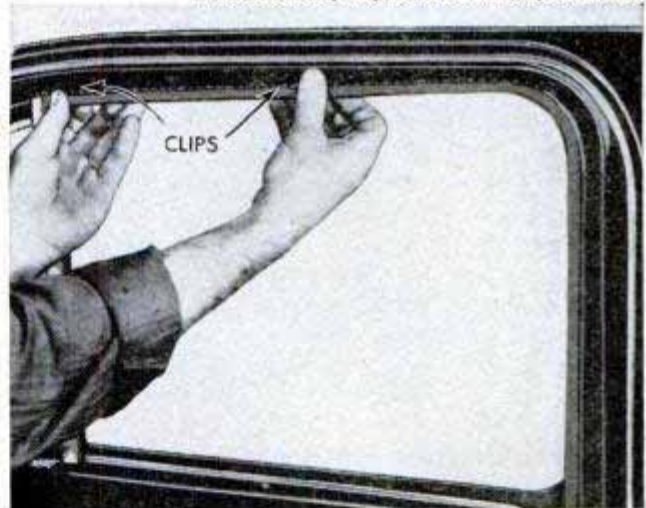
By this time the felt channels in the

doors and windows should be sufficiently dried out to permit the glass to roll up and down easily. If the channels have not been subjected to a prolonged soaking they still should be serviceable. However, the door panels should be removed so the lifting mechanism can be cleaned and lubricated. Run water from the hose inside the glass compartment to wash out any sediment that may have collected. Flush the door locks with a lock-cleaning fluid and blow dry with compressed air. Lubricate the locks, strikers and hinges. If the fabric in the seat cushions is torn, have the damaged section renewed by a professional upholsterer. Discoloration of the fabric usually can be removed by steam cleaning, but care must be taken not to damage sponge-rubber padding. Unless the car is nearly new, do not permit the engine to run more than three to five hours with break-in oil in the crankcase, and then only at slow speeds. It generally is best in an older car to drain the break-in oil after two to three hours of operation. Drain the oil only when the engine is hot, then fill the crankcase with regular oil. ★ ★ ★

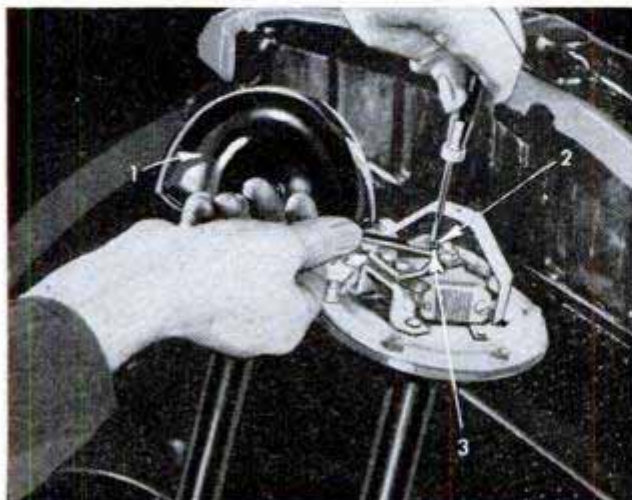
Photos courtesy Plymouth Div. Chrysler Corp.



Above, door panels should be removed so that glass-lifting mechanism can be cleaned and serviced. Below, it may be necessary to readjust the horn by removing cover and adjusting the screws, parts 1, 2 and 3



Above, glass channels may still be serviceable even though immersed. If not they are easily replaced. Below, usually a thorough washing and drying will recondition seat cushions. Then vacuum-clean the fabric





Camera Fitted With Extension To Eliminate Reflections

To eliminate surface reflections on the ground-glass of a twin-lens reflex camera, make yourself an extension for the focusing hood. Use a black paper envelope of the kind in which photographic paper is packaged. Cut the bottom from a 5 x 7 envelope and crease it lengthwise in the center of both sides to fit over the top of the hood as shown.

Virginia Hanson, Los Angeles, Calif.

Clipped Corner of Transparency Aids Positioning in Projector

The problem of keeping transparencies right side up when showing them in a darkened room can be eliminated simply by cutting off an upper corner of the mount. This will make it possible to feel whether or not the transparency is right side up as well as prevent it from being placed in the projector backwards. The job can be done with either a scissors or nail clippers.

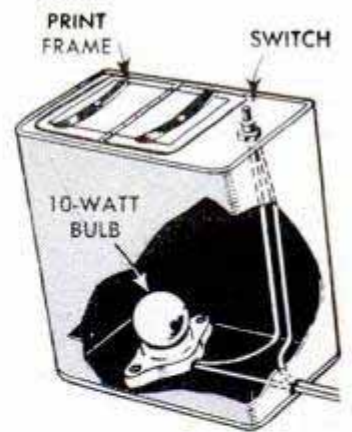
R. L. Taylor, Cuyahoga Falls, Ohio.

Zing - - -

Another one hooked, but what! That's the intriguing part of surf fishing—you never know what's on the line until you land it, and it takes a costly rod to do the job. Cost will be no problem if you make a husky rod as described next month. Read this story and get in on the fun of fishing the surf

Rectangular Paint Can Converted Into Inexpensive Print Box

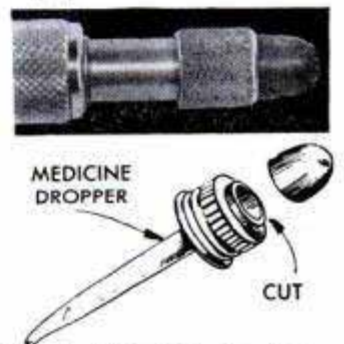
An inexpensive photographic print box can be made from a rectangular 1-gal. paint can by cutting out a section of the top of the can to fit a standard metal print frame. The frame is bolted over the opening and a switch is mounted in the top as shown.



On the bottom of the can under the center of the frame mount a porcelain light socket. If the interior of the can is clean, so that it will reflect light, a 10-watt bulb should be used.—Thornton J. Parker III, Chevy Chase, Md.

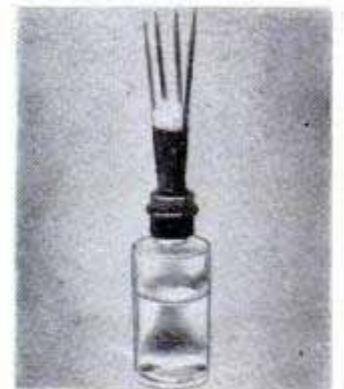
Rubber Tips for Tripod Legs From Medicine-Dropper Bulbs

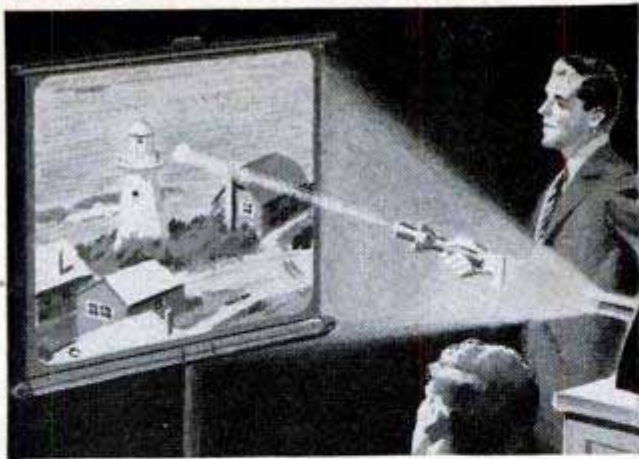
Replacements for rubber tips on the legs of some camera tripods can be made by cutting the tops from large medicine-dropper bulbs. Pack cotton into each bulb to act as a pad and slip it over the end of the leg, holding it in place with masking tape if necessary. Rubber tips that are not worn may be preserved indefinitely by placing the bulbs over them as "shoes."—John J. Rea, Urbana, Ill.



"Pincushion" on Bottle Cap Holds Retouching Materials

To assure having cotton and applicator sticks stored close at hand when using a retouching medium, one photographer made a holder from part of a toy balloon to fit over the cap of the retoucher bottle. Cutting the neck from the balloon, he filled it with a small quantity of cotton and then stretched the mouthpiece of the neck over the cap. The applicator sticks are pushed down into the cotton as shown.



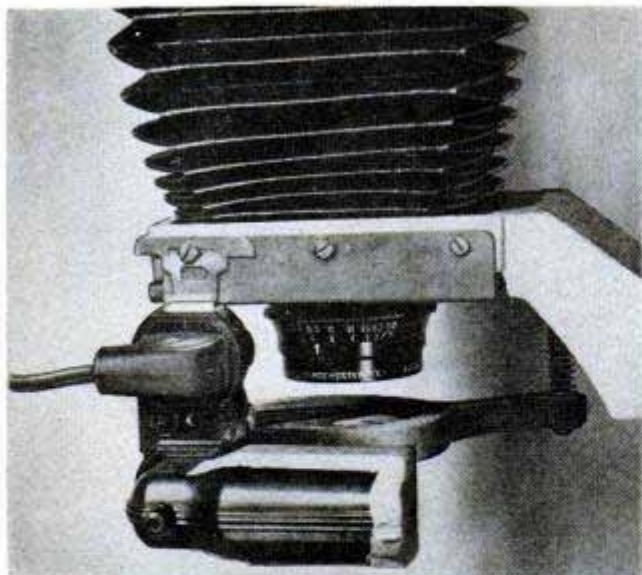


LIGHT- SPOT POINTER

HAVE THIS spot pointer handy the next time you show those vacation pictures. With it you can indicate interesting details without distracting the attention of your audience with a yardstick or some other improvised pointer. It consists of an ordinary flashlight fitted with a projecting lens from a 16-mm. projector. The projecting lens is fitted in a flanged mounting, or housing, made by soldering a sheet-brass flange to a length of thin-walled brass tubing which is a sliding fit over the lens barrel. In the assembly the flanged tube is inserted through the lens-retaining ring of the flashlight as shown in the detail at the right. When the ring is screwed tightly in place, the projector-lens tube and the flashlight lens are held securely in position. The projector lens is focused by sliding it in the tubular housing. Note that the flashlight reflector is covered with black paper so that only the light from the filament reaches the projecting lens. In flashlights having large reflector heads it may be necessary to assemble the parts without the flashlight lens. In this case, replace the lens with a cardboard washer of approximately the same thickness as the lens at the rim. In use, adjust the projecting lens until it throws a round, sharp-edged spot on the picture screen. For maximum brilliance of the spot, equip the flashlight with a new bulb and fresh batteries. Be sure that the lens slides smoothly in the tubing, yet is sufficiently tight to prevent it from falling out when the pointer is in use.



Safelight on Enlarger Lens Saves Darkroom Time



Lost time and motion can be saved in the darkroom by fitting your enlarger with a small safelight to illuminate the calibrations on the lens. Thus, in making a print, you merely focus the enlarger, stop down the lens, load the easel and make the exposure—no reaching for the room light switch to see the lens setting and no temporary blindness when the room light is turned off. The lamp is improvised from a dime-store sewing-machine lamp which is fitted with a cardboard shade resembling the lid of a box. A window is cut in the top

and covered with a piece of safelight filter. The shade is attached to the lamp with adhesive tape to seal against any light leakage. A duplex receptacle, in which the lamp is plugged, is mounted to the enlarger by one of the screws holding the lensboard retainer as shown in the photo. If you are unable to make use of an existing screw, an extra mounting hole can be drilled in the bellows bracket. Current is supplied to the lamp by an extension cord which is plugged into one side of the receptacle.

Robert C. Wilson, Akron, Ohio.

Strengthening Photo Developer

If you discover the developer getting weak when finishing the last of a batch of photographic prints, add a little sodium carbonate to the solution to make it last longer. This will enable you to develop a few more prints without having to mix fresh developer, eliminating also the need for forcing the prints in a weak, slow developer.—Robert C. Florian, Chicago.

☐ A handy, pocket-size exposure guide can be made by pasting tables and other data included with film on a piece of stiff cardboard. Use both sides of the card for the two kinds of film used most often and shellac to protect the tables from moisture.

Popular Mechanics Bookshop

Question:

How can I seal the basement floor—and I mean really seal it? Answer: See complete details starting on page 72 of *How to Paint With Brush and Spray*. Question: How can I apply those popular blond and pickled finishes to my own furniture? Answer: In the same book you'll find six full pages of "furniture schedules" telling step by step how to develop modern as well as traditional finishes. Question: Any ideas on touching-up the paint on my car? Answer: You bet! See page 142, same book. You'll find a thousand and one other answers to your painting problems, too. Question: Where can I get the book? Answer: Order *How to Paint With Brush and Spray* from Popular Mechanics Press, 208 E. Ontario St., Chicago, Ill. The price is only \$2.50.

For the Kids . . .

. . . we offer that all-time favorite, *The Boy Mechanic*. Here, in a brand-new edition, is the standard handbook for young craftsmen, completely revised and packed with more than 500 projects for any boy.

Each step is clearly illustrated with photos and drawings. It's a treasure chest of things to make from birdhouses to box kites, with special sections on outdoor projects, models, scientific experiments and indoor crafts. There's information for Dad, too, on how to get more fun out of his lad's electric train. The price is only \$2.95 from Popular Mechanics Press, 208 E. Ontario St., Chicago 11.

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. . . of leaking faucets and slow drains? The *Home Plumbing Guide* offers complete information on the design, installation, operation and repair of home-plumbing systems. It's written by E. R. Haan, former Shop Notes Editor of *Popular Mechanics*. There are chapters devoted to materials and tools, drainage systems, private disposal of sewage, installing house water lines, valves, faucets and fixtures. Here's an authoritative book that belongs in every home library—it can save the homeowner many times its price. Order the *Home Plumbing Guide* for \$3.50 from Popular Mechanics Press, 208 East Ontario St., Chicago 11.

All books available from Popular Mechanics Book Department, 208 E. Ontario St., Chicago 11

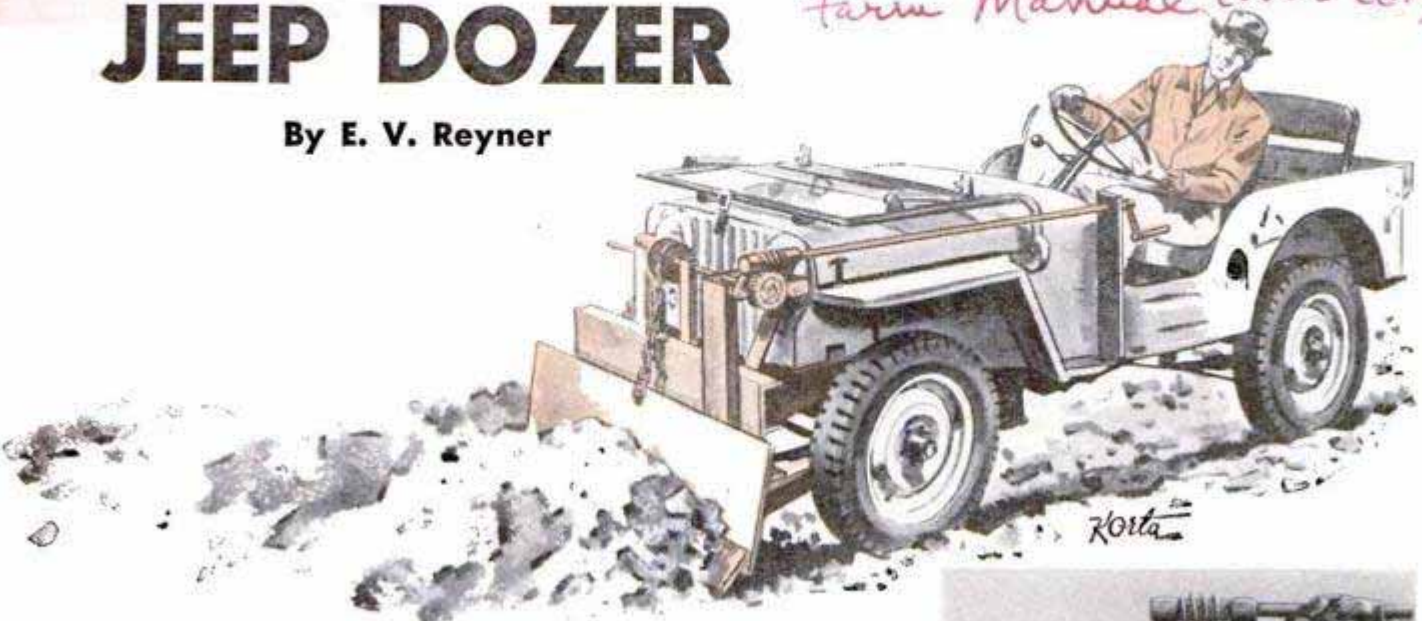


SHOP NOTES

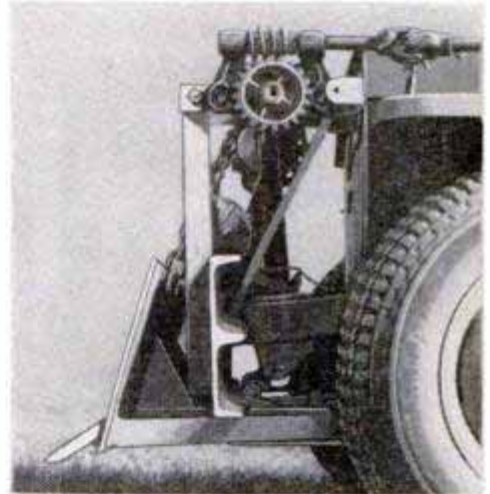
Farm Manual (1955 ed.)

JEEP DOZER

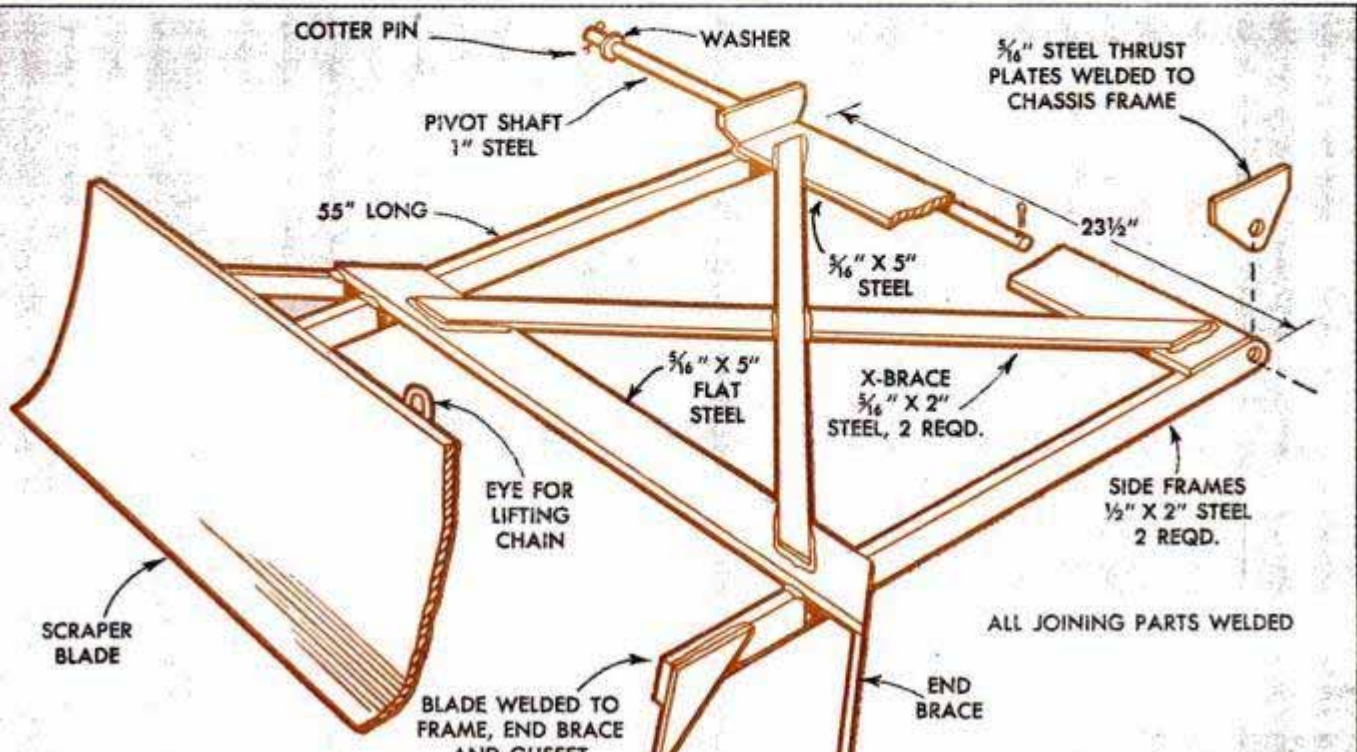
By E. V. Reyner



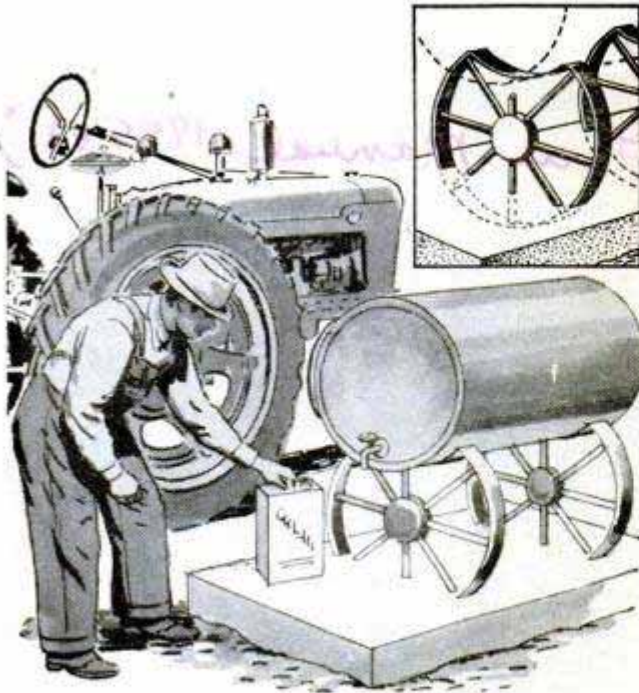
THIS LIGHT DOZER utilizes the agility, maneuverability and power of the Jeep to move snow, fill ditches, level fields and grade homesites. These jobs require a small, short-coupled unit that can move fast where the going is rough. The X-braced frame of the dozer detailed below is dimensioned for the regular Jeep with four-wheel drive and is operated by a simple hand lift improvised from a binder-wheel lifting gear mounted on two pieces of steel channel as in the photo at the right. The gear, which is a self-contained unit, is bolted to a bracket supported by the channels. These, in turn, are bolted to a special bumper made by welding two lengths of channel web to web. The gear operates a drum-type hoist, the free end of the chain being attached to the scraper blade. The dozer pivots on thrust plates welded to the Jeep frame.



Raising gear is operated by a crank attached to extended shaft supported by a bracket welded to the Jeep body



Sturdy Rack for Holding Tank From Farm-Implement Wheels



One farmer found that a pair of altered farm-implement wheels set in a concrete base provided a sturdy, durable rack for holding a fuel storage tank. A single spoke was cut from each wheel and the rim bent in at that point to fit the curving side of the tank. After pouring the concrete base, which was made long enough to provide a rest at one end for cans being filled, the wheels were set in the concrete with the bent portion uppermost. When the concrete had hardened sufficiently, the tank was installed on the top of the wheels.

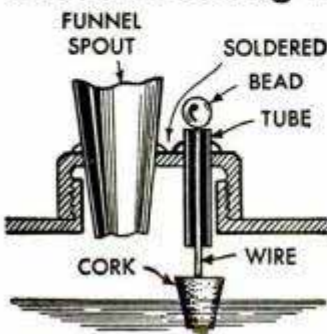
G. E. Hendrickson, Argyle, Wis.

Paper-Tape Adhesive Renewed By Moisture in Kitchen

If you have a roll of gummed paper tape that has dried to the extent where the adhesive is no longer effective, store it on a high shelf in the kitchen for a few days. The high humidity of the room will soon restore the tape to its original usefulness.

H. G. Frommer, Milwaukee, Wis.

Novel Cap Warns of Overflow When Refueling Tractor



By using an extra gas-tank cap fitted with a funnel and a floating level gauge, one farmer is able to fill his tractor gas tank without danger of the fuel overflowing. The

spout of the funnel is soldered into one of two holes drilled through the cap. A short length of copper tubing soldered in the second hole serves as an air vent and as a sleeve for the level indicator. The latter is simply a length of wire having a cork impaled on the lower end and a wooden bead mounted on the top. Thus, when the tank is almost filled, the cork will float and raise the bead. The wire should be short enough so the bead will not rise until the level of the gasoline has reached nearly to the top of the tank.

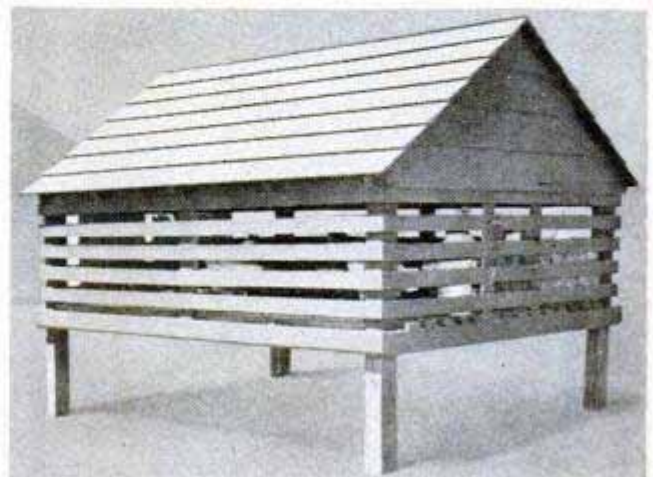
John Kretschmar, Monsey, N. Y.

Improvised Pouring Spout

Thinner or cleaning fluid poured from a gallon can will not be wasted by spilling if the can is fitted with a pouring spout. The rubber shell of an extension-cord plug provides a ready-made spout when pressed tightly over the threaded neck of the can. If the shell fits too loosely to stay in place while pouring, the can neck may be shimmed by wrapping the threads with friction tape.

Outdoor "Broody Coop" on Farm Given Legs to Speed Function

Elevated off the ground and located in the chicken yard where air can circulate about it, this "broody coop" has proven a valuable timesaver for one farmer. The coop, which is supported almost 2 ft. above the ground on 4 x 4 legs, simplifies both caring for and feeding the birds as well as cleaning underneath. The sides and flooring consist of 1 x 2 strips spaced approximately 1 in. apart, whereas slightly heavier stock is used for cross members that support the flooring. Uprights are centered in both ends of the coop to permit installation of small doors. The roof and gable ends are constructed from beveled drop siding. The coop, which is 6 ft. wide and 8 ft. long, is 2 ft. high at the sides and 4 ft. high at the ridge.



POPULAR MECHANICS

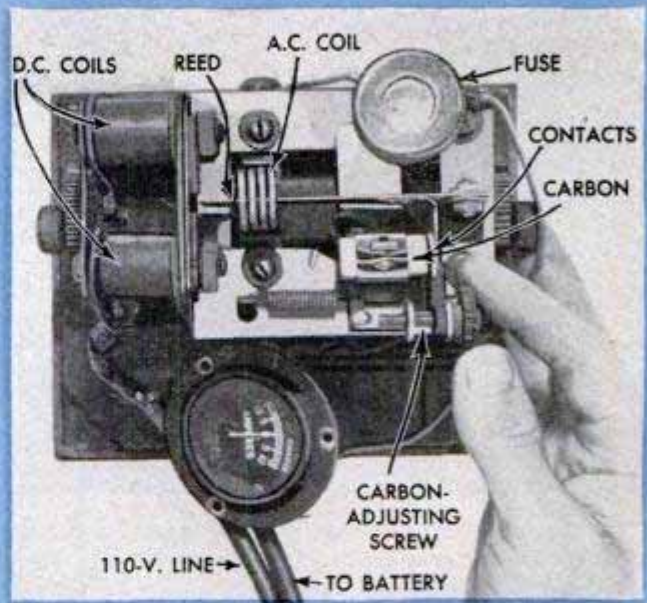


Serviceing VIBRATOR CHARGER

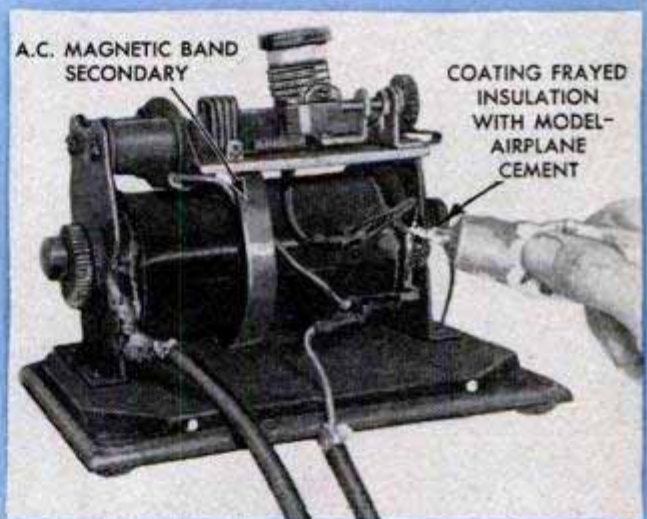
By Max Alth

KEEPING AN older-type vibrator charger in working order is a simple procedure that can pay off on a zero-cold night when your car battery needs a boost. For a complete check-over it's best to remove the unit from the metal box, or case. Be careful not to damage the wiring or the ammeter when this is done. Brush the accumulation of dust from all parts, especially the reed and the a.c. and d.c. coils. Be sure that the screw or bolt anchoring the reed is tight. Check the entire unit for frayed or cracked insulation and broken wires. Replace defective wiring and coat any frayed insulation with model-airplane cement and press back into place. Open the vibrator contact points by backing off the adjusting knob. Note the size of the fuse. It should have the same ampere rating as the high reading on the ammeter, usually 10 amp. When you plug the unit into an a.c. outlet, the reed should vibrate even though the points are quite widely separated. Badly pitted points may cause some irregularity and it is advisable to reface them so that they meet in as nearly a flat, over-all contact as possible.

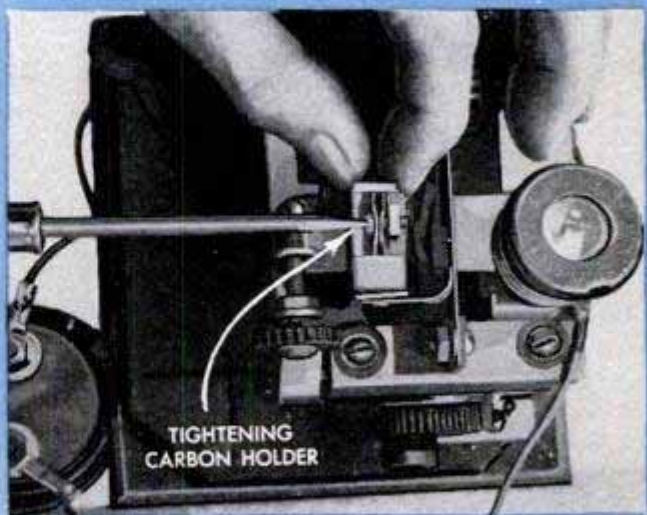
To check the d.c. coil, clip the low-voltage leads to the battery posts and disconnect the a.c. plug. Adjust the reed



Before servicing the charger unit it's a good idea to remove it from the case. Be careful not to damage either the ammeter or wiring in this procedure



Above, give unit a thorough check-over for defective wiring. Recement frayed insulation. Below, be sure the carbon is tight in its holder before using





After servicing the charger, check it over for loose connections. Some adjustment of the reed and other parts will be necessary after unit is in operation

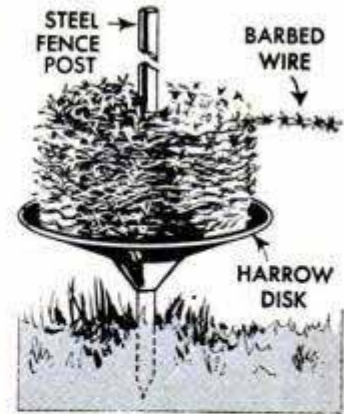
until it vibrates in a manner similar to a buzzer and sparks appear between contact points. A 1 to 3-amp. rate usually will show on the ammeter. Then connect to the a.c. and adjust the reed to give the highest possible charging rate with reasonably quiet operation. If the battery is low, at half charge or less, and the charging rate will not rise above 2 to 3 amp., check for poor contact between the battery clips and the posts, also loose connections at the ammeter and fuse. When putting the unit in service after reconditioning, note carefully the performance of the ammeter. If the pointer swings widely, close the points slightly or until it steadies. If the points are too far apart, excessive sparking and a lowered charging rate will result. If, on the other hand, adjustment fails to quiet the vibrating reed and the ammeter pointer still wavers, adjust the spacing between the free end of the reed and the d.c. coils. It is probable that a slight adjustment of the reed while the unit is in operation, will quiet the reed and may even increase the charging rate slightly. In normal operation this should range from 4 to 6 amp., with 5 amp. a good average unless, of course, the battery is bearing full charge. ★ ★ ★

Loose Screw Is Tightened By Notching Thread

When a small machine screw is made to serve as a stripper bolt by permitting a slight movement of the part it is holding, the problem of preventing the screw from turning is solved by notching the threads diagonally with side-cutting pliers. The notches have much the same holding power as knurled threads on certain types of self-locking screws.

Barbed Wire Unwound Safely From Harrow-Disk Reel

To hold a spool of barbed wire so that it can be unwound safely as needed for farm fencing jobs, improvise this useful reel from a steel fence post and a harrow disk. The post is driven partially into the ground and the disk is dropped over the end of the post so that it rests on the metal plate near the bottom. Then the spool of barbed wire is placed over the post and set on the disk. Pulling on the wire rotates both the spool and disk to pay out the wire.

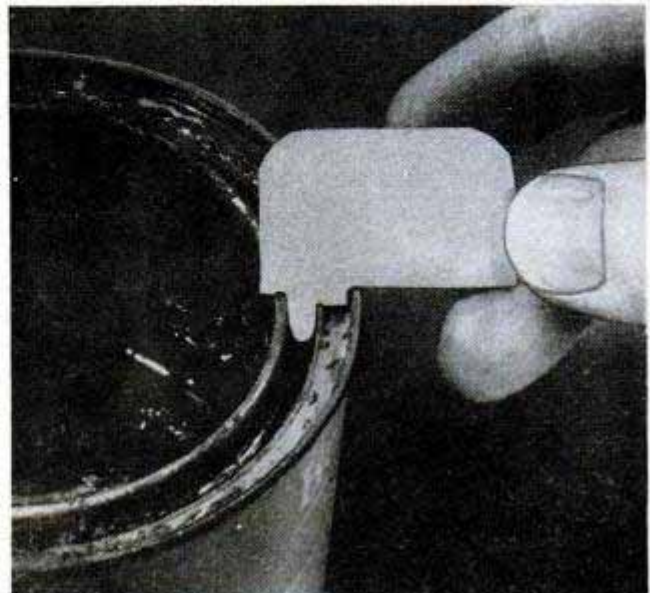


Increasing Life of Dry Cells

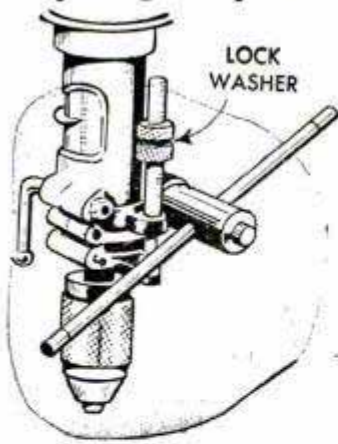
The life of flashlight dry cells can be prolonged by polishing the contacting surfaces at both ends of each cell with fine sandpaper. All traces of corrosion are removed by this treatment and contact is improved. I. M. Fenn, Chicago.

Paint-Can Rims Cleaned Easily With Small Contour Scraper

To simplify cleaning the rims of paint cans so they can be sealed tightly, one painter made a small contour scraper from a piece of sheet metal. Working by trial and error, he transferred the contour of the rim onto cardboard which then was used as a pattern for tracing the outline on a piece of sheet metal. Allowing enough extra metal for a handle, the piece was cut out and then filed to the exact shape required.



Depth-Stop Nuts on Drill Press Kept Tight by Lock Washer



If the knurled nuts on the depth stop of your drill press have a tendency to work loose as a result of vibration when the press is operating, a lock washer inserted between them will provide an effective remedy. Thus, when tightened by finger pressure only, the nuts will stay securely in place during work and yet be easy to adjust whenever a change in setting is necessary.

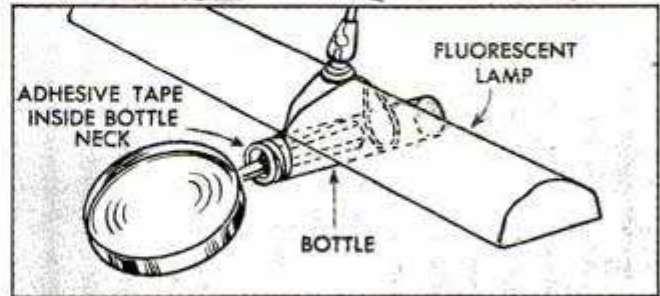
finger pressure only, the nuts will stay securely in place during work and yet be easy to adjust whenever a change in setting is necessary.

Handy Brake-Fluid Dispenser

By attaching a short length of rubber tubing near the bottom of a container used to pour brake fluid, one service-station attendant is better able to control the flow of the fluid when locating the cylinder-chamber opening. After punching a hole in the container, a nipple is soldered in place to take one end of the tubing. In use, the tubing is held upright along the side of the container while it is being filled, after which the free end is pinched until the opening is located.

Wire Holder for Hammer Hooked Over Belt

To carry a hammer when working on a ladder, scaffold or roof, one carpenter formed this novel holder from a piece of heavy wire, 1 ft. long. Slipped over the belt as shown, it can be worn either in front or back.—Grover Brinkman, Okawville, Ill.



Holder for Magnifying Glass Attaches to Artist's Lamp

To free both hands for work while using a magnifying glass, wire or tie a vial-type bottle large enough to contain the handle to an adjustable fluorescent lamp. As shown in the sketch, it will act as a holder for the magnifying glass. Adhesive tape applied around the inside neck of the bottle will provide a collar to keep the glass from slipping out while in use.

Walter White, Chicago.

Measuring Old Drill Shanks

As drills become old, the figures on their shanks which indicate their size sometimes become indiscernible. Where a caliper is not available, a fairly accurate reading may be taken with your shop vise. Close the vise carefully on the drill and measure the open span between the jaws with a ruler. Stove-bolt and machine-screw sizes also may be determined by this method.

Bob Funk, Sacramento, Calif.

Boxed-in Studs of Poultry House Provide Simple Feed Hopper

Hoppers for grit, oyster shell or laying mash can be improvised easily in a poultry house simply by boxing in pairs of studs and fitting them with shallow boxes at the bottom as shown. If held in place with screen-door hooks, the boxes may be removed easily for cleaning.

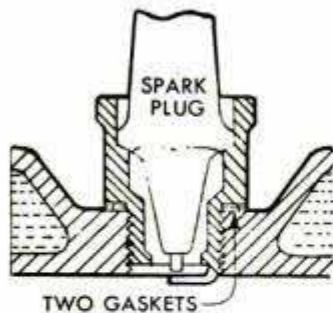


Sickle From Mowing Machine Makes Handy Weed Cutter



With all but three or four blade sections removed and the bar bent as shown, a discarded sickle from a mowing machine will provide an efficient weed cutter that is lighter and easier to handle than a scythe. The end of the bar serving as a handle may be smoothed and the edges rounded either on an emery wheel or with a file. Better still, rounded wooden pieces could be riveted to both sides of the bar and then taped if desired.

Extra Gasket Stops Plug Fouling



An extra gasket installed under each spark plug of your car will in many cases prevent plug fouling. The additional gasket raises the plug slightly so that it receives less oil. It also interrupts heat flow from the plug to the water jacket, thus causing the plug to run hotter and burn away deposits which might otherwise cause fouling.

Oil Cup on Car Air-Filter Cover Aids Gas Priming of Carburetor

Priming the carburetor with a little gasoline poured into the air-filter intake is one of the best ways to start a car in cold weather. But on most modern cars this

cannot be done without first removing the air-filter cover. One way of eliminating this step is to install on the cover a spring-lid oil cup of the type generally used on generator bearings. To do this, remove the cover and carefully punch a hole with a taper punch somewhere near the center so it will be positioned over the intake when the cover is replaced. Then force the cup into the hole and replace the cover. If desired, the cup may be brazed or soldered in place.

Handy Paddle for Shop Figuring

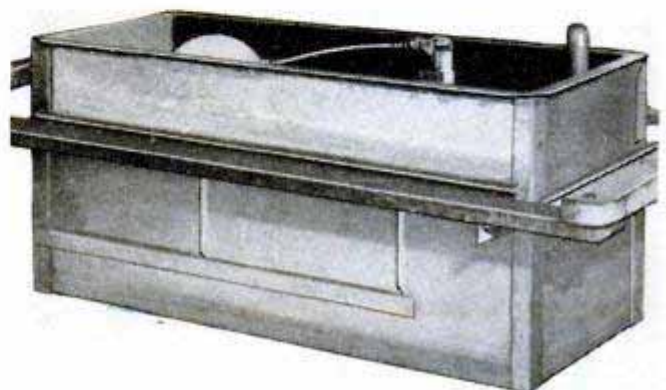
To provide a handy surface for recording measurements and figuring around his shop, one carpenter made this blackboard paddle. Cut from plywood, and drilled at the top so that it can be hung on the shop wall, the paddle is painted with standard blackboard paint. In use, the paddle saves the trouble of hunting for paper or scribbling on good pieces of lumber when figures are to be jotted down.

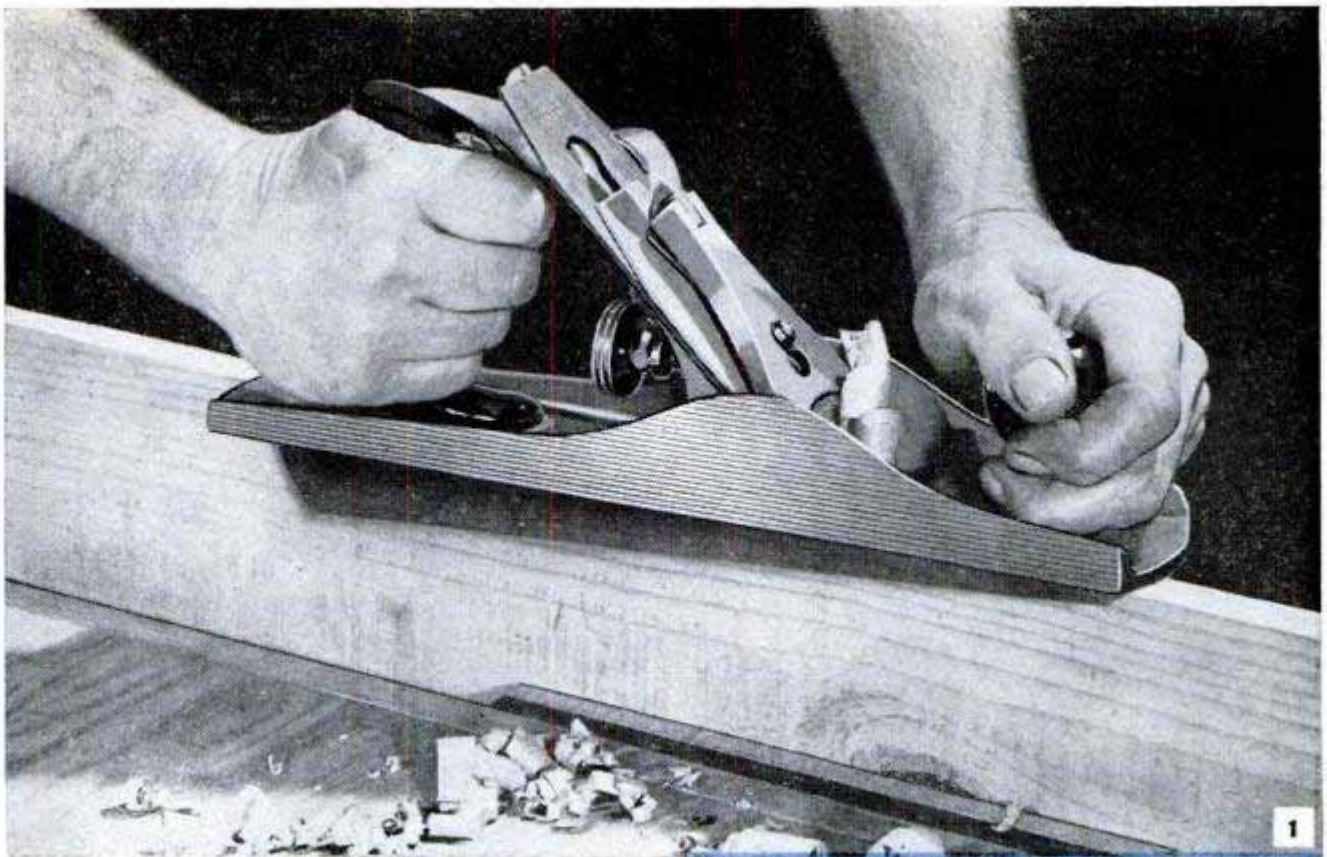


Poultry Waterer Refills When Water Level Lowers

Using a float valve from a toilet flush tank, this large-capacity poultry waterer refills automatically whenever the water level in the tank is lowered. The tank, which is made of welded angle steel and heavy galvanized iron, rests on a concrete base and is connected into the home water-supply system. A sliding door at one side of the base allows a kerosene heater to be placed under the tank for cold-weather operation. An outlet pipe with a stopper is located in one corner of the tank for easy draining, while a railing for birds to perch on is bolted around the waterer.

Gerald Rosenbloom, Wright, Iowa.

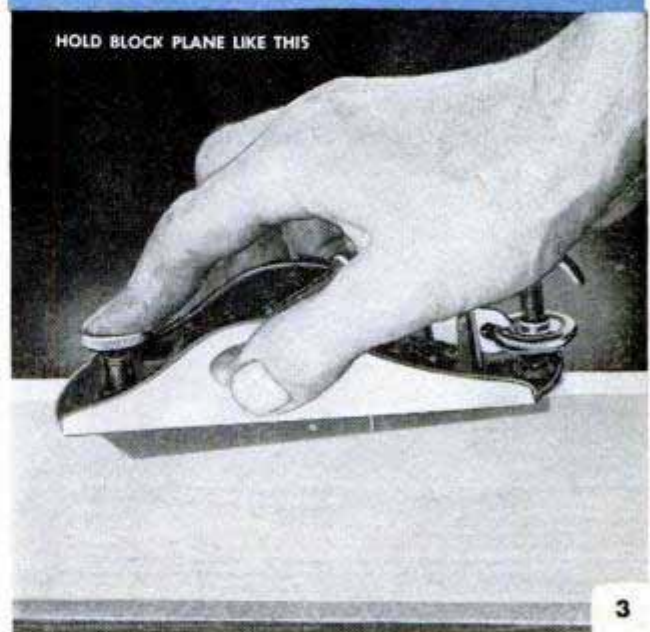
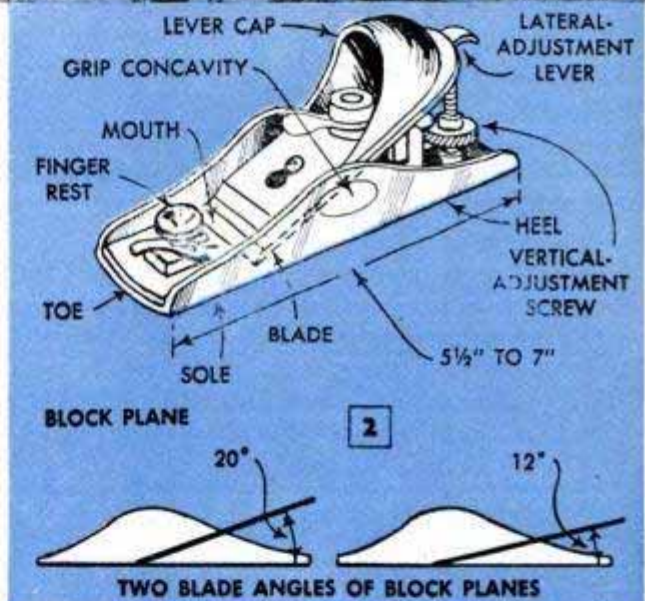


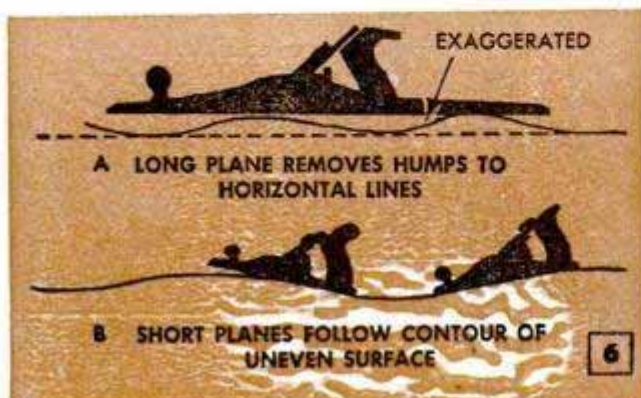
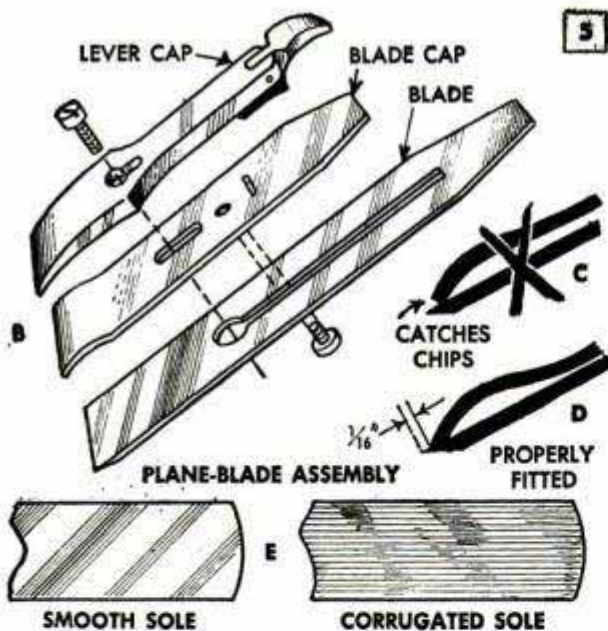
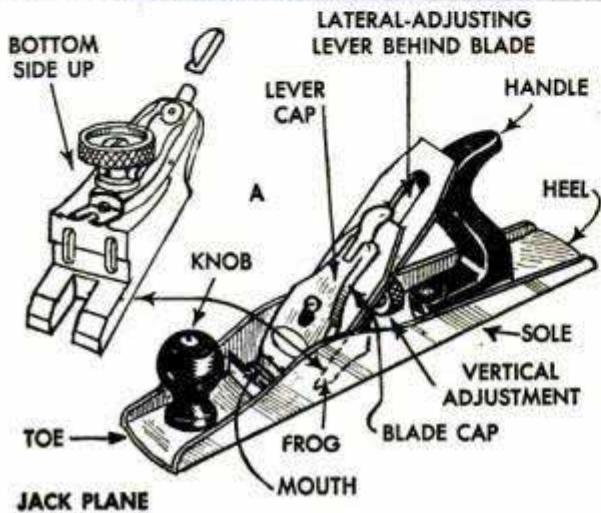


Planes Know-How

USED TO DRESS WOOD to exact size and produce smooth surfaces, a plane, basically, is nothing more than a chisel held at an angle in a block. The edge of the blade projects through a slot in the bottom, or sole, of the tool, the distance that the edge of the blade projects determining the thickness of the shavings removed from the work. Many jobs in the average home can be done with a block plane and, being the smallest of the common planes, it is especially suited for fine, exacting work. Often, however, you will find need for the larger, general-purpose jack plane for dressing rough wood to size; for example, when fitting new screens or storm sash in window frames. In addition to the block and jack planes, there are many other types designed for specific purposes.

Block planes: Made as shown in Fig. 2, block planes vary in size from 2-in. midgets to the more popular 5 to 7-in. lengths. They come in many varieties, including small curved-bottom planes used in specialized work. The blade, or plane iron, of a block plane is set at a lower angle than that of larger planes. This low angle—usually 20





deg. and sometimes 12 deg.—permits cutting end grain and oblique hardwood grain more readily. The beveled edge of a block-plane blade, or iron, should always face upward instead of downward as on the larger planes. The blade is locked in position by means of a lever cap tightened with a small lever or thumbscrew and the upper end of the cap is usually rounded to fit the palm of the hand comfortably.

Block planes are held in one hand, as pictured in Fig. 3, with the index finger resting on the concave finger rest at the toe and the thumb and other fingers gripping both sides. The slot in the sole through which the blade projects is called the mouth, or throat. In some cases, its width is adjustable for fine or coarse work. A knurled nut at the heel provides for vertical adjustment, the movement that advances or retracts the blade through the mouth. On many block planes, lateral adjustment is obtained by means of a lever located at the heel of the plane. The lever tilts the blade toward either side and permits aligning the cutting edge parallel with the sole, so the shavings will be of equal thickness across the full width of the cut.

When making blade adjustments, a block plane, like other planes, is held as in Fig. 4. Sight across the sole to see how far the cutting edge projects and whether it is parallel to the sole. The usual error is to have the blade projecting too far. It should project only the thickness of a hair to produce thin shavings. Lateral blade adjustment on planes not equipped with a lever is made by loosening the lever cap and then pushing the blade toward one side or the other.

Jack planes: Made in lengths from 11½ to 15 in., jack planes are used for rough, heavy work in dressing stock to size. The parts and assembly are shown in Fig. 5, detail A. The frog is a steel block at the rear of the mouth to support the blade and, in some cases, it is adjustable to control the width of the mouth in proportion to the thickness of the shavings. The blade is fitted with a blade cap that prevents the blade from chattering and also acts as a chip breaker which diverts shavings so they will not break off ahead of the cutting edge. The blade and blade cap are held against the frog by means of a lever cap. Detail B shows the three parts separated. When the blade cap does not fit properly, as in detail C, wood shavings are likely to wedge under it, piling up and choking the plane. Detail D shows how the blade cap should fit, 1/16 in. behind the edge of the blade.

The thumb nut at the rear of the frog permits vertical adjustment of the blade to control shaving thickness. The lateral-adjustment lever is located between the blade and handle. As in detail E, the sole of the

plane may be either smooth or corrugated, many users preferring the latter as there is less surface friction between the plane and the work. In use, a jack plane is held with both hands, as in Fig. 1, which gives control of pressure at both toe and heel.

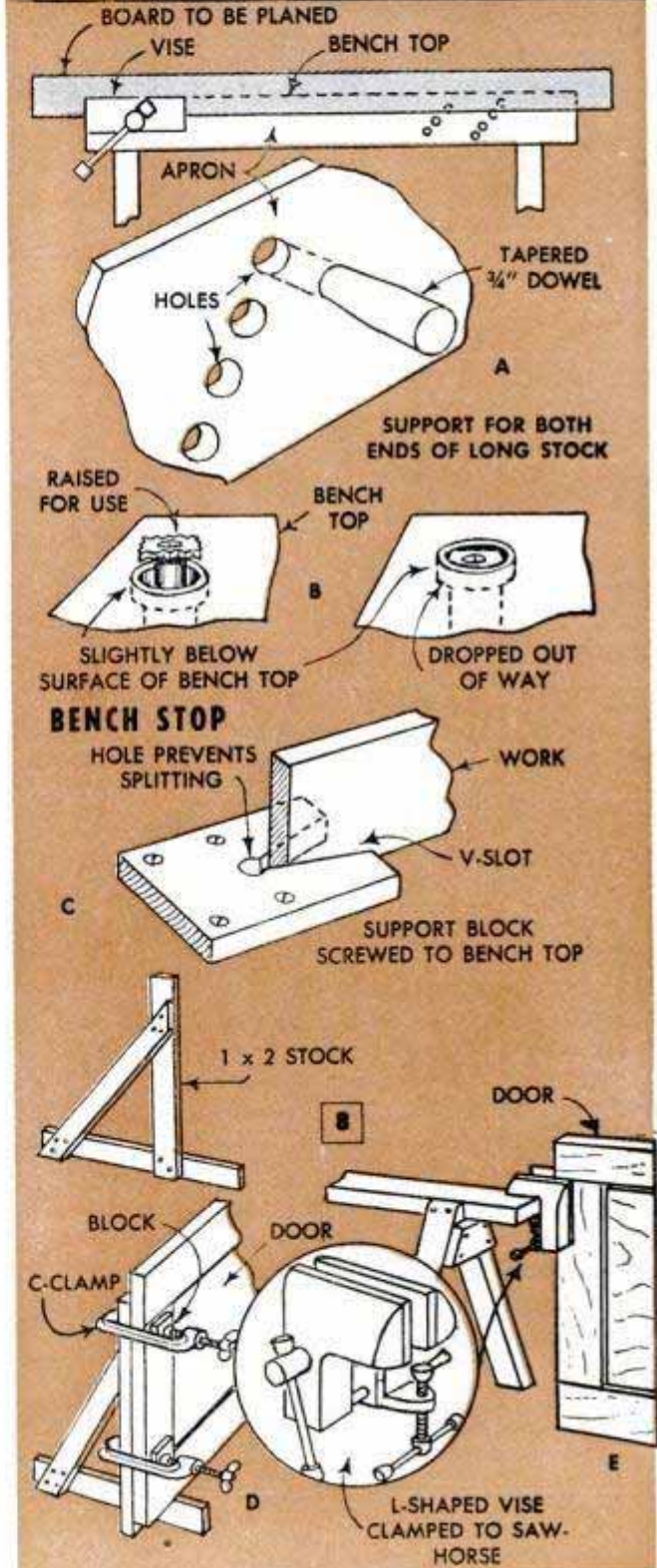
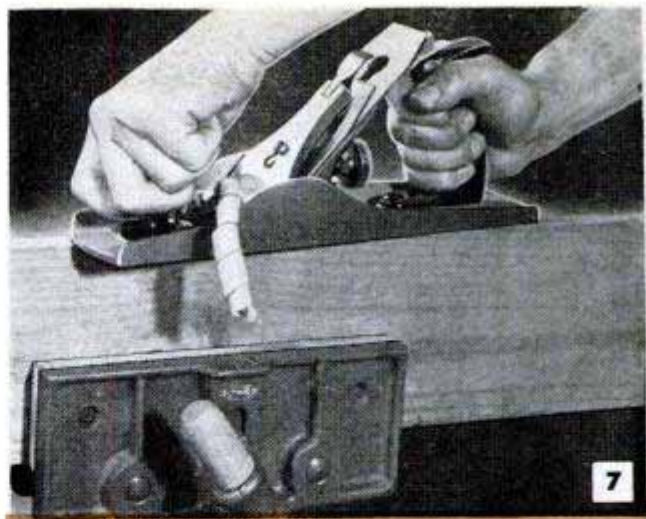
Fore and jointer planes: Assembled in the same manner as a jack plane, jointer planes differ only in length, ranging from 18 to 24 in. long. A short jointer plane is called a fore plane. The length of a jointer plane allows it to dress the edges of long boards perfectly straight, as the plane bridges the concavities and dresses down the humps, Fig. 6, detail A. Shorter planes follow the surface contours as in detail B.

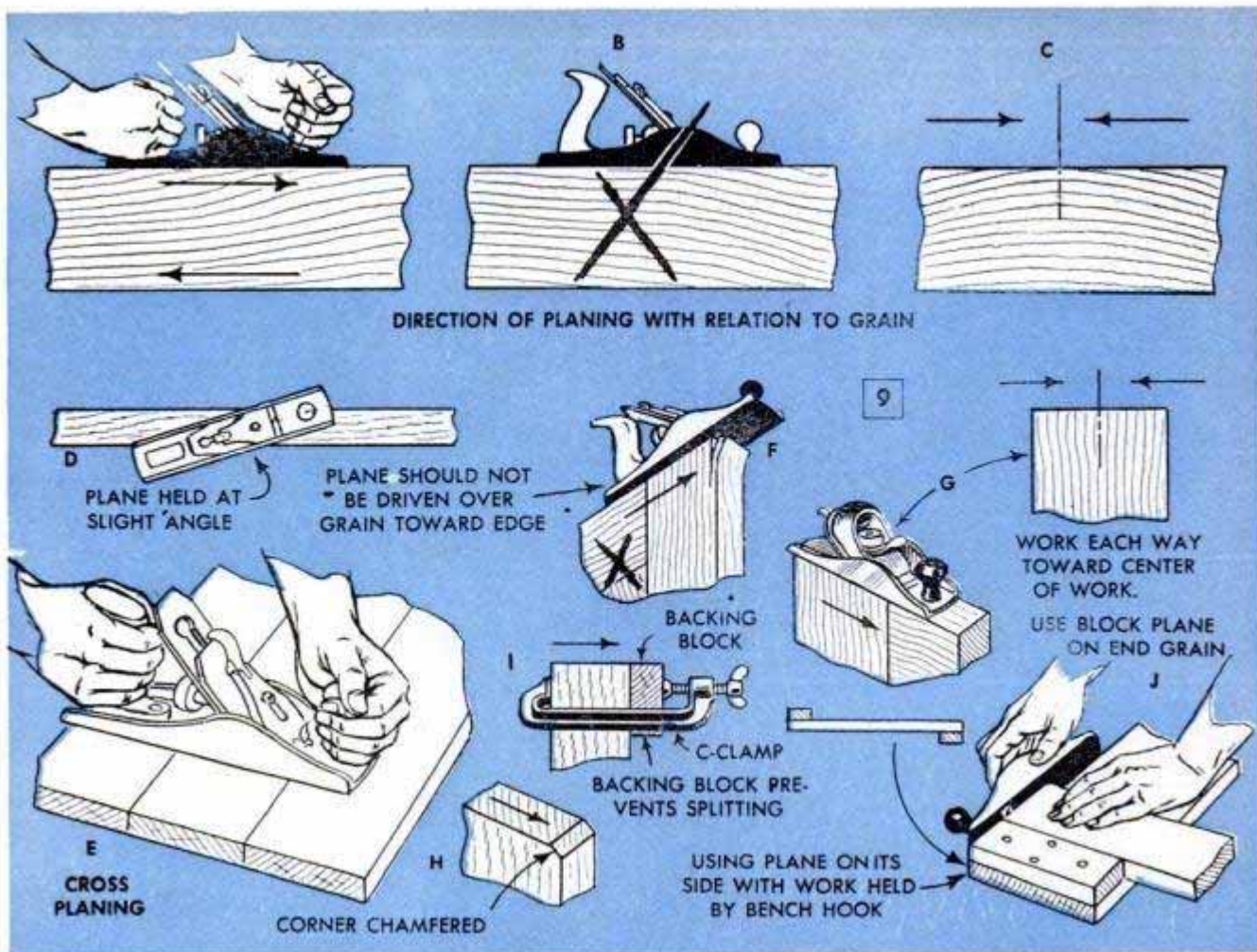
Smoothing planes: Ranging from 7 to 10 in. long, smoothing planes are used for fine finishing of surfaces that have been dressed down uniformly with a jack plane. The cutting edge of a smoothing plane must be kept razor sharp and the blade adjusted for extremely thin shavings. Equal pressure must be exerted at both ends to prevent forming hollows.

Work support: Work to be planed must be supported rigidly, which usually is done by holding it in a woodworking vise, Fig. 7 and Fig. 8, detail A. Other types of vises generally will mar the surface of the work unless wooden or hardboard pads are inserted between the jaws and the work. The best location for a vise is on the left end of a workbench, allowing plenty of clearance for long stock. To support long boards, two vises may be used or tapered dowels pressed into holes bored in the bench apron as in Fig. 8, A.

A bench stop, detail B, fitted near the left end of a bench also is convenient for holding stock being planed. When not in use, the stop is dropped below the surface of the bench top. Another type of bench stop, detail C, consists of a slotted wooden block which is screwed to the bench top. Short work also can be held by means of a bench hook, Fig. 9, detail J. Wide work, such as doors, screen frames and storm sash, is supported vertically on the floor by an improvised brace clamped to the work, or with an L-vise mounted on a sawhorse, as in detail E. Dressing the top edge of a door can be done without removing it from the hinges simply by inserting a wedge between the door and the floor to hold the door in position.

Consider the wood grain: Always examine stock to see which way the grain runs and then arrange the setup so you can plane with the grain instead of against it, Fig. 9, details A and B. Ordinarily, opposite edges of a board must be planed from opposite directions. When planing against the grain, the wood fibers are broken off, producing a rough surface. When the direction





of grain changes somewhat along the edge, as in detail C, plane from both ends to the point where the grain direction changes.

Planing is easier if the plane is held at a slight angle, as in detail D, to produce a shearing action. Used in this way the blade will retain its cutting edge longer. Wide surfaces, consisting of several pieces of stock glued together, often are cross-planed as in detail E. A plane used for this purpose must be razor sharp and set to take a very shallow cut. When planing end grain, which is usually done with a block plane, the wood at the corner of the work is likely to break off, detail F, if the cutting edge of the plane is run off a corner. To prevent this, plane from the corners to the center as in detail G. Another method of avoiding chipping the corners is to chamfer the corner, as in detail H, or support the wood with a backing piece where it is likely to break off, details I and J.

Pointers on handling planes: An easy, coordinated swing of arms and body is used in planing. Plane toward the left, standing at one end of the work, with your left foot forward, as in Fig. 10, detail A. As you move the plane forward, keep your head approximately over the plane handle and rock your body forward, transferring the weight to the left foot toward the end of the stroke. When drawing the plane back on the return

stroke, lift the blade above the work surface, as dragging the blade over the work will quickly dull the cutting edge.

Beginners often experience two troubles when planing: the planed edges of a board are not square with the sides, and more stock is removed from one or both ends of the work than at the center. To plane an edge square with the surfaces of a board, hold a wooden guide block under the plane and against the side of the board, as in detail B, hooking the thumb over the knob and grasping the front side of the plane and block at the same time. Still more accuracy in edge planing is assured by using an edge-trimming block plane, detail C, or by using a jointer gauge, D. The latter consists of an adjustable fence which is clamped on a plane and bears against the side of the work. Attached to either side of the plane, the fence can be adjusted for planing bevels and also fitted with a larger auxiliary fence for greater bearing surface. You can improvise a gauge by making interchangeable 45 and 90-deg. guides from hardwood, as in the lower detail. The bearing surfaces of the guides are sanded smooth and waxed to minimize friction and are screwed to tapped holes in the side of the plane.

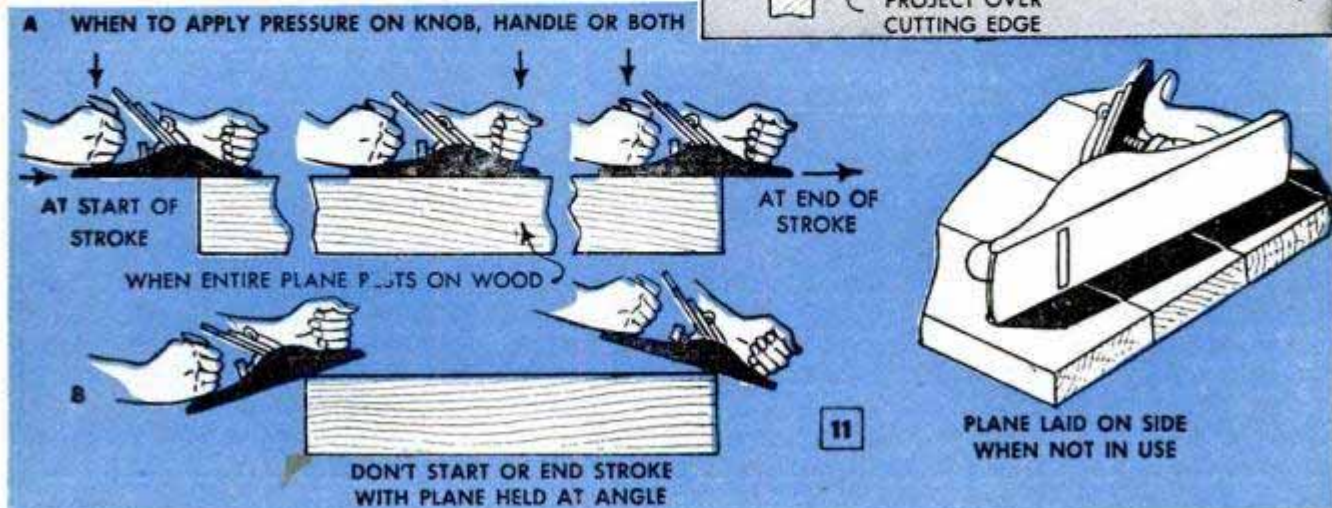
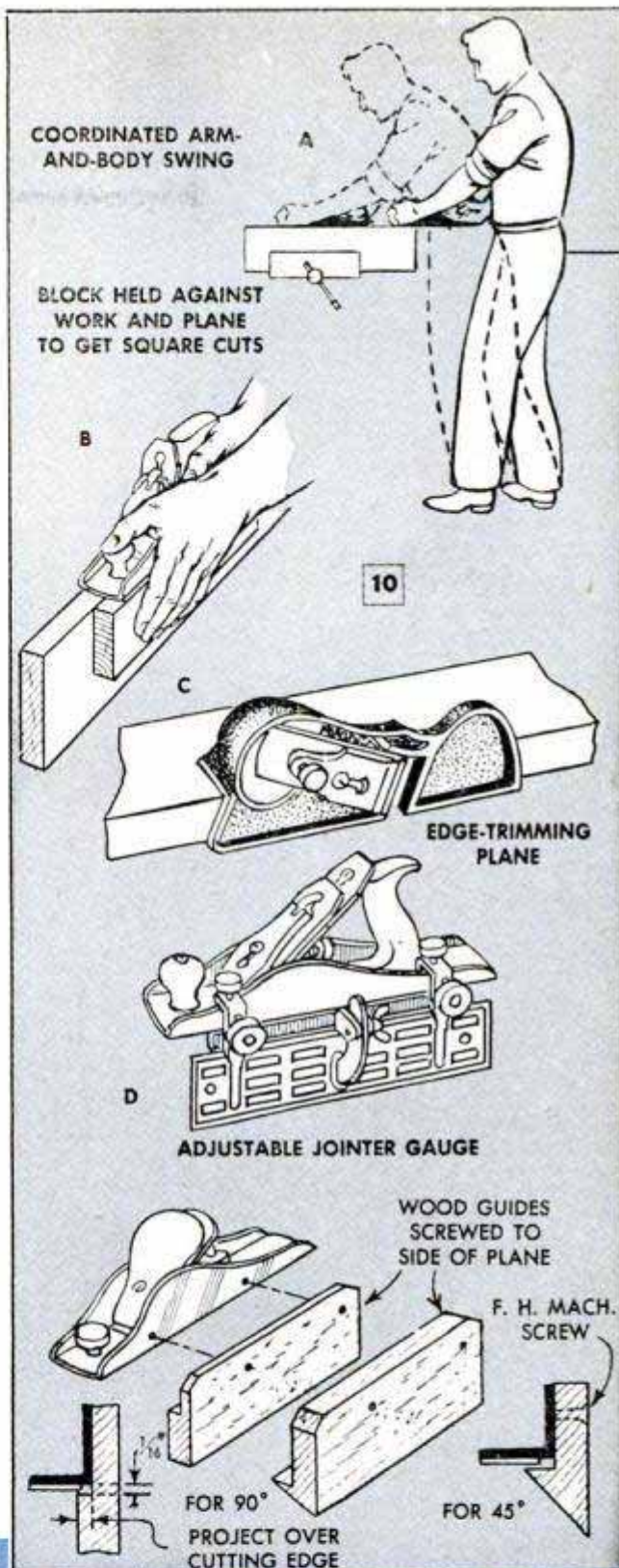
The common tendency to remove more stock from the ends of a board than at the center results from incorrectly applying

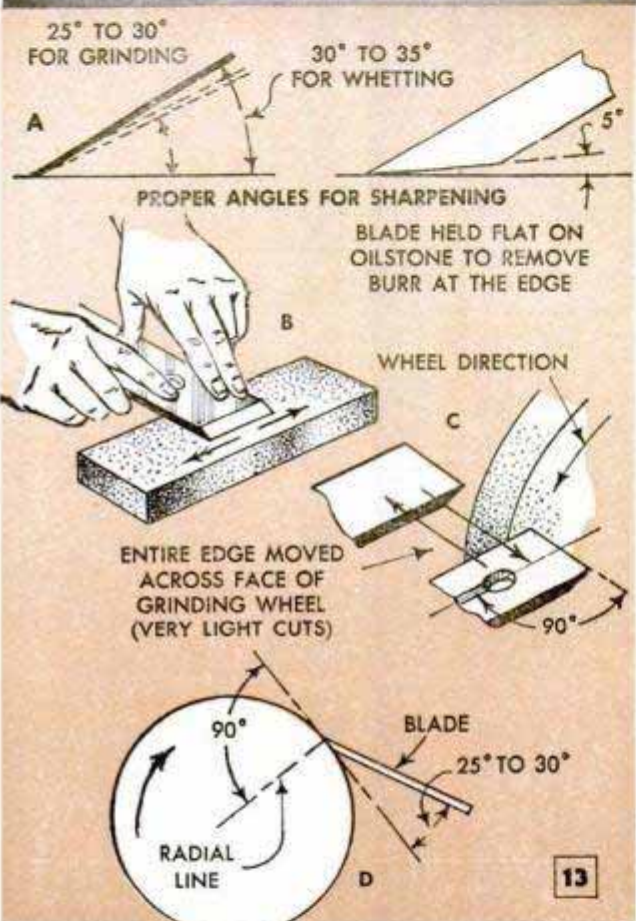
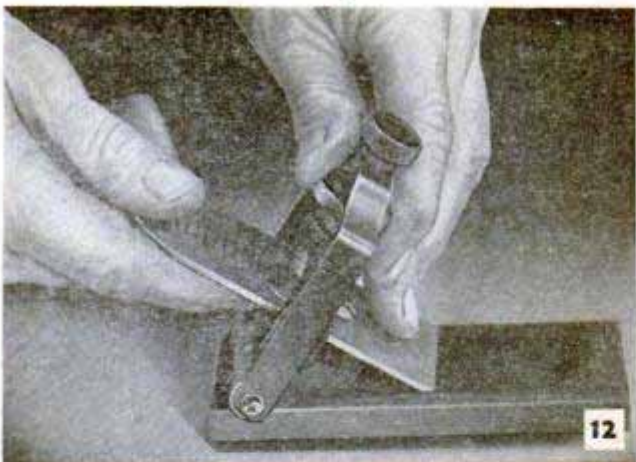
downward pressure on the plane. The right way to start a cut, Fig. 11, detail A, is to hold the sole of the plane on the work horizontally, in line with the edge, and to bear down only on the knob at the toe before the entire plane rides on the wood. Then pressure is exerted equally on both toe and heel of the plane. When the toe of the plane leaves the work, remove pressure from it but keep bearing down on the handle. Don't start a cut with the toe up, detail B, or allow the toe to drop down at the end of a stroke, as both of these errors will cause rounded corners.

Plane care: When not using a plane, place it on its side, as in Fig. 11, detail C. Before storing a plane, retract the blade inside the mouth to protect it from possible damage. Never use a screwdriver or other metal tool to remove shavings which clog the mouth of the plane as this may dull the cutting edge. Instead, remove the shavings with a pointed dowel.

Sharpening: Every plane user should know how to keep the cutting edges sharp. The cutting edge of a properly ground blade can be renewed a number of times without regrinding by whetting the blade on an oilstone. A special holder, Fig. 12, overcomes inaccuracies. The whetting angle of 30 to 35 deg., Fig. 13, detail A, is about 5 deg. greater than the grinding angle. After whetting, the fine burr or featheredge is removed by a few very light strokes on the other side of the blade while it is held flat on the stone, detail B. To avoid plane marks on the work, the corners of the blade should be rounded slightly. When reassembling the blade, attach the cap with its edge well away from the cutting edge of the blade, and then advance the cap to $\frac{1}{16}$ in. from the edge as in Fig. 5, D.

Grinding is necessary when the cutting edge is nicked or worn by repeated whettings. In grinding, a plane blade must be passed squarely across the face of the grinding wheel, Fig. 13, detail C—not held against the side of the wheel. When grinding, don't

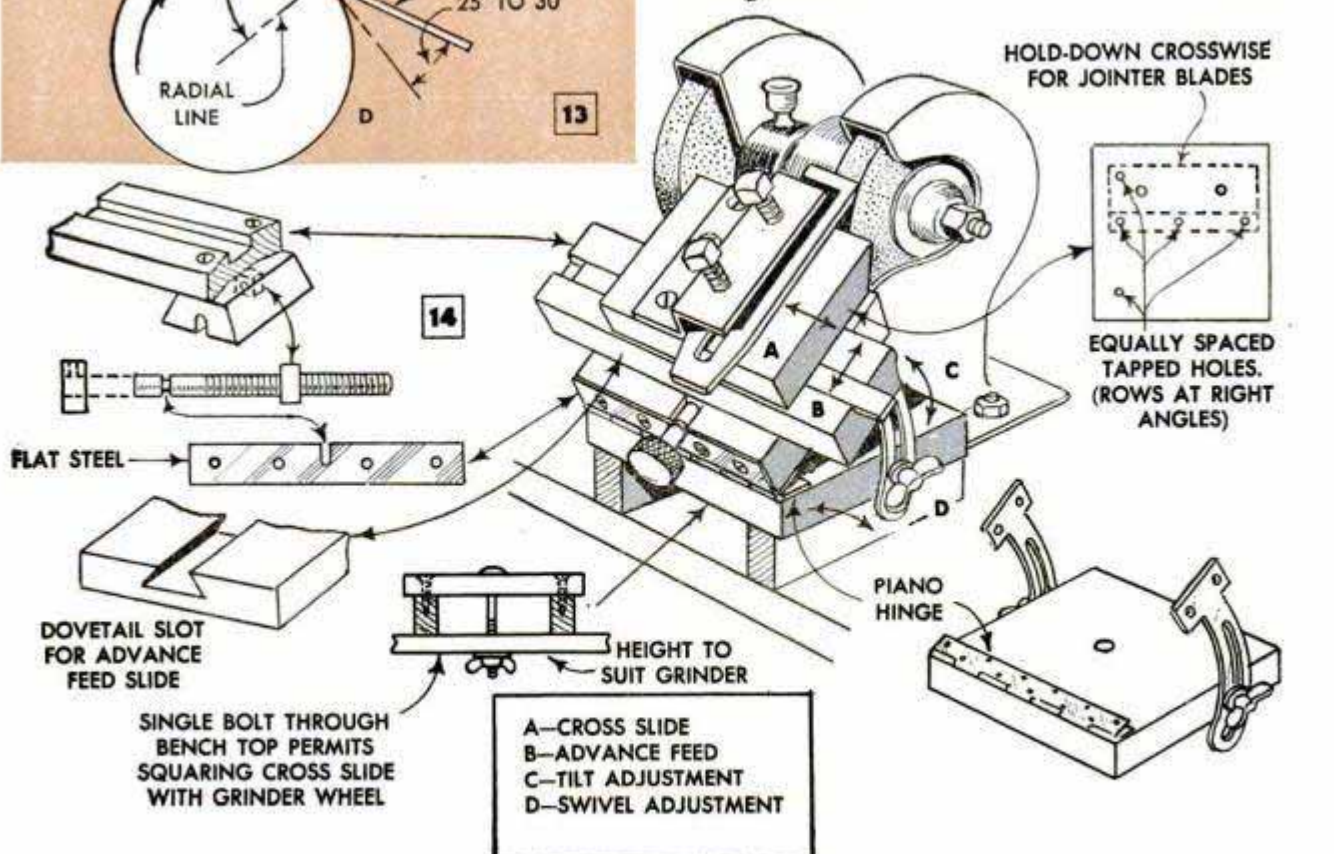




attempt to square the sides of the blade above the cutting edge, as many blades have slight clearance bevels on the sides. For grinding the bevel, hold the blade as in detail D, at a 25 to 30-deg. angle to a line running at right angles to the radial line of the wheel. The tool rest should be set to just clear the wheel in order to provide maximum support for the blade.

When properly aligned, the blade is advanced just far enough to barely touch the edge of the wheel when passed across it. Each advance feed should not be greater than the thickness of a piece of writing paper—sometimes less. The edge of the blade must be kept cool by dipping it in water after each pass, unless a grinding coolant can be used while the grinding proceeds. Overheating the blade to the point of color change removes the temper so that it will no longer hold a cutting edge. The blade is ground down until a fine burr or featheredge is visible. This is then removed on an oilstone.

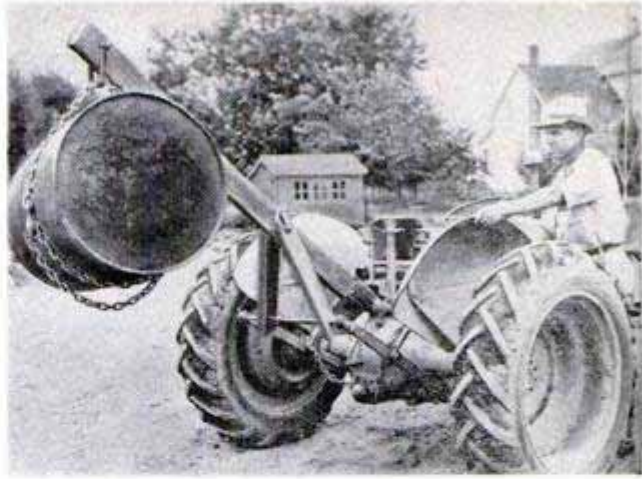
Grinding plane blades is simplified considerably by using an adjustable tool rest similar to the one shown in Fig. 14. This gives accurate results that are hardly possible by hand grinding, due to the difficulty of grinding an edge straight and at 90 deg. to the blade axis. The features of the grinding fixture are a cross slide that gives straight-line accuracy and a threaded feed control for advancing the blade to the wheel. Although a satisfactory fixture can be made from hardwood, a better and more accurate job, of course, will result from using metal. ★★★



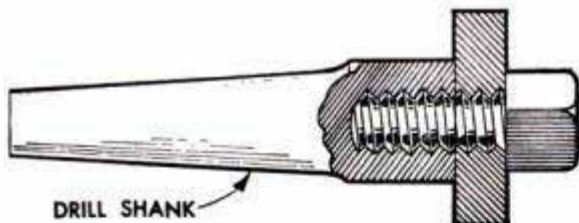
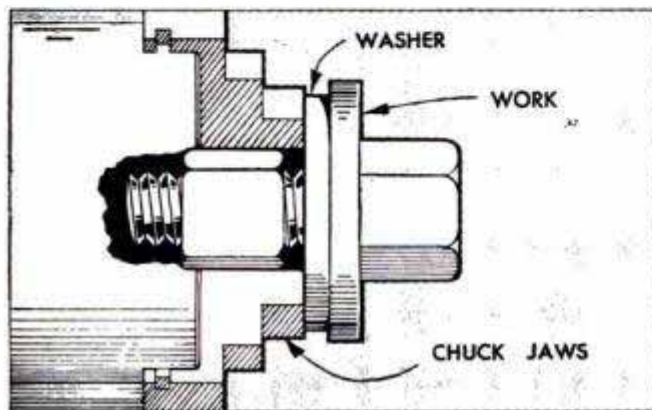
Lifting and Carrying Hoist Mounted on Small Tractor

By installing a hardwood boom on the regular hydraulic lift of his tractor in the manner shown, one farmer was able to speed up the job of loading or transporting oil drums and other heavy objects around the farm. The improvised assembly consists of a boom which is A-braced to the tractor drawbar. The braces pivot at both ends to permit movement of the boom. One end of the latter is pivoted on the tension-bar yoke which is mounted on the top of the transmission housing. A clevis fitted to the outer end of the boom provides for attachment of a chain sling or a hook.

A. M. Wettach, Mt. Pleasant, Iowa.



Outer Edge of Washer Machined by Mounting in Lathe Chuck



For machining the outer edges of washers, mount them by chucking a hexagon nut in the three-jaw chuck, as shown in the upper diagram. The work is centered and screwed tightly against the chuck jaws with a cap screw. If the washer to be machined does not project beyond the chuck jaws, insert a smaller washer in back of the work so the lathe tool will not strike the chuck. In machining collars or work with small center holes, a simple mandrel as shown in the lower diagram can be used. This is made from the tapered shank of a discarded twist drill with the large end faced smooth and a hole drilled and tapped for a cap screw to hold the work in place.

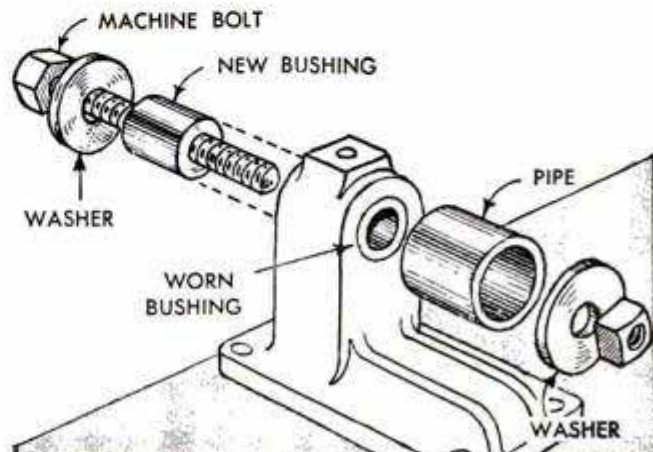
Electric Heater Warms Engine For Easy Winter Starting

Easy starting of a car on a sub-zero morning is possible in most instances if the engine block or manifold is preheated during the night. In modern automobiles, however, these parts usually are difficult to get at. Although small enough in some cases for this purpose, certain single-coil electric heaters nevertheless present a fire hazard, in that the coil usually is exposed. To overcome these obstacles, one car owner places an electric blower-type heater on a box inside the car so its heat is directed against the car heater. Plugged into an outlet in his unheated garage, the heater eventually heats the water in the car heater sufficiently to start it circulating through the engine block. Under extreme weather conditions, a blanket placed over the block is useful in helping to cut down the amount of heat lost by radiation.

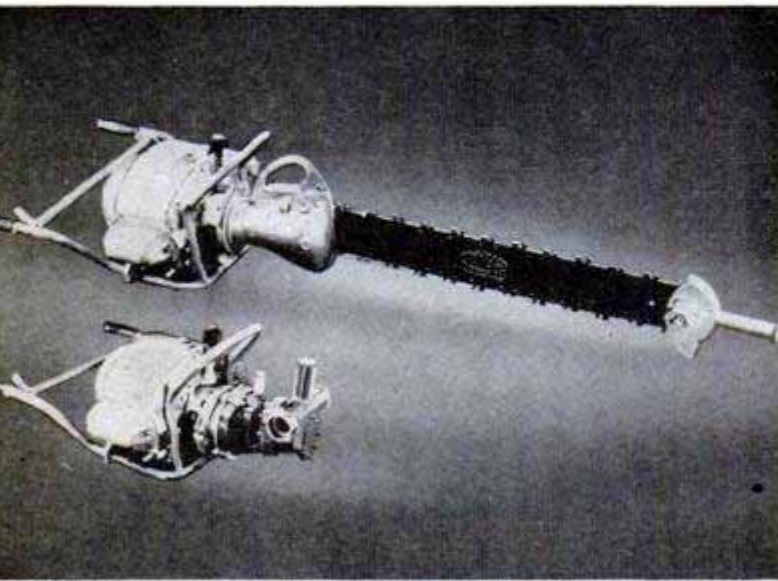
Removing Worn Bushings

If you find it difficult to remove a worn bearing or bushing, try forcing it out as I did with pressure applied by turning a long bolt through a new bushing, a nut, two washers and a short length of pipe as shown. The pipe should be longer as well as slightly larger in diameter than the bushing that is to be removed. In use, pressure on the new bushing as the bolt is turned forces the old bushing into the pipe.

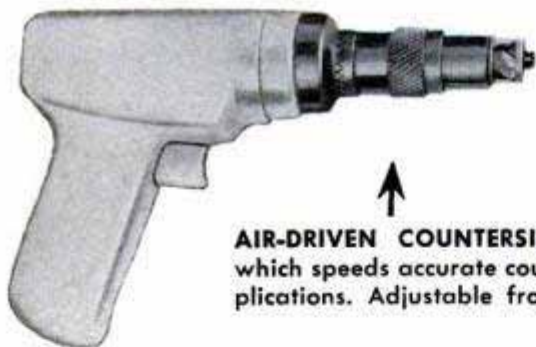
Arthur R. Spelbring, Rochester, Mich.



SHOPPING FOR TOOLS



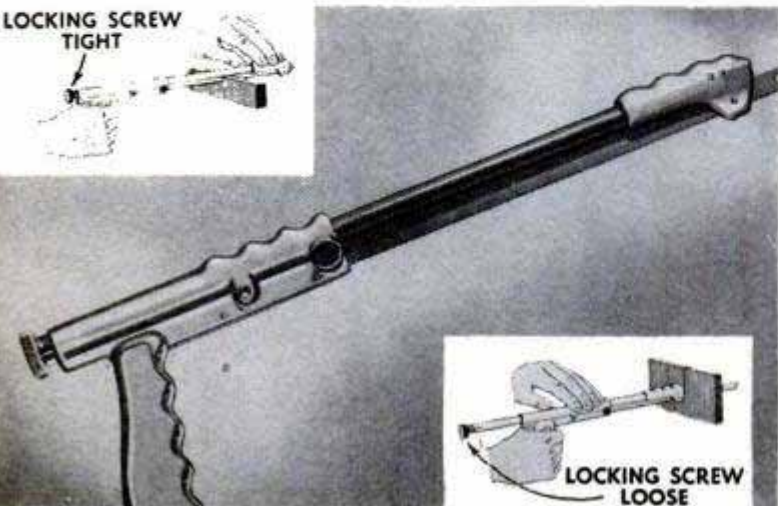
↑ **PUMP ATTACHMENT** for chain saw has a capacity of 50 gal. per min. and can be attached ready for operation in a few seconds. Farmers, estate managers and forest-fire fighters will appreciate its advantages



↑ **AIR-DRIVEN COUNTERSINK** has nonrotating head which speeds accurate countersinking in nearly all applications. Adjustable from zero to maximum depth

↓ **"ENDLESS" HACKSAW** is actuated by a spring-loaded plunger which permits unrestricted depth of cut. Takes regular 10 or 12-in. blade, which is supported by a guide tube. The back of the blade rides on hardened steel balls. Locking screw is loosened for deep cuts

LOCKING SCREW TIGHT

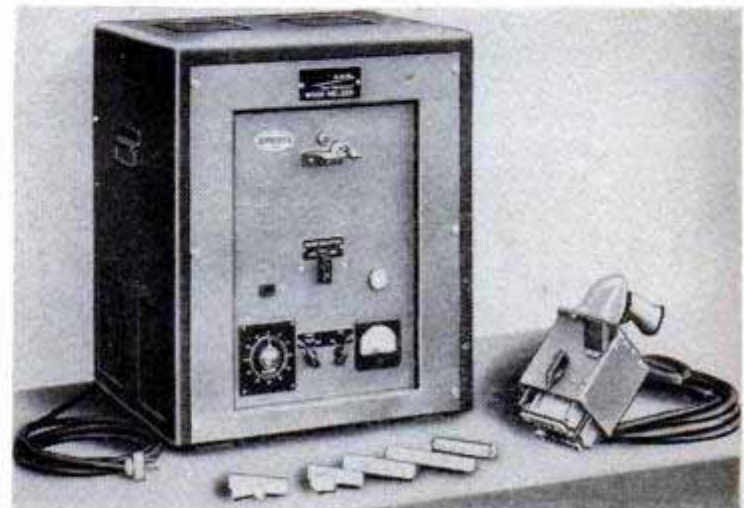


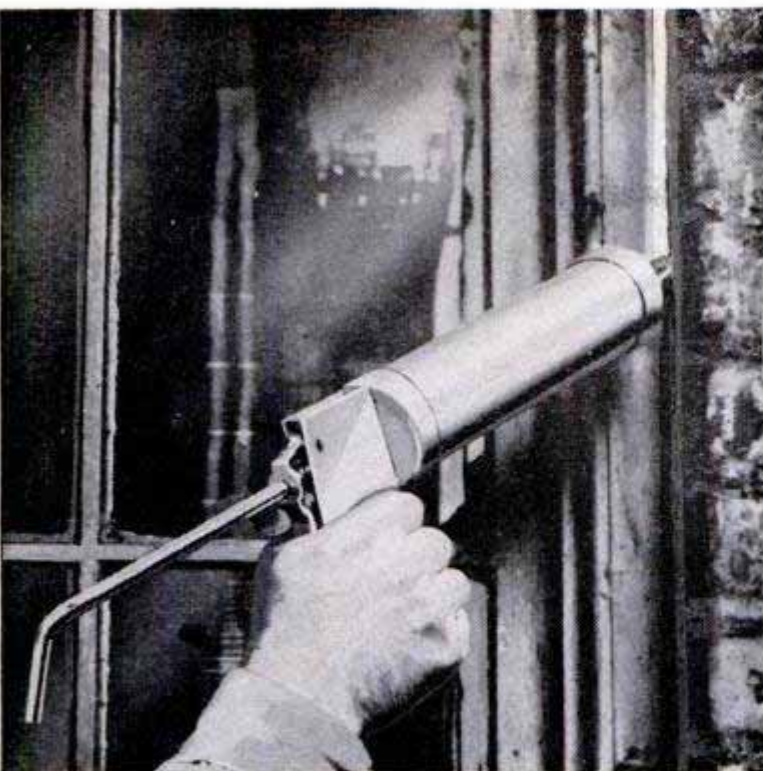
LOCKING SCREW LOOSE

↓ **WHEEL-MOUNTING TOOL** simplifies the disagreeable job of lifting and guiding an auto wheel into position on the brake-drum studs. Simply insert the hollow end of the tool through the lower hole in the wheel, slip the end over the stud and raise to proper level

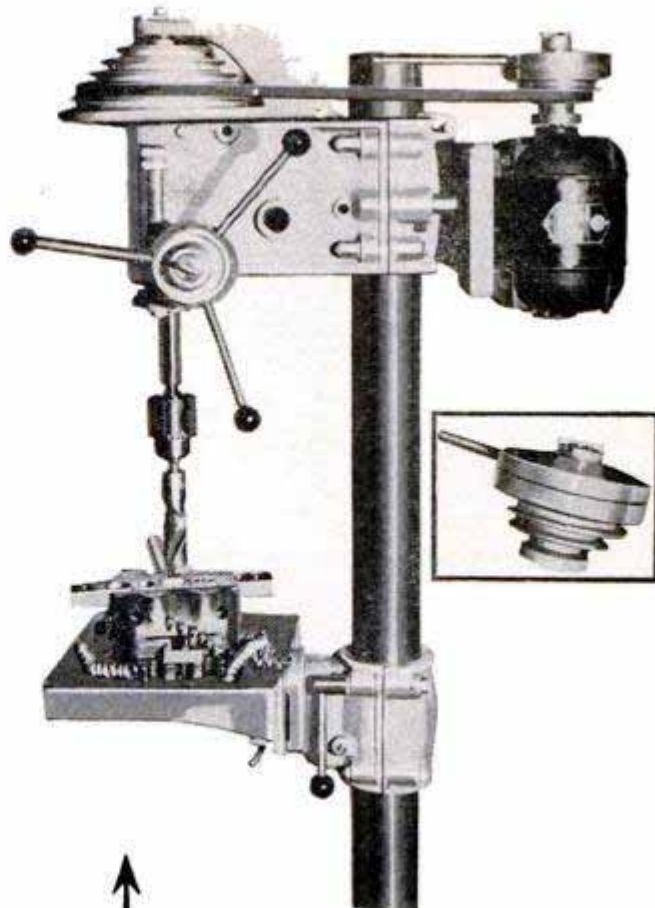


↓ **WOOD WELDER** for small shop speeds bonding of wood to wood, and plastic to metal or wood. Penetration ranges from 1/8 to 2 in. A three-position switch controls the energy required for shallow or deep bonding. Unit is designed to operate on 115-volt a.c.





↑ **CALKING COMPOUND** in a cartridge-type container is available in 26 different colors to get matching or contrasting effects on brick, asbestos-cement siding, shingles and wood. Cartridge container can be used in regular calking guns by removing plastic nozzle

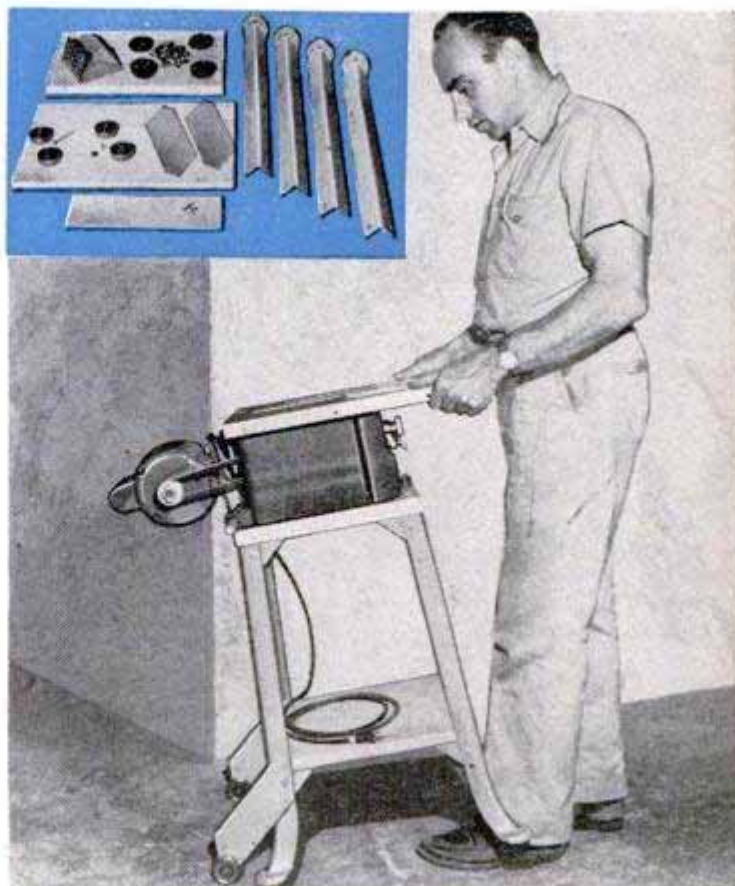


↑ **SPEED-REDUCING PULLEY** has been designed to increase the use range of a small drill press. Reducer is gear driven and models are available with 4½:1 and 7:1 reductions, the speeds ranging from 75 to 2000 r.p.m. through six variations on a three-step pulley

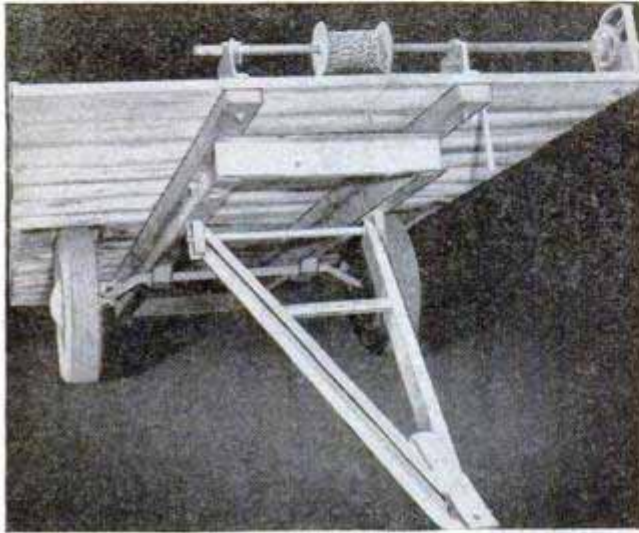
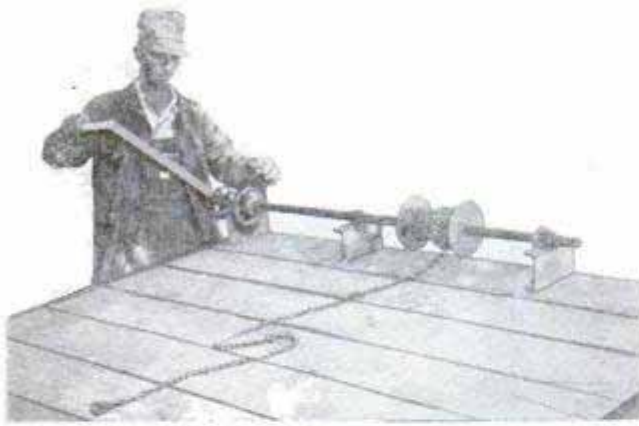
→ **PORTABLE POWER-TOOL STAND** comes knocked down and consists of four steel legs with bolt holes drilled, brackets, four rubber feet for legs and ball-bearing rollers. The top and shelf can be made by the purchaser



↑ **HEAVY-DUTY SOLDER POT** takes large units for soldering by immersion and is available in varying sizes and temperature ranges. Has long-life ceramic-embedded element and thermostatic control for fast recovery. The unit is fitted with adjustable legs and dross tray



Low-Bed Farm Trailer Has Loading Winch



Especially designed for transporting heavy machinery and implements, this farm trailer has a bed, or platform, 6 ft. wide and 10 ft. long. The top of the bed is about 30 in. from the ground when in the horizontal position. An exceptionally long A-type drawbar allows ample clearance for short turns when drawn by a tractor. Both the drawbar and the trailer subframe are made from heavy steel channels, all joints being welded. The drawbar is pivoted to the subframe in front of the axle, permitting the bed to tilt readily. A geared winch, crank-driven, has a drum carrying a length of welded steel chain. The drum is mounted on a long shaft having bearing brackets placed so that the drum is at the center of the platform. With this arrangement, heavy implements are drawn easily onto the trailer bed for transport.

Fuel Pump May Cause Slow Starts

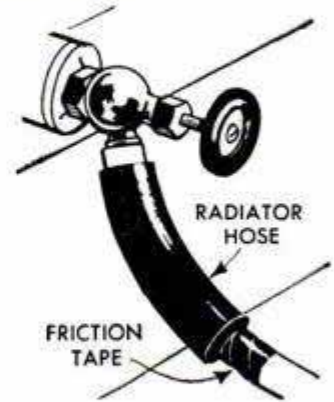
The fuel pump, usually one of the last items to be considered by the automobile owner, may be the cause of hard starting in cold weather. When the pump is more than a year old, its shaft may be worn as much as .010 to .020, enough to permit moisture to enter the bearing. If this moisture

freezes on the bearing surfaces, it prevents the arm from returning when it stops on the high side of the cam, thus putting the pump out of operation. Therefore, a new pump should be considered when troubled by continual hard starting in cold weather.

E. K. Schooley, Waukegan, Ill.

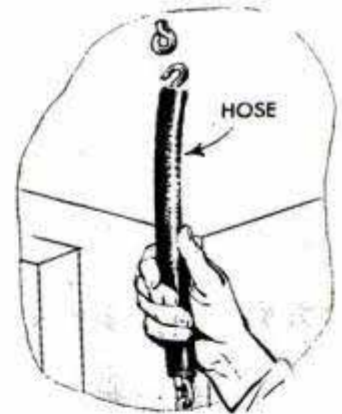
Garage Car-Washing Kink

Observing that the hoses in the car-washing section of his garage were wearing rapidly because of constant kinking near the sill-cock connection, one garage owner slipped a length of radiator hose over the water hose and taped it in place just below the sill cock. By thus preventing further kinking, the life of the hose is prolonged considerably.



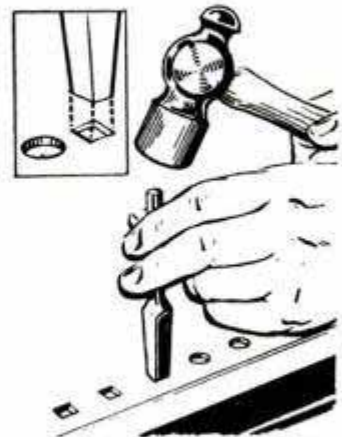
Chain End Held Extended by Hose To Hook in Out-of-Reach Eyebolt

To attach the hook on a hoist chain to an eyebolt just out of reach, one mechanic slipped a length of radiator hose over the end near the hook. This made it possible to engage the hook while standing on the floor.



Auger Shank Squares Round Hole

One sheet-metal worker, who had none of the essential tools ordinarily needed for punching square holes to receive square-shanked bolts in sheet metal, cut the shank from a discarded auger bit and used it as a punch to square previously drilled round holes. Since the auger shank is tapered at one end, the final size of the square hole will be determined by the depth to which the tool is driven.



WIRESPONDENTS USE "TALKING LETTERS"

By Tom Riley

WIRE RECORDERS have created a new hobby for many people who now "mail their voices" on a coil of wire instead of writing letters to distant friends and relatives. The message goes to their friends on a 15, 30 or 60-minute spool of fine wire, instead of a disk recording. Friends in Chicago, photo A, gather to hear a spool from a wiresponsendent across the nation. After hearing a message it can be erased by simply recording the reply on the same spool, as the couple are doing in photo C.

A wiresponsendence club, sponsored by a Chicago manufacturer of wire recorders, now has 1987 members in the United States and foreign countries; mailing cartons are supplied to members using his spools.

An international wiresponsendent is Tahia Karioka, the glamorous Egyptian film star shown in photo B. She uses the wire recorder to keep in touch with distant friends and also employs it to rehearse her roles. To men on the battle front in Korea, to hospital patients and friends in distant countries, these spools of "talking wire" provide an especially precious tie.

Wiresponsendence is frequently combined with other hobbies, carrying on exchanges between fans in various parts of the world. Photo D shows members of the Mango Lines Model Railroad Club of Chicago recording a meeting to send to another railroad club in England. Radio "hams" often exchange wire recordings for checking speech quality.

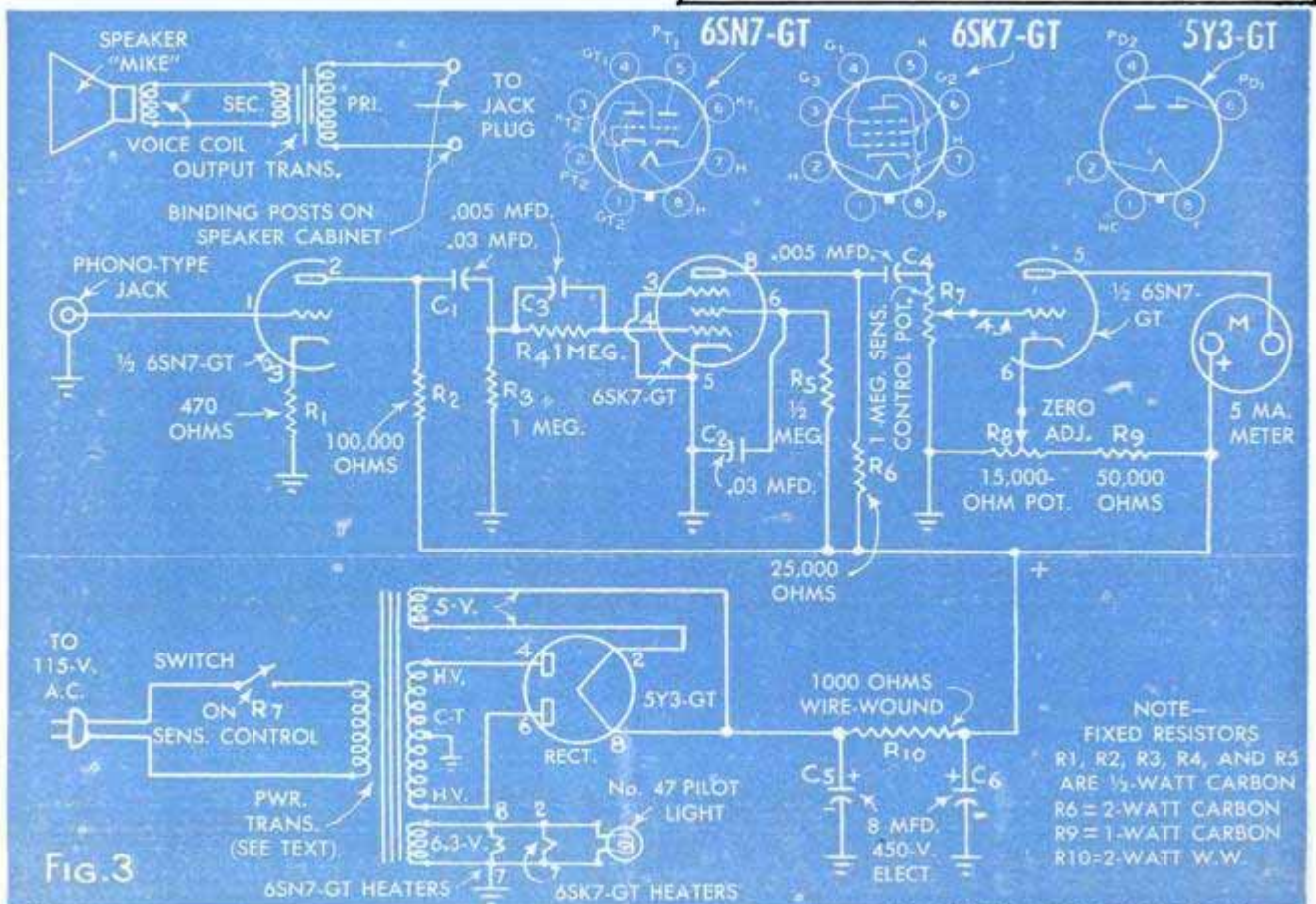
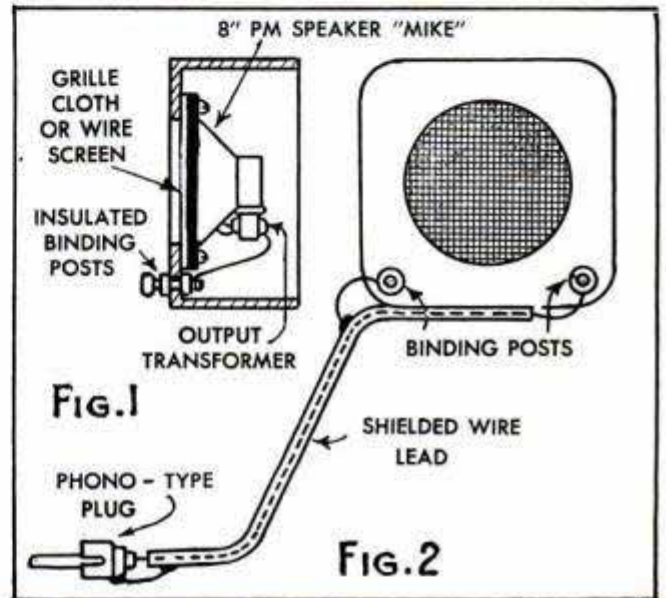
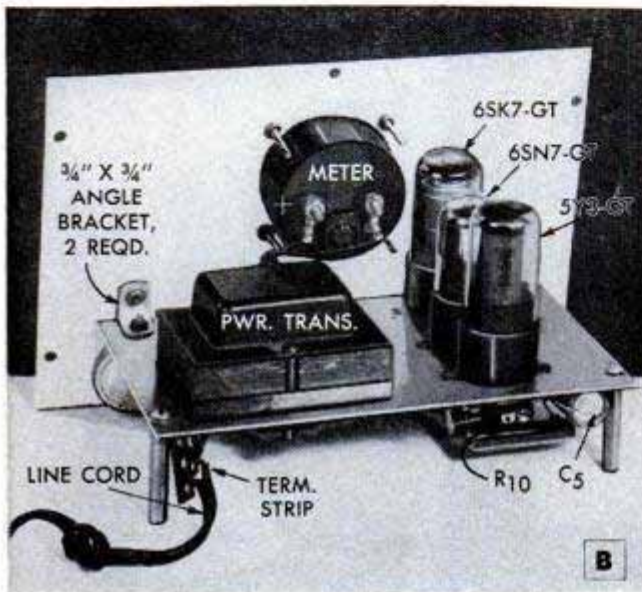
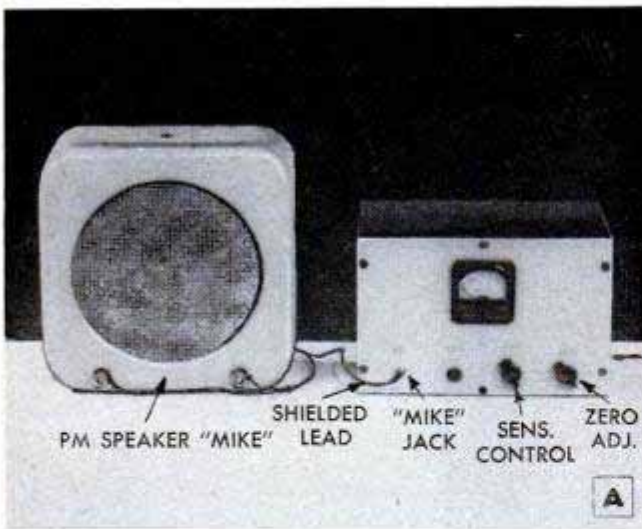


HOW TO BUILD AN

By Edward J. Bukstein

IMPARTIAL JUDGMENT as registered by the electronic circuit of an applause meter removes all questions of fairness and suggestions of favoritism. This simplified version justifies its construction with the increased pleasure and interest it adds to amateur shows, parties, school affairs, contests and similar group activities.

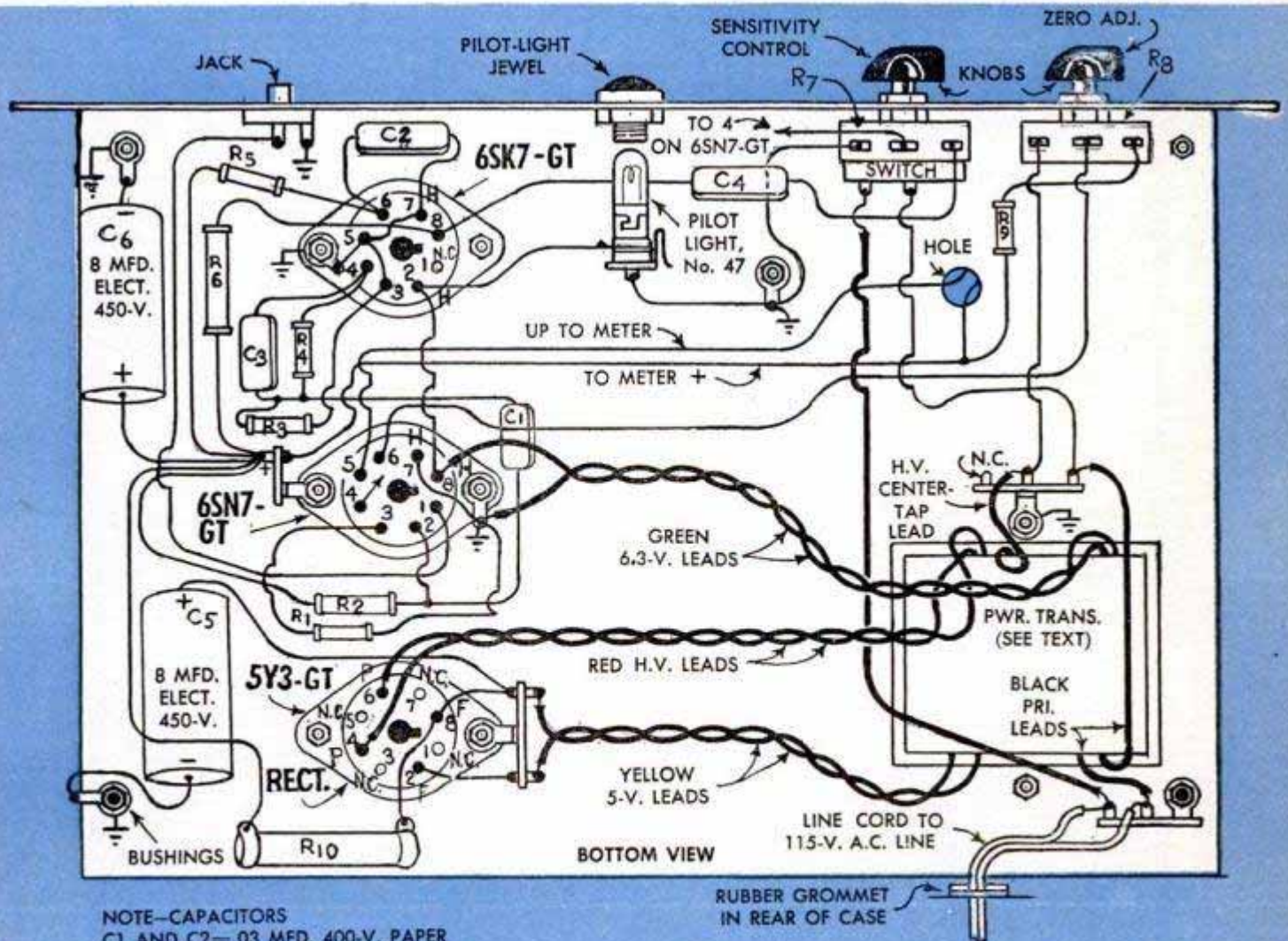
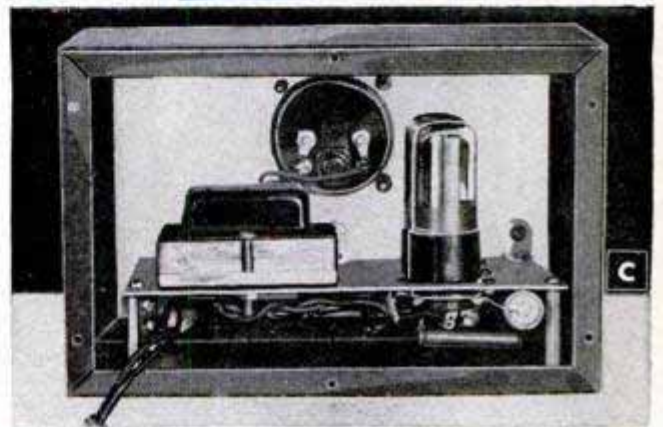
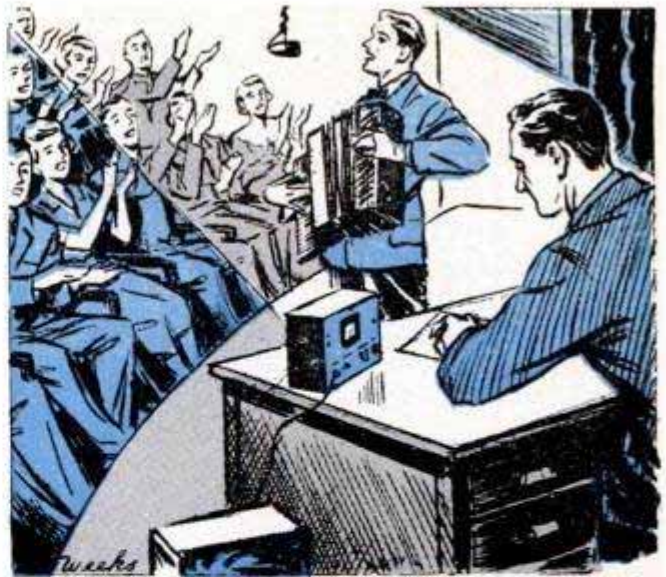
The circuit consists of two tubes (plus rectifier). All parts are standard and easily available from radio-parts houses. The cab-



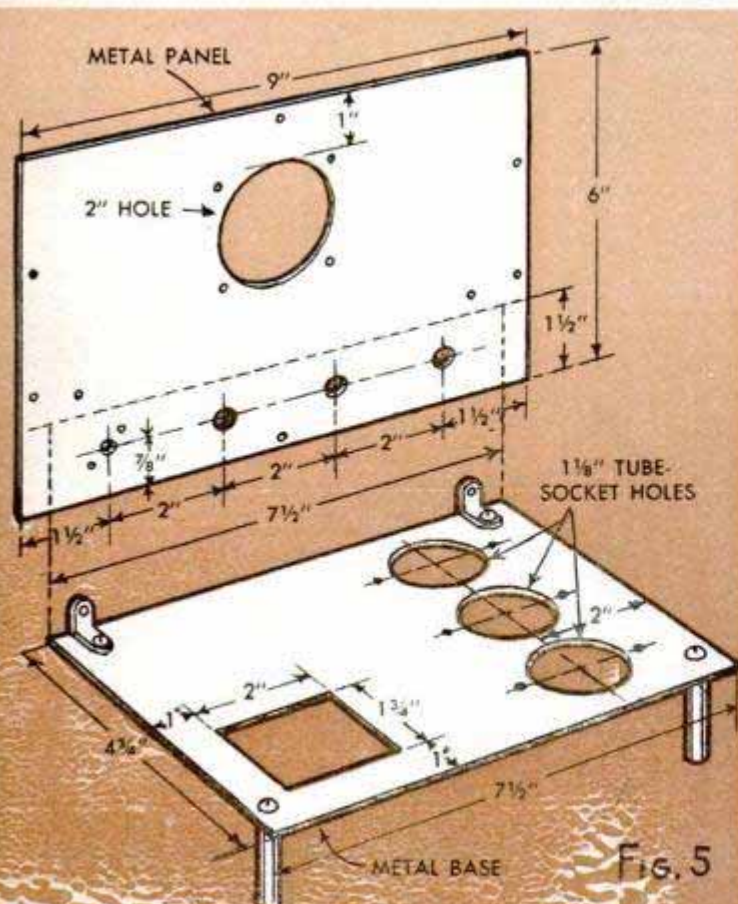
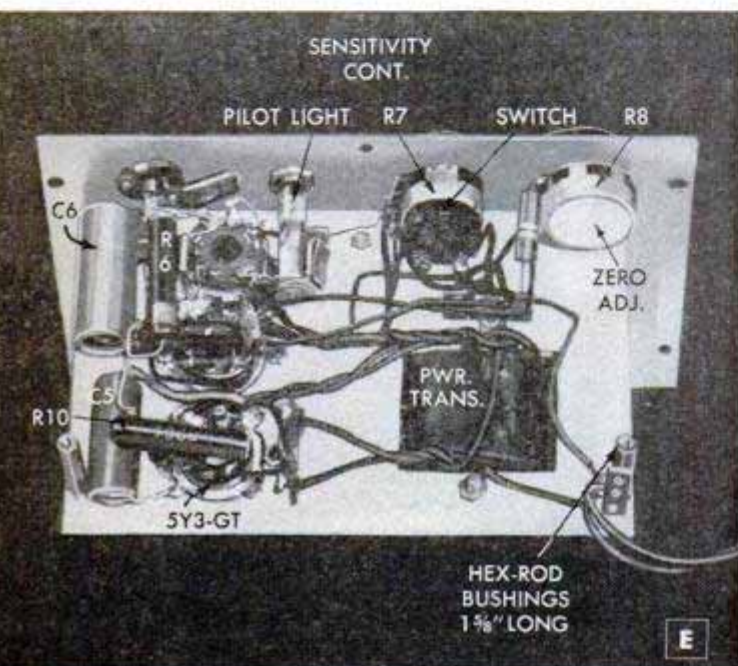
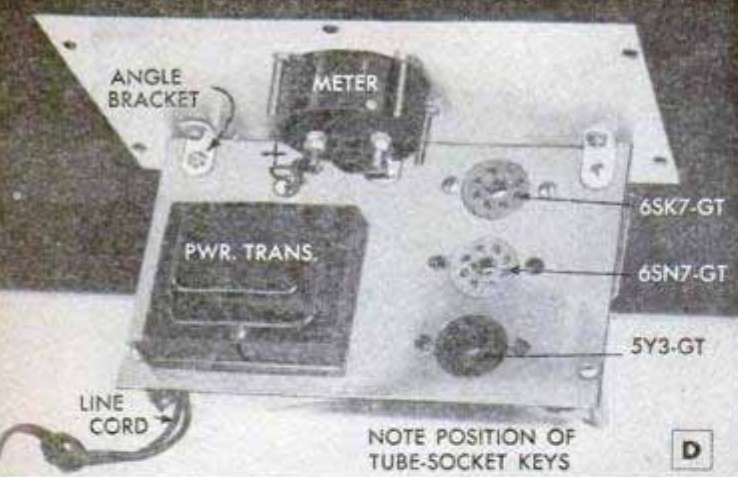
APPLAUSE METER

inet is a steel type measuring 6 x 9 x 5 in. It comes in a black ripple finish and is available also in aluminum with a gray finish. The loudspeaker is an 8-in. PM type which, in this case, serves as a microphone. A universal-type output transformer (usually mounted on loudspeakers) was left on the speaker so that it acts as a step-up transformer to increase the sensitivity of the instrument. It can be any inexpensive single 8000-ohm, 20 ma., 3-watt type. The meter used in the model was a rectangular flush-mounting type. The diameter of the mounting hole in the panel will depend upon the particular meter used. A 0-5 d.c. milliammeter can be used as shown in the schematic diagram Fig. 3, or if the builder wishes greater sensitivity he can use a 1 ma. meter without any circuit changes.

Photo A shows the complete applause-meter assembly; photos B, C, D and E are various views of the chassis base and panel. All details for the base and front panel are given in Fig. 5. A pictorial wiring diagram showing all connections under the base panel, appears in Fig. 4.



NOTE—CAPACITORS
 C1 AND C2—.03 MFD. 400-V. PAPER
 C3 AND C4—.005 MFD. 400-V. PAPER
 N.C.—NO CONNECTION
 ⊥ =GROUND ON CHASSIS BASE



The power transformer can be any good make, either fully shielded or the half-shell type. The size of the mounting hole in the metal base will depend upon the type used. The one employed in the model has a 650-volt, center-tapped 40-ma. high-voltage plate winding; 6.3-volt, 2-amp. filament winding, and a 5-volt, 2-amp. winding for the 5Y3-GT rectifier tube, R7, the sensitivity control, is a 1-megohm, audio-taper type with switch. The zero adjustment potentiometer, R8, is a 15,000-ohm, linear type.

The sensitivity control is for adjusting the amount of sound required to produce a full-scale deflection of the meter; the zero control is for adjusting the meter to zero in a quiet room. A length of single-conductor shielded wire cable terminating in a phono plug is used to connect the speaker microphone to the applause meter. The microphone is mounted in a separate cabinet as shown in photo A and Fig. 2 so that the judges watching the meter will not obstruct the sound.

The electronic circuit employs a 6SN7-GT double-triode tube; one half of this tube is used for the first amplifier stage. The second stage is a 6SK7-GT tube operating with grid-leak bias. With this arrangement, the gain of the tube becomes dependent upon the level of sound energy entering the microphone. The gain of the amplifier therefore decreases with the increase of sound level. This feature gives the instrument a response which is approximately logarithmic and which simulates the response of the human ear. The remaining half of the 6SN7-GT tube is used as the final amplifier and the meter is connected in its plate circuit. This stage is biased at cutoff so that the meter will read zero when no sound enters the microphone. The zero control makes this adjustment as previously stated. The amplitude of the signal applied to the final stage is adjusted by the sensitivity control. The setting of this sensitivity control is necessarily rather critical as it determines the amount of applause or other sound which will produce a full-scale reading of the meter.

This instrument also can be used for noise studies in factories, offices, traffic, etc. Many industrial firms conduct surveys of this type as it has been found that the efficiency of factory workers is impaired by excessive noise.

When wiring the circuit, use the insulated tie-point strips shown in Fig. 4. Solder all connections carefully with rosin-core wire solder; No. 20 hookup wire with push-back insulation is used for circuit wiring. Detailed student material list R-419 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage. ★ ★ ★

TELEVISION TODAY

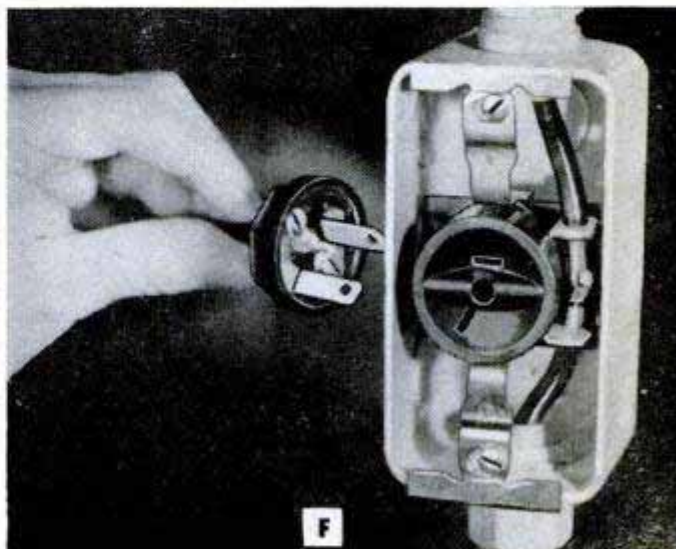
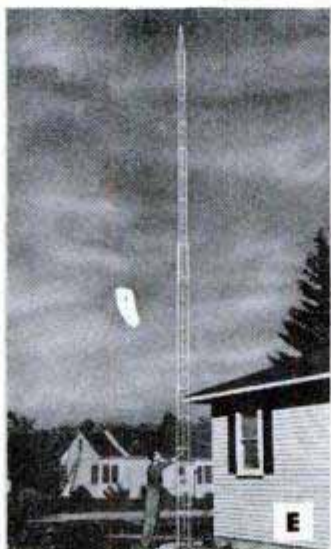
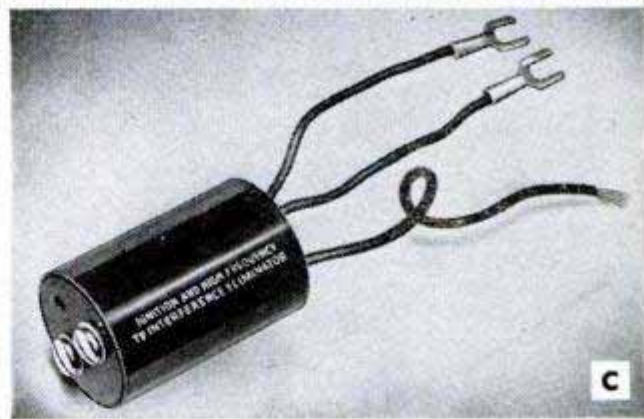
TELEVISION-TELEPHONE recently demonstrated in England enables the caller to view the person answering the call on a TV screen. The **PYE TV-telephone** engineer in photo A has just called the young lady whose image appears on the screen in front of the instrument. A specially designed TV light, claimed to relieve eyestrain, appears in photo B. Unlike similar TV lights in clocks and other devices, this one is in a highly decorative planter.

An easily installed TV interference filter is shown in photo C. This compact television filter is claimed to clear or minimize TV interference picked up through the antenna system, such as auto and airplane ignition, high-frequency flutters, motor sparks, etc. No adjustments or technical skills are required to connect it to any TV receiver.

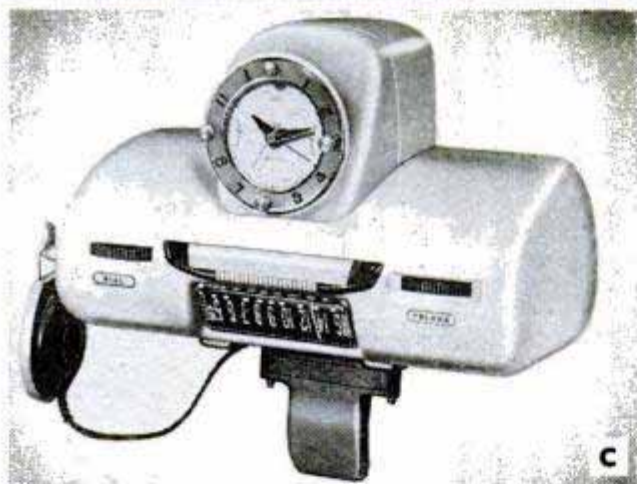
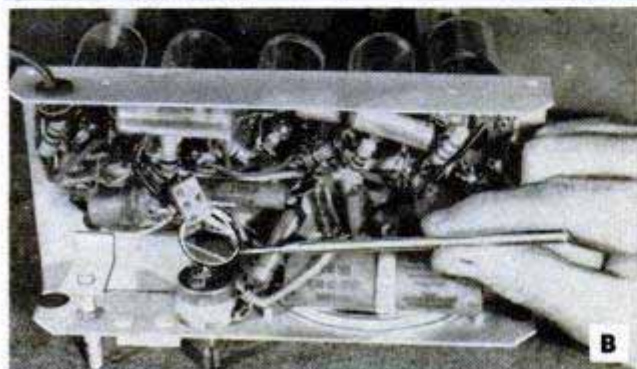
The mirror arrangement on the CBS television camera that appears in photo D enables the operator to capture shots that ordinary TV cameras could not reach. The two mirrors are hinged to the front of the camera so that one picks up the picture at the difficult location and the other reflects it to the lens.

Those who live in areas frequently visited by hurricanes and high winds often wish they could lower their TV-antenna array quickly to protect it from damage. The one-man telescoping tower shown in photo E solves the problem by means of a crank at ground level. It telescopes from a height of 40 ft. to 20 ft. and weighs 60 lb.

The tap-off device shown in photo F provides the necessary isolation between television receivers in master TV-antenna systems along the transmission lines housed in conduits. At the same time it provides the proper attenuation to maintain a constant level of signal strength throughout the system. It will fit a standard outlet box.



Hints for Radio and Electronics Experimenters



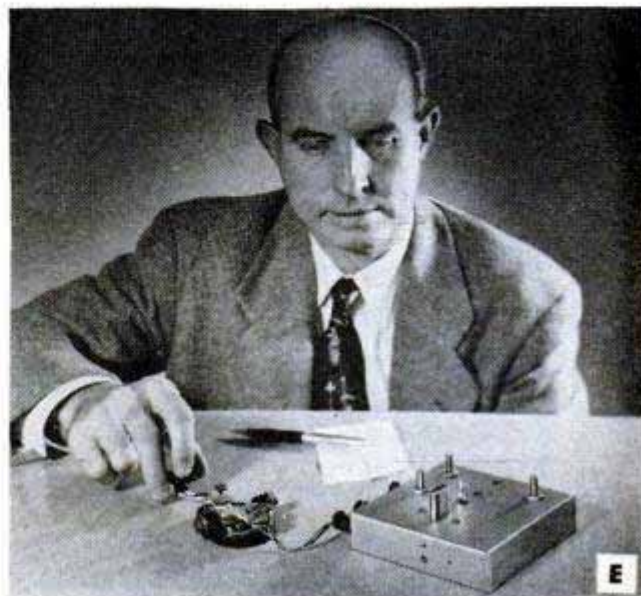
A LOST WORLD of priceless entertainment has been opened to exploration by General Electric audio engineers with a newly developed record compensator shown in photo A. The great performances of Enrico Caruso, Amelita Galli-Curci, John Phillip Sousa and other noted artists, whose legacies have been buried under the scratched and worn surfaces of thousands of old phonograph records, can now be freed of surface noises which in most cases bar any possible enjoyment in listening to early recordings. It can also be used with modern recordings of any of the three popular speeds.

Radio and TV servicemen often use a dentist's mirror, in the manner illustrated in photo B, to detect broken wires and bad connections in difficult chassis locations.

The bedroom radio receiver shown in photo C employs an under-pillow speaker designed to meet hospital specifications for quiet operation. It has an upside-down dial and combines radio, clock, alarm and night light.

A sediment-free solution that does not clog contacts in radio and TV-set controls is now available for eliminating noise and preserving moving contacts in controls. It is applied with a dropper as illustrated in photo D, to clean the contacts without harm to insulation or soldered joints.

Modern radio experimenting recently reached a new high when George M. Rose, who operates amateur radio station K2AH from his home in Mountain Lakes, N. J., demonstrated his tiny transistor transmitter shown in photo E. It is built around a single RCA transistor.



It's the sportsman's movie camera



30-shot loading

Uses economical 8mm. roll film with easy, no-thread loading.

Enough film in each roll to shoot 30-40 average-length movie scenes!



Movies rain or shine

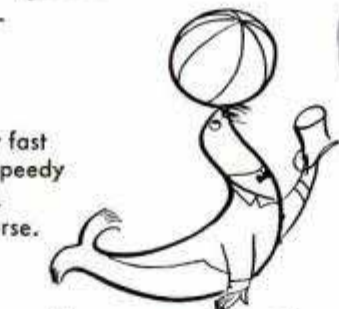
Your choice of an f/2.7 lens . . . plenty fast for cloudy-day shooting . . . or a super-speedy f/1.9 job that can see in the rain.

Both Lumenized (hard-coated), of course.



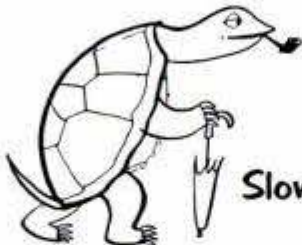
Tough... rugged

Die-cast aluminum body is built to take it. Your "Reliant" thrives on rough going — yet it's sweet-running as a custom-made reel.



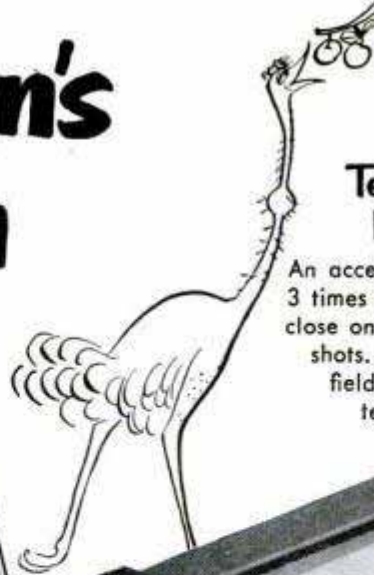
Exposures on the nose

Built-in exposure guide takes out all the figuring, leaves only the fun . . . makes sure exposure's right every time!



Slow motion, too

Really cuts fast action down to size. Use it with any film, either lens, for those extra-detailed effects.



Telephoto for long reach

An accessory lens magnifies 3 times to let you come up close on those hard-to-reach shots. View finder shows fields for standard or telephoto lens.

CINE-KODAK RELIANT CAMERA
 With f/2.7 lens, \$89.50
 With super-speedy f/1.9 lens, \$110
 Other Kodak movie cameras, from \$39.75 . . . at your Kodak dealer's. Prices include Federal Tax and are subject to change without notice.



Slips in a pocket



Light and compact enough to slip in a jacket pocket where it's always ready when action starts popping. Swings and points as easily as your own 12-gauge.

Color movies, of course

They're easy — inexpensive, too. Kodachrome movie film costs but \$3.95 a roll (8mm.) — including processing! (Only \$3.25 for black-and-white.)



Eastman Kodak Company, Rochester 4, N. Y.



See "Photographic Equipment and Supplies"



"LET'S MAKE MOVIES"

A free and fascinating booklet that tells you how to make color movies . . . how to make movies indoors as well as out . . . how to choose the right camera for your needs. Just fill out coupon and send to Kodak.

Please send free copy of "Let's Make Movies" to:

Name _____

Address _____

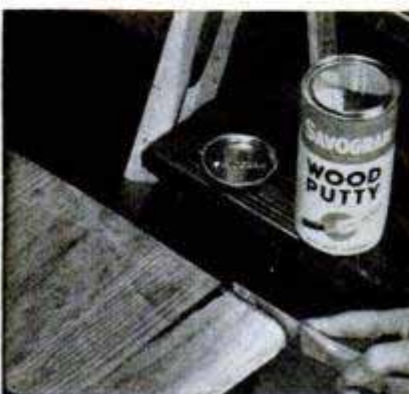
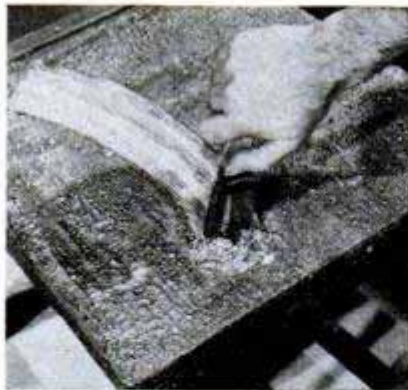
City _____

State _____

Kodak
TRADE-MARK

How to Get Smoother, Slicker Paint Jobs

Step 1. Prepare surface. Remove all chipped and peeling paint or varnish down to bare wood. You can do this easily and quickly with Strypeeze . . . the guaranteed paint remover that stays wet longer, clings to upright surfaces, doesn't harm hands.



Step 2. Rebuild broken corners, fill nicks and holes. A powder-form plastic putty, Savogran Wood Putty, is ideal for this. You can form it, tool it . . . and it doesn't shrink. For cracks in plaster, use Savogran Crack Filler. It's the original patented quick-hardening water putty.

Step 3. Start job with clean brushes. If it's an old brush, clean it before you begin painting. Clean all brushes after painting and whenever you change colors. Kwikkeeze, the Liquid Brush Cleaner, softens hard brushes in minutes . . . cleans out fresh paint instantly! May be re-used.



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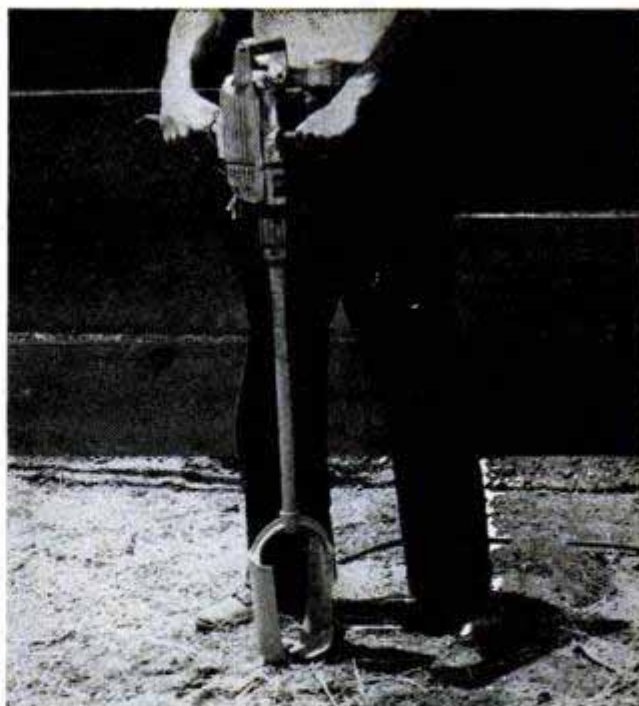
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Only a minute is required to install an Italian rain-and-wind deflector for motor scooters. A watertight canvas top and unbreakable windshield comprise the unit. It is manufactured in several different colors.



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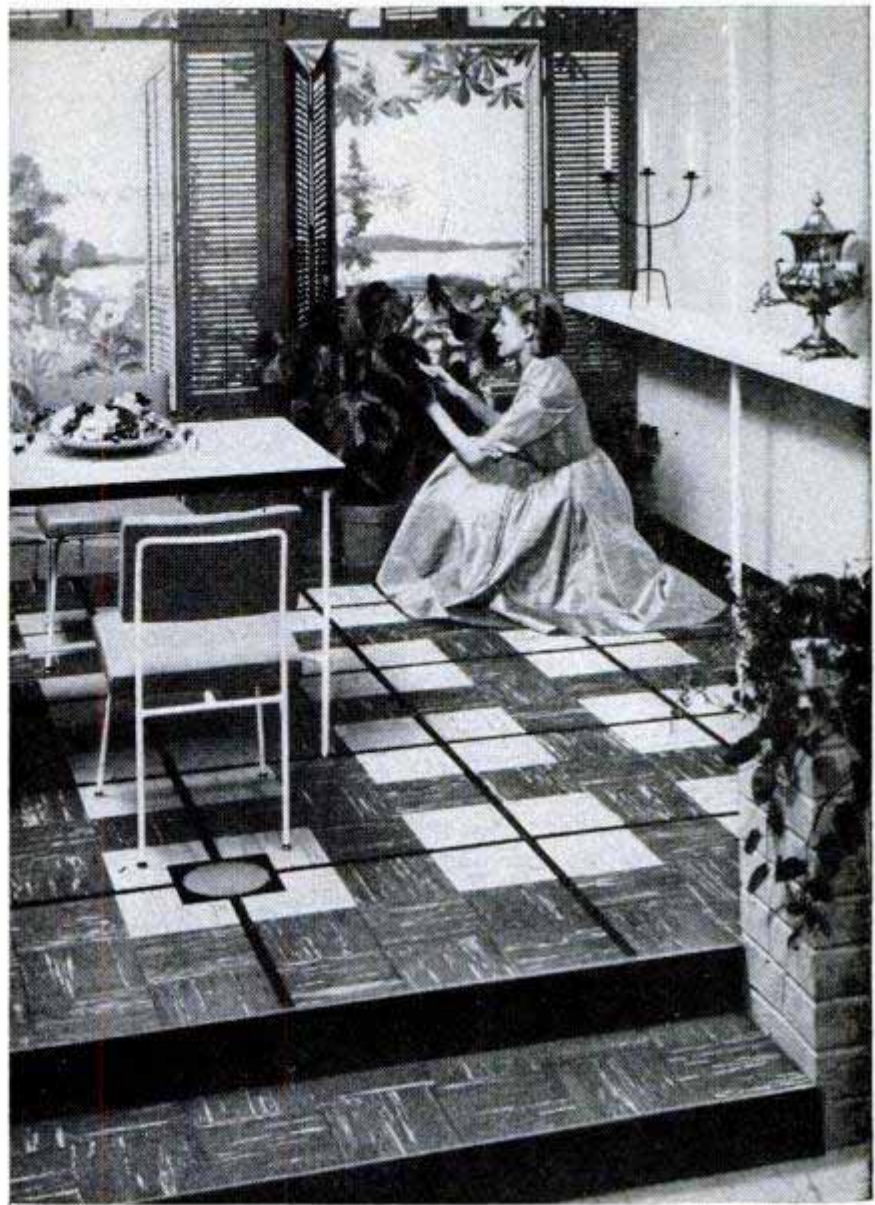
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* Price quoted is for a floor approximately 11'6" x 9'3" installed by you. Your floor may cost less or slightly more depending on size, colors and freight rates. See your local Kentile, Inc. Dealer for FREE estimate. His name is listed under FLOORS in your Classified Telephone Directory. In Canada, T. Eaton Co., Ltd.

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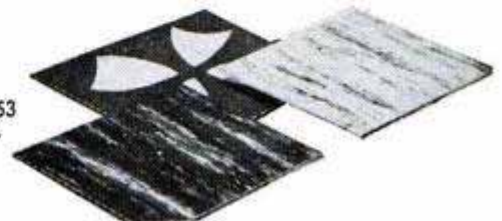
KENTILE
GUARANTEE

Kentile, Inc., will furnish new tile without charge for any Kentile that wears out . . . and on which colors wear off . . . during your own occupancy of your own home wherein you have installed Kentile or have had it installed by an authorized Kentile Dealer. This guarantee does not apply to damage caused by your improper handling or your failure to follow the instructions for installation and/or maintenance available at your Kentile dealer's. This guarantee must be presented if  is made for new tile.

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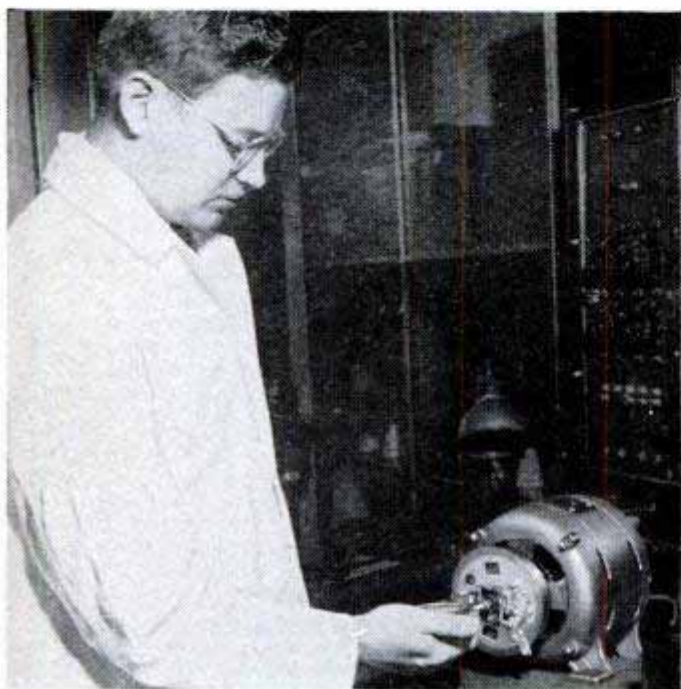
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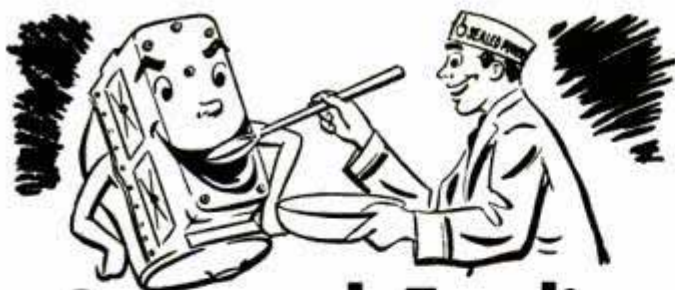
These typical "unseen differences" engineered into all Auto-Lite electrical equipment show why the "Tested Quality" of Auto-Lite Original Service Parts is your best guarantee of trouble-free motoring. Auto-Lite is specified as original factory equipment on many of America's finest cars, trucks and tractors. So be safe! Always insist on Auto-Lite Original Service Parts . . . because you're always right with Auto-Lite.



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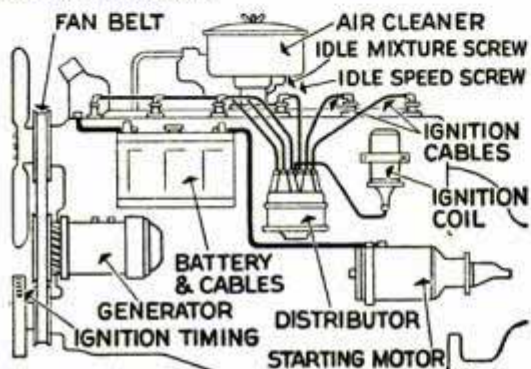
Care and Feeding of Engines

BY S. P. CORP

HOW TO TUNE UP YOUR ENGINE

Every engine needs a periodic tune-up. Here is a list of operations to check:

BATTERY: Tune-up starts with the battery which should test from half to full charge. See that cables are tight and connections clean.



SPARK PLUGS should be removed, cleaned, and inspected. Replace any which are defective. Check gaps to car manufacturer's specifications. Use new gaskets.

COMPRESSION: While plugs are out, use a pressure gauge to check compression of each cylinder. Sticky valves and defective piston rings will be revealed by this test. Such conditions must be corrected if your engine is to perform satisfactorily. If compression is up to standard, make these other tune-up checks:

DISTRIBUTOR: Check ignition points to see that they are clean and offer no resistance to current flow. Check distributor cap, rotor, and wires for cracks, corrosion, or damage. For peak economy time the engine for the gasoline used.

CARBURETOR: There is an idle mixture adjusting screw on the lower side of the carburetor—two screws if it is a dual-throat carburetor. Connect a vacuum gauge to the intake manifold and adjust the mixture to obtain a reading of 18-20 in. Set throttle stop screw so car will travel not less than 8 to 10 miles per hour.

AIR CLEANER: Clean the air cleaner on top of the carburetor and refill to indicated oil level with same grade of oil used in your engine. While cleaner is off, inspect choke valve to be sure it is free. Also make sure manifold heat control valve is free, as required for smooth and economical operation.

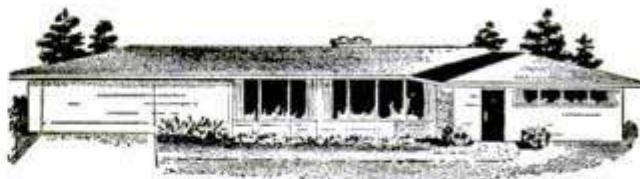
All this may sound like a lot of work, but it's mighty important if you want peak performance!



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Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.



Snow Mold

Q—When grass started on my lawn a year ago, I noticed several areas where there was no new growth. Apparently the plants had been killed, as only weeds took over later on. The grass adjacent to these spots seemed unaffected and I raked the soil and reseeded. The new seeding made a good growth. What happened?—W.A., Ind.

A—There are several possibilities, but your description makes it sound like what is known as snow mold. Of course, oil, dry-cleaning fluids and certain root destroying chemicals produce similar phenomena but, the fact that new seeding germinated and rooted freely makes snow mold the more probable cause. It is fairly common in northern states yet does not seem to occur in any given locality with any degree of regularity. It is caused by a fungus, and to prevent recurrence, the soil can be treated with mercuric chloride at the rate of about 3 oz. per 1000 sq. ft. In your own experience this would appear to be unnecessary.

Layering

Q—What is the meaning of the term layering as applied to plants? Is it a natural or artificial method of propagation?—R. U., Pa.

A—Well-known examples in nature of what is known as layering as a means of propagation, are strawberries, dewberries and black raspberries. Strawberry plants send out runners each season which root in the soil adjacent to the parent plant and thereby establish a new plant, or plants, depending on the number of runners. Dewberries and raspberries root at the tips of the canes, which bend naturally until the tips contact the surface of the soil. Gardeners practice simple layering by bending the canes in the spring and covering them near the ends with soil to a depth of 2 to 5 in. In this procedure the tip must be left exposed. Air layering is sometimes utilized on certain house plants that have developed long, unsightly stems. In this process, the stem is notched and the wound covered, or "bandaged," with loose soil and sphagnum moss held in place with raffia or burlap. The bandage is kept damp by frequent application of water until roots have formed. Then the stem is severed below the bandage and the altered plant repotted. When repotting, don't remove the bandage, as the materials will not restrict root development.

(Continued to page 224)

Here's how for home painters



Wipe out ladder accidents! Take sensible precautions. One good trick to prevent foot slipping while painting outside your house: wrap a piece of burlap around low rung, use it as foot-wiper. Remember, for repainting, Devoe Wonder-1-Coat is the most economical house paint you can use.



Masking tape hints! Masking tape is indispensable for painting stripes on furniture, masking off walls when painting baseboards, keeping glass clean while painting window frames. Big point to remember is remove tape as soon as paint has set. If paint dries, you may pull off some paint. Have you tried Devoe Velour Gloss or Semi-Gloss for baseboards and indoor trim? Highly washable.



Neatest trick of the week! When cleaning your brush in thinner—to shake it out without splattering the room, put it in a paper bag and grasp the mouth of the bag around handle. The splatter is literally “in the bag.” For the neatest paint job on walls and woodwork you ever saw, try new Devoe flat wall enamel—odorless, one-coat coverage, completely scrubbable.



How to keep outdoor furniture from chalking! Always use an “alkyd” paint because it prevents chalking and protects your clothes. Devoe Mirrolac Enamel is what you need. Easy to apply; will not fade. Incidentally, on metal furniture, be sure to sand off loose rust before refinishing.

For repainting your home, use Devoe Wonder-1-Coat House Paint . . . gives 2-coat beauty and protection in just one coat, cuts repainting time and costs practically in half. Your Devoe dealer (in Classified Phone Book) will be glad to help you with all your painting needs.



(Continued from page 222)



Polishing Pewter

Q—I have some old pewter, a platter and several bowls and a part of what I suppose was a tea service. How does one polish pewter without producing scratches on the surface? I've tried several methods and preparations, none of which have been satisfactory as small scratches are still visible on the surface of the metal, giving it a

dull appearance. I want to produce a bright surface, like silverware.—B. W., Colo.

A—You might try one of the older methods which is a two-step procedure. Mix flour and salt in approximately equal parts and then add sufficient vinegar to make a medium-heavy paste that will adhere to the surface of the metal. Apply immediately and allow to dry. Then rub off the coating with a soft cloth and wash the pieces in warm water. This first step will remove the discoloration. Dry the pieces before polishing. Dry-polish with a piece of soft leather (a small square cut from an old kid glove is just the thing) which is sprinkled occasionally with ordinary whiting.

Clearing Gutter Drain

Q—I have tile drains from the downspouts to the storm sewer and one of these is plugged so tightly that water no longer passes through it. The house is quite old so the system must have been working normally for some years. The concrete cap over the bell end of the tile seems to be intact and there are no trees near the tile line. What could cause the complete stoppage and how can I remove the obstruction?—V. T., N. J.



A—Offhand, of course, we don't know but there are several possibilities. We'd guess that a partial stoppage has existed for some time and, proceeding on this as an assumption, it's probably safe to rule out leaves as these usually decompose and eventually wash away, especially if the stoppage is in the tile and not in the downspout. It's more likely that a twig, a piece of concrete or some other hard object has found its way into the tile and lodged in the horizontal run of tile below the elbow. Particles of slate from the roof coating and possibly a small piece of roofing or shingle can build up behind such an obstruction and cause the complete stoppage you describe. The surest remedy is to remove the concrete cap from the end of the tile and also the lower section of downspout so that a sewer rod, or “snake,” can be inserted to dislodge the obstruction. After the tile has been cleared, flush it with a strong stream from a hose.

Preventing Corrosion of Car-Battery Terminals

Q—How does one remove the white powdery substance that collects on car-battery terminals? How can I prevent its recurrence?—T. S., La.

A—Several methods are recommended, none of which can be considered permanent. However, one of the simplest ways of minimizing corrosion at the terminals is to remove the cables and clean the top of the battery thoroughly, using a dampened cloth and a soft bristle brush. You may have to remove the top of the battery carrier in order to do a thorough job. Then coat the posts, the cable clamps and the area around the posts with petroleum jelly, applying a fairly heavy coating to all parts. When replacing the carrier top, don't draw the hold-down bolts too tightly.

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summer driving!



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—says **WILBUR SHAW**, President, Indianapolis Motor Speedway and
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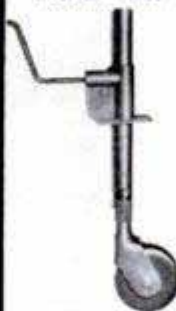
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BIG NEWS IN THE BIG SWEEP TO SPIN-FISHING THE NEW AIREX VAGABOND

Featuring New FULL
BAIL with ROLLER PICKUP
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weighs only 14 oz. yet holds 270 yds. 12 lb. test line. For surfcasting, boat or squidding and heavy fresh water fishing.



Now 4 Great Reels \$13.50 to \$28.50. Famous "Master-reel," \$22.75. Popular "Spinster," \$13.50. New "Vagabond," \$16.50. New salt water "Beachcomber," \$28.50.

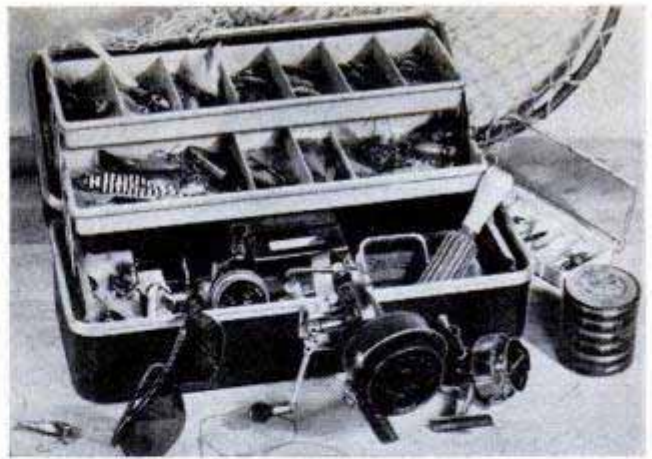
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Spin-fishing equipment includes a tackle box, reels, selection of lures, extra line, floating net and Polaroid glasses so angler can see fish beneath surface

They Call It Spin Fishing

(Continued from page 88)

of three o'clock. You will hear a clicking as you overpower the drag. Now reverse the direction until the crank snaps into the casting position at about five o'clock, and make your cast as with an open-face reel.

Most spin fishermen will recognize only one drawback to spinning, but it's important that you know about line twist and how to overcome it. Each time the pickup revolves around the reel it puts a twist in the line, but this straightens out when you cast. A great many lures such as devons and spinners will twist the line as they move through the water. Eventually the line may twist to such a point that it may shrivel into tight loops. Then there are those times when the fish is running out line and you carelessly reel in. More twist.

To overcome line twist, it is better to wind new line on a spool by hand or with a lathe than with the reel itself. There are many good spin fishermen who don't completely agree with this; they put line on their reel by twisting it on with the pickup, figuring they can straighten the line when they cast out.

Many of the spinning lures are loaded so the weight is off center to combat line twist. Some are made in pairs: Twin lures that look exactly alike, yet one revolves to the left and the other to the right. You fish with one for a while, then switch to the other and work the twist out of the line. Other lures have keels which keep them from revolving but permit a blade to spin. Bead-chain swivels are very effective in preventing line twist and even more effective when used with keel-type lures. Some use the ball-bearing swivels. When you complete a retrieve, keep the rod tip as high as possible to untwist the line.

(Continued to page 230)

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*will take your Castle
out of the air...*



and Put it Behind
YOUR CAR

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After each hour of spin fishing you'll be wise if you remove the lure and let out the line in a current or trail it over the stern of a moving boat until all the line twist comes out. Most fishermen carry extra spools of line for changing during a day of fishing, especially if they are going after fish of different sizes, in which case they change the weight of the line to fit the circumstance.

Among the spin-fishing reels which have contributed to this new sport in America are the Mitchell, Salt Water Mitchell, C.A.P., Thommen Record, Booth Centaure, Orvis 100 and 101 (Pelican), Ambidex, Rockland Ru-Lac, Ru-Sport, Ru-Mer, Ru-Atlantic, Airex Bache-Brown Mastereel, Spinster, Vic, Beachcomber, Vagabond, Luxor-Luxe No. 1 and 1-S Special, Luxor No. 2 Supreme, Luxor No. 3 Mer Salmon, South Bend Spincast, Shakespeare Spinning Reel, Wright & McGill Fre-Line, H-I Triplex, H-I Bradco, Heddon Spinpal, Benora, Zebco, Waltco Ny-O-Lite, Ocean City No. 300, Fix Manual, Fix Automatic, Silent Spin-Flyte, Pecos-Luxe, Swiss Whiz, Quick, Staro, Alcedo, Oredon, Capta, Louis Johnson Sure-Spin, Tradewinds Spin-in Champ, Langley Spinlite, International No. 100, Bretton Spinning Reel, Good-All Star Deluxe, Bristol No. 69, Monti-Super, Rado, Johnson Reel, Telecast, Whirlaway, Humphreys, Worden Belly-Winder, Agal, Olympic De Luxe and the Magic. Many others are expected soon.

Spin fishing has really taken hold on the Pacific Coast. Don Harger, a widely known fishing authority of Salem, Ore., says that spinning on the West Coast has grown from the novelty stage to a point where it now leads all other angling methods by a wide margin. Down Florida way, Homer Rhode, an all-around angler of Miami, reports that fishermen of the southeastern part of the nation have gone overboard for spinning, and are taking pompano from the bridges, bonefish and permit on the Keys flats, snook along the canals, tarpon up the rivers, and sailfish, white marlin, wahoo and dolphin in the Gulf Stream, all on monofilament line of less than 12-pound test.

Ted Williams, the Boston slugger-Marine Corps pilot, who also specializes in catching anything that swims, told me "It's even more fun than fishing with my fly rod." Joe Bates, Jr., of Longmeadow, Mass., one of America's leading authorities on spin fishing, says "Any fisherman not equipped with spinning gear is a bit old-fashioned." Clare Bryan of Chicago, who caught a 34-pound 10-ounce white marlin on an 11-pound test monofilament line, says, "Soon spin fishermen will be catching 100-pound

(Continued to page 252)

Protect your cooling system now
to guard against summer overheating



Cooling system failure—on the New York Southern State Parkway last summer—stranded these motorists.

NEW DU PONT ANTI-RUST

and Water Pump Lubricant

RETARDS RUST FORMATION, NEUTRALIZES CORROSIVE ACIDS



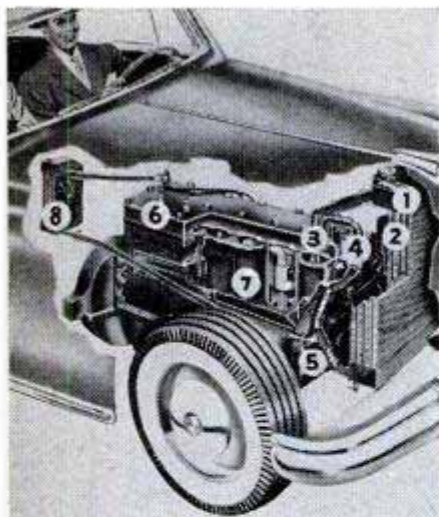
Just pour it in the radiator, leave it in!

Now, you can easily eliminate one hot-weather worry—failure of your car's cooling system. Most overheating is caused by clogging due to rust, and corrosive attack. New Du Pont Anti-Rust not only inhibits rust, but neutralizes acids and lubricates the water pump as well.

Best of all, liquid Du Pont Anti-Rust is simple to use. Just pour it in your radiator and forget it. It starts immediately to protect you against troublesome breakdowns and costly repairs. And Anti-Rust can't clog . . . is harmless to hose or metal parts. Get it at your service station or auto supply store—\$1.00 at most dealers.



Better Things for Better Living
... through Chemistry



HERE'S WHERE Du Pont Anti-Rust works in your car's cooling system to neutralize acid, retard rust and corrosion, lubricate moving parts. 1. Radiator tanks. 2. Water tubes. 3. Thermostat. 4. Water pump. 5. Hose connections. 6. Cylinder head. 7. Cylinder wall. 8. Heater.

DU PONT SPRING DRAIN-OUT:



Ask at your garage or service station about this complete summer protection. The service includes 1. Draining out winter-worn anti-freeze. 2. Thoroughly cleaning out rust and scale with Du Pont Cooling System Cleanser. 3. Adding Du Pont Anti-Rust and Water Pump Lubricant. 4. Checking all cooling system parts.

DU PONT COOLING SYSTEM CLEANSER

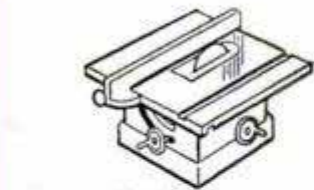
**Top-Quality
Individual
Power Tools**

are actually

**The Same 4 Basic
Parts Arranged in
Different Ways**

plus a

Principal Feature



**8-INCH
CIRCULAR SAW**



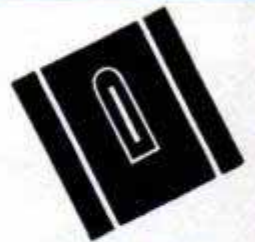
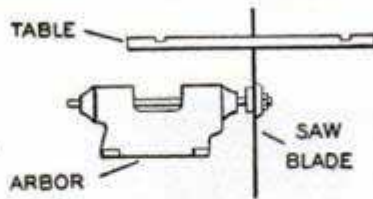
**12-INCH
DISC SANDER**



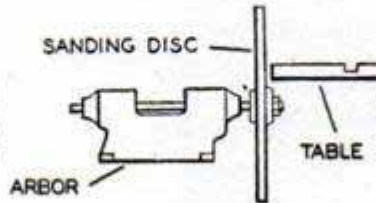
**15-INCH
DRILL PRESS**



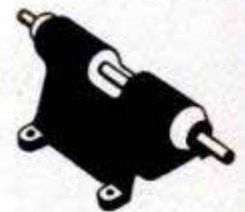
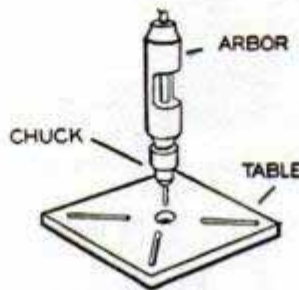
**33-INCH
WOOD LATHE**



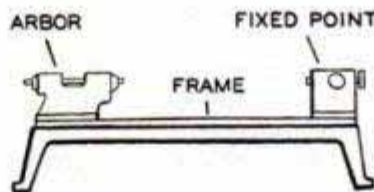
LARGE TABLE



EXTRA POWER



**BALL-BEARING
SPINDLE**



RIGID FRAME

How to compare today's

NOW LET'S LOOK AT THE "GENERAL ASSEMBLY"



3 OR 4 TABLES



4 SEPARATE FRAMES



4 SPINDLES OR ARBORS



1 MOTOR, 4 V-BELTS

SINGLE, MULTI-TOOL UNIT COMBINES THE BEST FEATURES OF BIG INDIVIDUAL POWER TOOLS



In each of its basic operations, the multi-purpose tool does the job of a big individual tool, does it as well (because it has the same basic features) or does it better (because it has features which though standard in one operation are useful and unique in another). For example:

CIRCULAR SAW—has added feature of large working area, saw blade that can be shifted from side to side for hairline adjustments or dadoing. Ball-bearing spindle means extra-smooth, quiet operation.

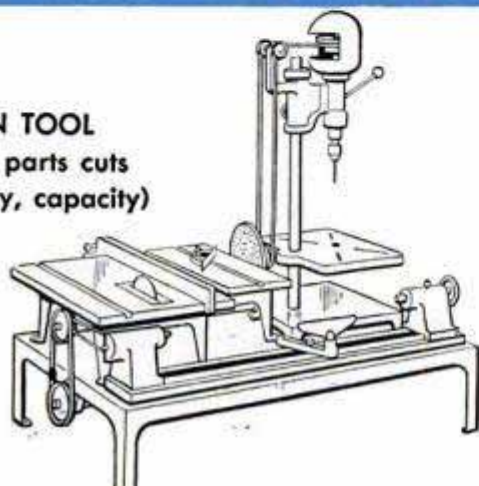
DISC SANDER — outperforms all but the largest industrial types. Has unique feature: Disc can be fed into work for maximum accuracy and for precise finishing of duplicate pieces.

DRILL PRESS — works horizontally as well as vertically. This makes the handling of long or awkward pieces an easy job. Horizontal drill is an ideal tool for making doweled joints.

WOOD LATHE — has movable headstock instead of movable tailstock. Means operator can slide headstock to end of ways for faceplate turning, enabling him to face the work instead of working from one side.

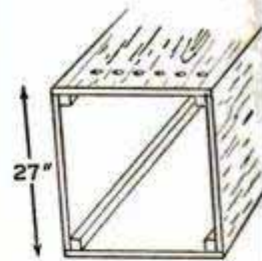
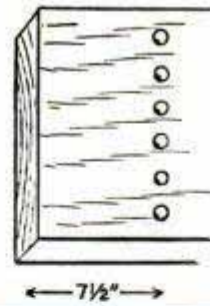
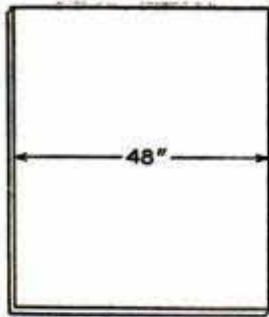
multi-use power tools

ASSEMBLED COMBINATION TOOL
(duplication of parts cuts down on quality, capacity)

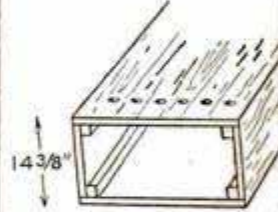
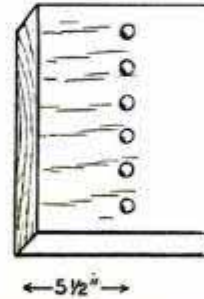
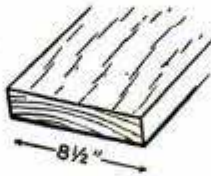
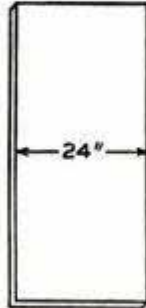


The new multi-use power tools do more than saw, sand, drill and turn. They've broken down forever the old saw that "the biggest and best projects require individual tools." And they're kicking up a furor all their own. Which is better: the "all-in-one" combination tool or the "one-for-all" multi-purpose tool? A basic concept is involved. So that the important differences won't be overlooked in the battle of advertising claims, we diagram them here and discuss them in the two pages following.

**LEADING
MULTI-
PURPOSE
TOOL**



**LEADING
COMBINATION
TOOL**



Sawing big panels - maximum blade to fence capacity

Sanding ends of boards - maximum width of work

Drilling - maximum distance in from edge of work

Drilling - maximum thickness or height of work

Americans have suddenly discovered that there's fun, relaxation and substantial savings in the age-old art of woodworking. One reason for this new "do-it-yourself" enthusiasm is the advent of some exciting, new multi-purpose and combination power tools. They make it possible to have a complete, versatile power shop in limited space, on a limited budget.

The three principal new-type tools are: (1) Radial-arm saws—standard cut-off saws with provision for other attachments; (2) Combination tools—assemblies of single-purpose tools on single benches with one or two motors; (3) Multi-purpose tools—single units designed specifically for multiple operations.

A look at the facts

The radial-arm saw does an excellent, though specialized, job. It is unsurpassed

for cross-cut sawing, outperforming both tilting table and tilting arbor saws. But it is somewhat limited in other sawing operations and in drilling, sanding or turning. It cannot, for example, be used conveniently to cut large plywood panels or to rip wide boards.

The combination tool, with its neat arrangement of single tools, is similar in principle to the old shops where all the tools were driven by belts from a jack shaft. The latest model, for example, requires more than 15 feet of V-beltting to operate four tools.

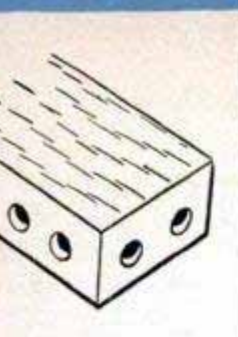
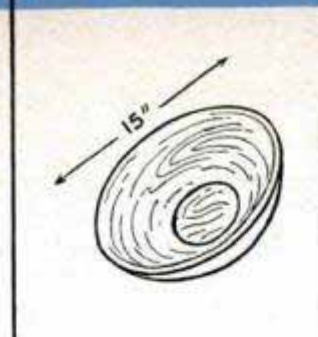
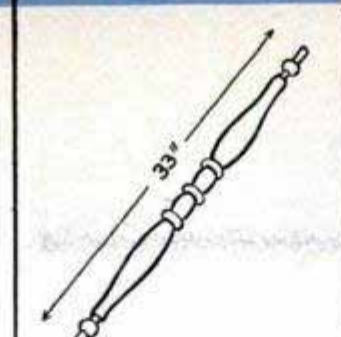
Usually built around a good saw, the combination tool is likely to fall short in its other operations. Its basic weakness is its duplication of parts, duplication at the expense of quality and tool capacity. Furthermore, the combining of individual tools reduces the ease of operation and

**Bonus features
of
multi-purpose
tool**

QUICK-CHANGE SPINDLE TIP
— all changes made with Allen wrench *in seconds*. Hardened tip has a self-locking safety flat.

EXTENDIBLE QUILL
— feature of vertical and horizontal drill gives accurate saw blade settings.



		
NOT PRACTICAL* <small>*even with extra attachment</small>	NOT POSSIBLE	NOT POSSIBLE
Horizontal drilling — for drilling board ends and edges	Faceplate turning — maximum diameter of work	Lathe turning — maximum length of work

flexibility of each, may even cause interference between tools.

An entirely new concept

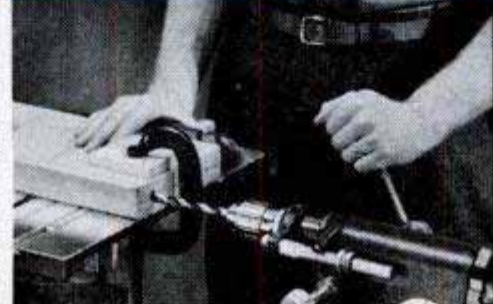
Most revolutionary of the multi-purpose tools is the SHOPS MITH, manufactured by Magna Engineering Corporation, Menlo Park, California. The main difference between this and the other tools is *design*. SHOPS MITH is a completely new design and not just another assembly. It is first and foremost a *single, multi-tool unit*.

SHOPS MITH takes the basic elements of the very finest individual tools — large, machined table; ball-bearing spindle or arbor; heavy-duty castings and frames — and works them into an 8" saw, a 12" disc sander, a 33" lathe and a vertical and horizontal drill press. In each of its operations, this versatile tool equals or outperforms the single-purpose tool it replaces.

AUTOMATIC JIGGING — miter gauge and rip fence for all operations. Speeds drilling and sanding jobs.

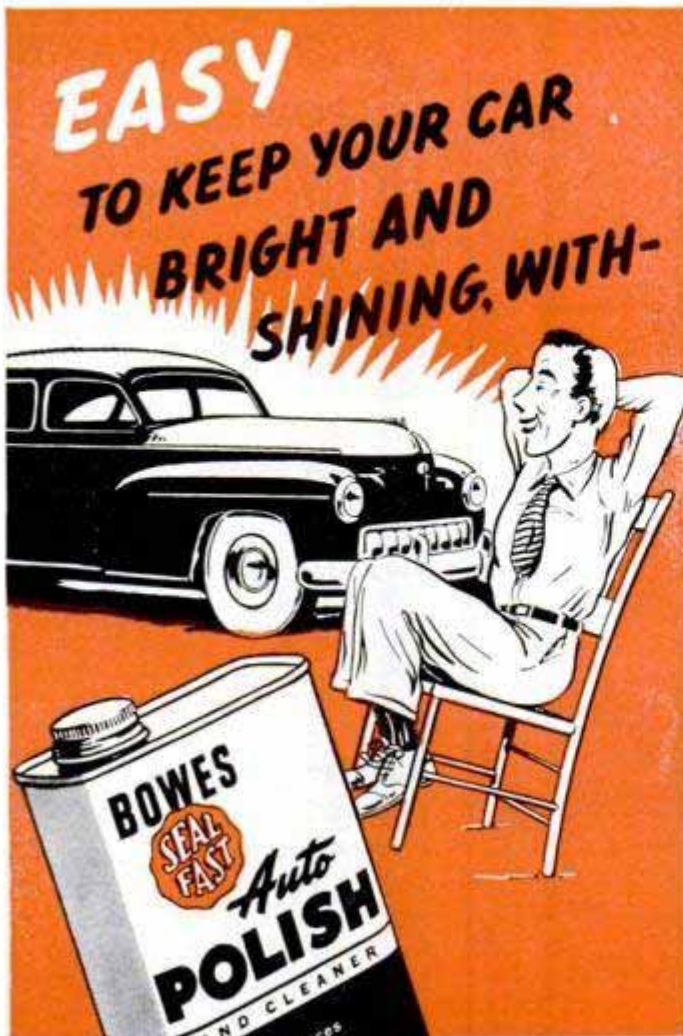


HORIZONTAL DRILLING—unique, time-saving operation. Does 50% of all drilling jobs, does them faster, more accurately.



POINTS TO CHECK WHEN COMPARING POWER TOOLS

	Power Tool A	Power Tool B	Power Tool C
Circular Saw			
Capacity—ability to handle big work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No interference from other tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Automatic stops in miter gauge and tilting table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Micro adjustments (table raising, blade-to-fence)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drill Press			
Capacity—chuck-to-table, chuck-to-column	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Full 4-inch quill feed; adjustable indicator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tilting drill table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Horizontal drilling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Disc Sander			
Large sanding disc	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sanding disc can be fed into workpiece	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Miter gauge and fence for accuracy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wood Lathe			
Ball-bearing spindle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Full 15-inch swing, 33 inches between centers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tool rest slides parallel with work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
General			
All ball-bearing construction throughout	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ready-made jigs for difficult operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Full line of low-cost accessories	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



EASY
TO KEEP YOUR CAR
BRIGHT AND
SHINING, WITH-

★ Because it cleans and polishes in the

same operation, it is easy to keep your car clean and shining with BOWES Auto Polish and Cleaner.

In one quick operation you remove dirt and dulling road film and restore original beauty . . . without back-breaking fatigue.

Keep your car clean and shining the easy way, with BOWES Auto Polish and Cleaner . . . gives you more shine with less work and will make you proud of your car.

BOWES SHINE CLOTH

Chemically treated, this unusually efficient shine cloth absorbs dust, leaves no oily film to catch more dust . . . and . . . makes your polish and cleaning job last over a long period of time.



BOWES Save time and labor with this unusually effective shine cloth.



BOWES "SEAL FAST" CORPORATION
INDIANAPOLIS 7, INDIANA

Sports Cars Have a Field Day

(Continued from page 137)

up with a gymkhana involving some tests of driving skill. Courses are varied to suit the occasion, place and expertness of the group. Most sports-car gymkhanas start with simple speed tests for tire or spark-plug removal, in which cars are lined up and the awkward driver pinches his fingers in the jack or wrench in the rush to remove the part and race with it to the finish line.

While one group of cars is busy at this, others snake, with engines roaring, in and out between barrels on an obstacle course in a race against time. The driver must end up cleanly between a set of flags, ram his gears quickly but quietly into reverse and swing around into an adjacent set of flags without knocking down any barrels, flags or judges.

On another course, blindfolded drivers back their cars down the field under the direction of their navigators. They may have to weave around a couple of barrels, then straighten out and knock over a target of tin cans. Colorful talk frequently goes on between team mates in this event when "rights" and "lefts" are balled up by the reverse motion of the car. Few drivers hit the target on the first run. One of the cars in our rally ended up facing the wrong way.

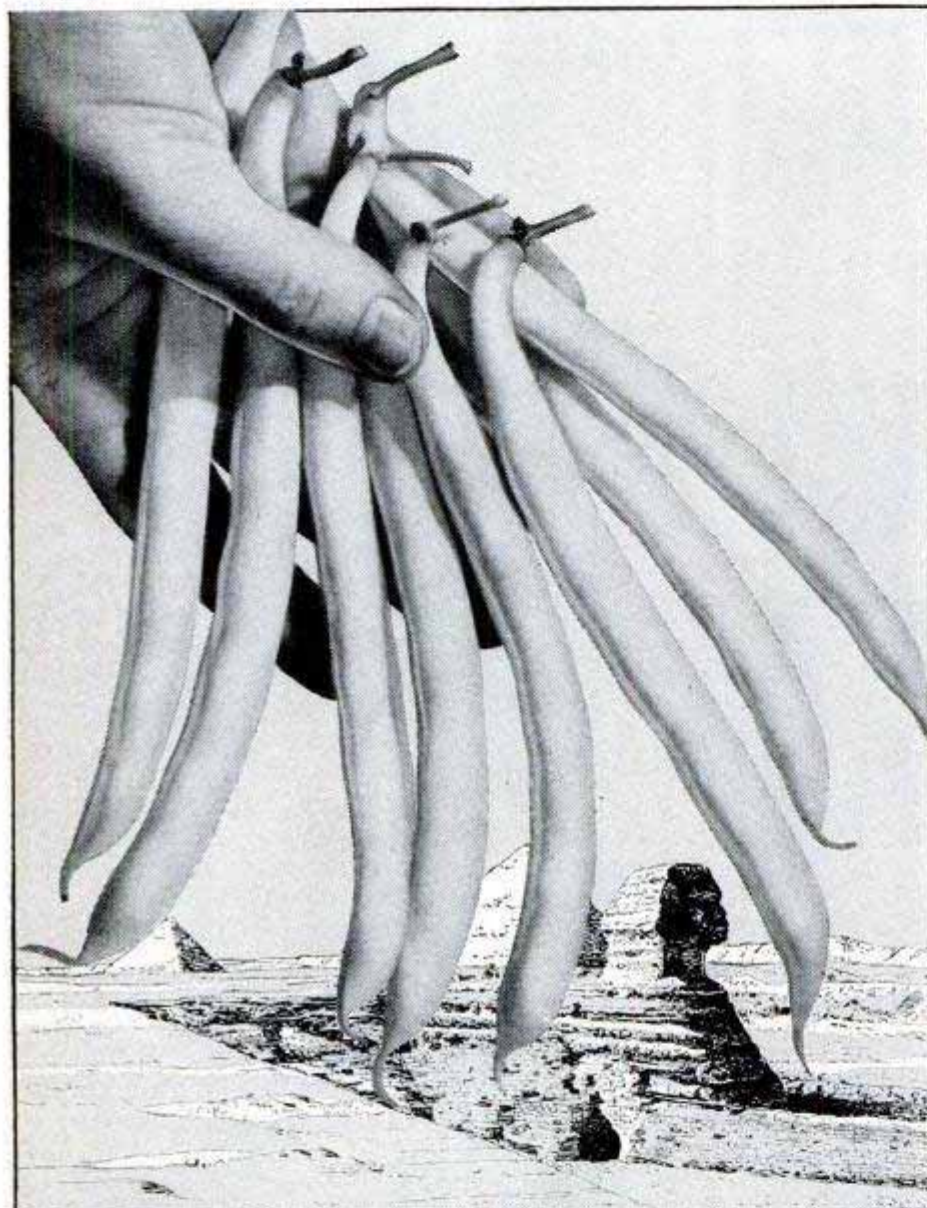
An exciting contest is the balloon-popping race—a West Coast favorite. While the driver guides his car down the course, his passenger leans out and pricks a series of balloons laid out on the ground along the way. He'll be scored not only for speed, but also for unpoped balloons left on the course when he hits the finish line. The trick is to keep from falling out of the car while popping a balloon. And the driver can't come up too close or too fast to a balloon or the car will waft it out of reach.

Along a straightaway near by, or around the contest area, teams of cars may run a spark-plug relay race. Each contestant tears down a given distance, slithers to a halt, climbs out, throws up the hood, removes a spark plug and passes it to the waiting driver of the next car in his team. The second man grabs the plug, leaps into his car, starts it and roars off to the squeal of tires and smell of rubber. This process is repeated at relay point after relay point—for as many cars as there are on each team. Shortest time around the course wins the race. After the competition is over and the winners applauded, the drivers pile into their sports cars and drive home—once more using their vehicles, like ordinary folks, just for transportation purposes only. ★ ★ ★

Proof!

VIGORO* CAN GROW FINE VEGETABLES

even in Sahara Desert sand!



New feeding test reveals basic secret of gardening success

You couldn't find *any* soil as utterly lacking in nourishment as barren Sahara Desert sand!

Beans . . . from sand

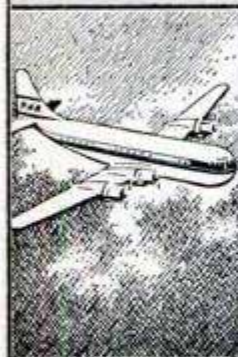
And yet, we managed to grow these fine, plump, wax beans in that sand—thanks to regular Vigoro feedings. Imagine—then—what Vigoro can do for the vegetables you grow in *real* soil . . . in *your* garden.

Poor soil no problem

Your garden soil may be below par. It may lack some of the nutrients which help produce fine vegetables. But no matter how poor your soil is, Vigoro can give it *all* the food elements vegetables need to be big, mineral-rich, full of flavor. Remember—vegetables are the richest single source of minerals. Regular Vigoro feedings assure your family every last possible ounce of goodness in the vegetables you grow.

So, for a bumper crop of fine vegetables, work Vigoro into your soil before planting. Apply at the rate of 4 lbs. per 100 sq. ft.

**Vigoro is the trade-mark for Swift & Company's complete, balanced plant food.*



Sand from the Sahara Desert was flown in for this test by Pan American World Airways.



We planted bean seeds in that sand—and gave them no other form of nourishment but Vigoro.



Vigoro goes to work—within a few days, bean sprouts appear...the plant matures.



And the result! A bean plant as fine and healthy as any grown in rich, black soil.



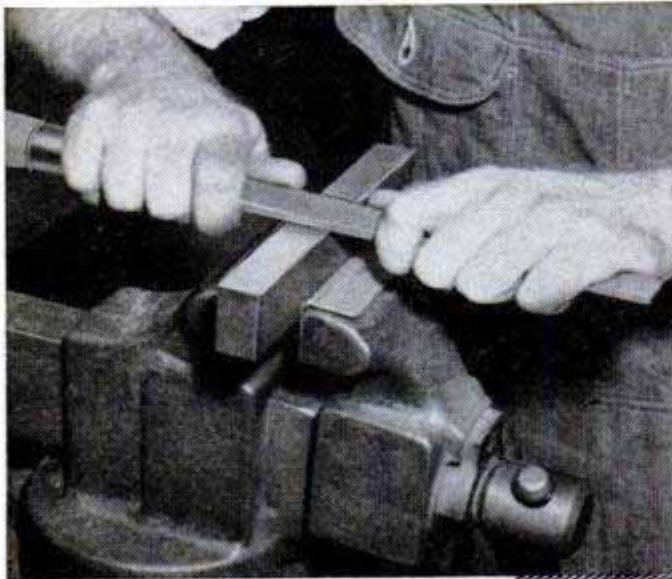
The **VIGORO** Family of Gardening Aids!

- VIGORO
- Instant VIGORO
- End-o-Pest
- End-o-Weed
- End-o-Weed Crab Grass Killer
- End-o-Pest ARC (Anti-Reach-Chigger Killer)

Vigoro comes in 2 forms—regular and new, water-soluble Instant VIGORO

DRAWFILING...

for a smoother surface



Drawfiling with a Nicholson or Black Diamond file (which is perfectly straight, accurately cut and of highest quality) produces a truly smooth, level surface, considerably finer in finish than does "straight" filing. Clamp the work in a vise, using zinc, copper or other soft metal "protectors" to prevent vise pressure from damaging work. Grasp the file firmly at each end and, without "rocking" it, alternately push and pull it sidewise across the work.

• **THE FILE TO USE:** Ordinarily, a Nicholson or Black Diamond Mill Bastard File (illustrated) is best for drawfiling. But where a greater amount of stock is to be removed—as on the edge of a metal sheet or plate—a Flat or Hand file (double-cut) will work faster. The resulting surface is not as smooth, so it may be necessary to follow up with the single-cut (Mill) file. *Your hardware dealer has both types.*



NICHOLSON FILE CO.

23 Acorn Street
Providence 1, R. I.

(In Canada, Port Hope, Ont.)



NICHOLSON

FILES

FOR EVERY PURPOSE

What Became of the Shelter Belt?

(Continued from page 106)

he's a farmer. The smell of the Russian olives is sweeter than that of clover. Going to plant more trees soon—all along the rest of my farm."

Probably the greatest limiting factor on the planting of windbreaks today is the availability of seedlings. Clarke-McNary Act nurseries throughout the country annually supply millions of seedlings to farmers and ranchers at low cost through the extension services, but more are needed. D. H. Cogdill, an old-time cattleman near Crowheart, Wyo., points out another factor:

"When the early settlers came west," he says, "one of their first moves was to set out trees. Many carried seeds and seedlings in the boxes of their covered wagons. The ranchers who live on their own land are generally still planting trees. But we have a lot of ranches in these parts today which are owned by folk living on the other side of the United States. Of course, there are many outstanding exceptions, but for the most part the remote-control ranchers are interested in profits from the land now—not later. And not trees. Especially if the foreman's main interest is Saturday night in town, a tree just doesn't have a chance."

But the tree-planting future for the West generally looks bright—particularly when viewed through the eyes of the generation coming up. Conservation is being taught extensively in grade and high schools. Essay contests with cash awards are sponsored by SCS districts.

Demand for shelter belts and farmstead windbreaks is greatest today in the Dakotas. North Dakota led last year with 373 miles of shelter belts planted, and 4092 acres of farmstead windbreaks. South Dakota was next with 111 miles of shelter belts, 4067 acres of farmstead windbreaks.

But, for an all-around tree-planting program throughout the years it's hard to beat the State of Nebraska. Comments Earl G. Maxwell, extension forester at the University of Nebraska: "Tree planting for Nebraskans is both a heritage of the past and a mission for the future."

Early settlers planted so many trees to provide shelter from the wind and for fuel that the state became known as the "Tree Planters' State." In 1861 a law was passed providing for a \$50 tax exemption for the planting of a specified number of trees. Later this exemption was increased to \$100.

In 1872 Nebraska started Arbor Day, which was later adopted by all other states and many foreign countries. On that first Arbor Day in Nebraska more than 3,000,000

(Continued to page 240)

The plier design that **OBSOLETE**s all others

THE NEW No. 420

CHAN NEL LOCK

PLIER

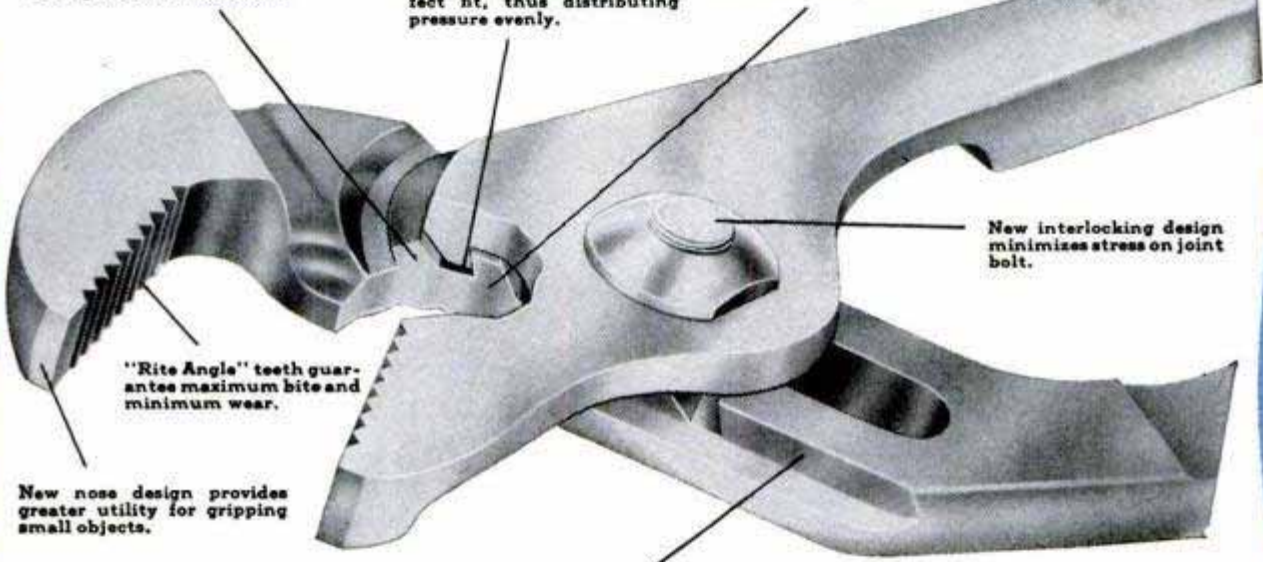
TRADE MARK REG.

U. S. PATENT OFFICE

New type wide base lugs provide maximum cross section strength . . . cannot shear.

Precision machined interlocking surfaces provide perfect fit, thus distributing pressure evenly.

Interlocking principle positively prevents slipping under any load . . . the heavier the job the greater the interlocking action.



"Rite Angle" teeth guarantee maximum bite and minimum wear.

New nose design provides greater utility for gripping small objects.

New interlocking design minimizes stress on joint bolt.

Patented design of tension edge provides more strength and eliminates stress concentration at channels.

Channellock pliers are listed in the Yellow Pages of most Telephone Directories under "Tools".

Here's the new, improved Channellock Plier—bringing to you new features which offer more positive gripping, greater strength and longer wear. The undercut interlocking channel is the first really new idea in plier design in years. Engineering skill has developed a plier with new patented features which give you the newest, strongest, most practical plier you can buy. Here is a plier that will last for years! Channellock Pliers—made only by Champion DeArment Tool Company, Meadville, Pa.

Send for your Catalog today.



THE PLIER DESIGN THAT OBSOLETE

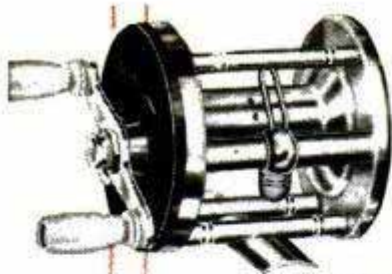
Only **CHAMPION DeARMENT** makes

CHAN NEL LOCK



CHAMPION DeARMENT TOOL CO.

MEADVILLE, PA.



BRONSON

J. A. Coxe Coronet
(No. 25-C) \$33.00
Only casting reel with automatic
free spool—handle disengages
on cast. One-piece machined
aluminum spool revolves on stationary shaft. Wt. 5 oz. Finest
reel money can buy.



BRONSON

Royal-Matic (No. 390) \$10.95
Only free-stripping automatic fly
reel with governor-controlled re-
trieve to help prevent rod tip
breakage. 50% greater capacity.

You'll find a Bronson-made reel just right for you at your nearest sporting goods counter. You'll get lightweight ruggedness . . . precision gears for speed and accuracy . . . advanced design for good looks and long life. Ask for a Bronson or a Bronson-made J. A. Coxe reel—from \$2.95 to \$33.00.

Free Catalog—Write Dept. HF, Bronson Reel Co., Bronson, Mich., (Division of Higbie Co.)



BRONSON

Multi-Royal (No. 380) \$7.95
Only fly reel with 2½-to-1
gear ratio for fast line pick-
up. Adjustable drag. Re-
versible handle for left hand
use. Maroon aluminum for
looks, lightness and life.
Weighs in at 6 ounces.

Free Catalog—Write Dept. PM, Bronson Reel Co., Bronson, Mich. (Division of Higbie Mfg. Co.)

trees were planted in a state-wide program.

The first Soil Conservation District was organized in 1938. Within the next 10 years, 84 districts had been established, comprising 93 percent of the state's land area. Under the SCS program, more than a million trees are now being planted a year.

Since 1941, the State Game, Forestation and Parks commission has planted trees and shrubs on farms in eastern Nebraska in a wildlife-habitat dam project. In one year alone, 428,236 trees and shrubs were planted on 150 farms. From 1934 to 1941, the State Highway Department planted approximately 185,000 trees and shrubs beside main highways. Since 1936, 4-H clubs in the state have planted about 500,000 trees.

But the backbone of Nebraska's tree-planting program has been such men as W. L. Merz, a cattleman in the sand-hills country near Mullan. Merz has five acres of thriving windbreaks surrounding his farmyard and pastures—and every tree came the hard way over a 50-year period.

When Merz first started raising cattle in the area about a half century ago, folk told him trees wouldn't grow there. They were almost right, for most of the first trees he planted never lived the year out. He kept replacing and adding a few more each year.

"Used to be that you could take a rack of hay out in the winter and most of it would blow away before the hunched-up cattle got to it," says Merz. "Now, in the protection of the groves, one man can feed a thousand head of cattle in the winter winds—and be done by noon. Cattle eat in comfort, too."

A major accomplishment of the original Prairie States Forestry Project, which had such rough going in the first years, was the determination of what types of trees were best suited to different types of soil and climatic conditions. Many early settlers just planted cottonwoods—even though they were on the messy side—because they grew wild along creek beds and cuttings were easy to get. Today some 40 different varieties of trees are being utilized in the shelter-belt project.

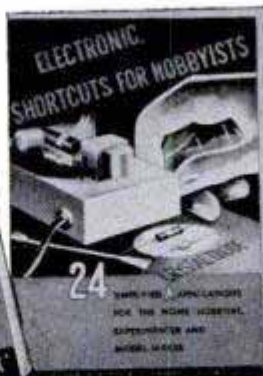
Some farmers are now tearing out their old cottonwood stands and planting new windbreaks. Others feel the cottonwoods have been so kind to them throughout the years they can't destroy them.

"The wind will have to knock mine down," says Homer Jensen, who raises cattle and cottonwoods on Poverty Flats in Montana. "When my father and his brother came here from Denmark in '92 they were dismayed by the barrenness of the land. They plowed furrows, then went down to Clark's Fork River and got cottonwood branches, dragged them back and laid them

(Continued to page 242)

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ELECTRO TOOL CORP., Dept. W523-E, Racine, Wis.

241

in the furrows and plowed dirt back over the furrows. You can't imagine the comfort those cottonwoods have given to our family and our cattle."

Tree planting today is more scientific. First the soil is carefully worked. In many areas it is advisable to summer-fallow the land for a year to store up additional moisture before planting. The land must be cultivated until the trees become large enough to shade the ground, and to outgain the weeds and other growth competing for moisture.

Under the SCS program the farmer can rent cheaply from the Service one of several hundred tree-planting machines located strategically throughout the country. This machine not only digs a trench in which the trees are planted but packs the earth around the trees with special wheels as it moves. Two-man crews are supplied with the planter, and the farmer usually furnishes and drives the tractor pulling it.

Typical shelter belts planted today have 10 rows of trees about 10 feet apart. The belts are usually at right angles to the prevailing winds, but some are also made on the contour to fit the field pattern. Low shrubs are planted in the first row on the wind side, followed by a stair-stepping variety of trees. Row number nine is the key one, containing a tall and fast-growing type

of tree to break the wind in the fewest number of years. The tenth row tapers down again with shrubs. Winds blowing across the plains thus get a sort of roller-coaster ride over the farm lands.

If you travel far across the country, you will see thousands of miles of such protective belts. Don't expect, though, to see that continuous cross-country belt proposed in the headlines of 1934. ★ ★ ★

Jet Noise Is Loud Enough to Break Down Tissues of Body

Jet-engine noise of 120 to 140 decibels, loud enough to break down body tissues, is posing a serious problem for the military services. The roar was termed the loudest manmade industrial noise by Lt. Col. James E. Lett of the United States Air Force School of Aviation Medicine. Ninety-five decibels is a safe level and the loudest sound from piston-engine airplanes was 110 decibels from the B36. Ground-crew workers are those most affected, since the flyers sit forward of the noise area. In addition to making those exposed for long periods jittery and tired, high-frequency sound adversely affects lung tissue. The noise from jet planes in flight cannot have a serious physical effect on those on the ground.



"All I got was a letter from my girl,
He got a tube of non-alcoholic
Wildroot Cream-Oil!"

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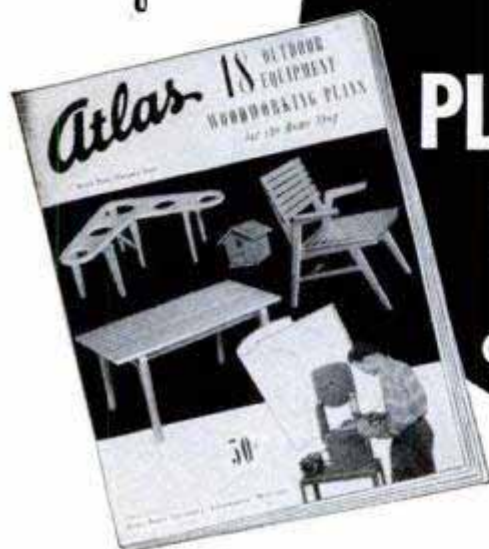
Don't give dandruff and dryness a chance to ruin the looks of your hair. Keep it neat and natural all day with Wildroot Cream-Oil. Made with the heart of Lanolin, so much like the natural oil of your skin! 29¢ 60¢ \$1



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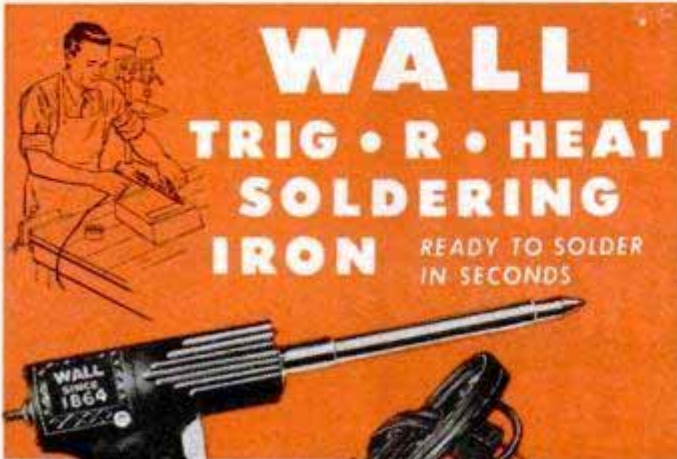
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WALL
MANUFACTURING CO.
GROVE CITY • PENNSYLVANIA

Industry's Private Detectives

(Continued from page 123)

husband was picked up with a .38-caliber pistol and ammunition in his possession. A day later another man was arrested with his .41-caliber revolver and ammunition. By shooting both guns into a large block of wood and running spectrographs of the lead from the two pistols in contrast with the lead recovered from the victim's body, it was proved that the .41-caliber gun was the murder weapon.

The laboratories do considerable work for insurance companies. Before they settle doubtful claims, the firms often seek the help of the laboratories to find just what the facts are. When some insured cattle of an Oklahoma farmer died, the farmer suspected paint which was left in open cans by a contractor who had been painting tanks on the premises. The paint was analyzed and found to contain lead compounds which, of course, poisoned the cattle. The responsibility was established.

In another instance, the Oklahoma Testing Laboratories of Oklahoma City showed that someone had poured salt into a car's gasoline tank with the intention of ruining the engine. The interior of the engine was covered with a shiny salt glaze similar to that formed on clay pipe or tile during its manufacture.

There are close to 400 commercial research and testing laboratories in the country. They range in size from some with four employees to a few with staffs of 500 or more. Laboratories will work for anyone, not only industrial firms. If you have a problem which scientific investigation and testing can solve, they'll uncover the facts and evidence. The fees range from \$5 for a routine report on a bottle of liquid to over \$100,000 for extensive testing. ★ ★ ★

Synthetic-Rubber Tires May Outwear the Car

Still in the development stage is a new type of synthetic rubber which engineers predict will make the tire of the future outwear the car itself. Secret work on the material has been underway for several years at the Goodyear Tire and Rubber Company. Tests show that tire treads of this material have from two to five times greater wear resistance than the best cold rubber produced and resistance to oxidation is far superior to any other rubber, natural or synthetic. It is equivalent to butyl rubber in air-diffusion resistance and vulcanization time for tires made of it can be cut more than half.

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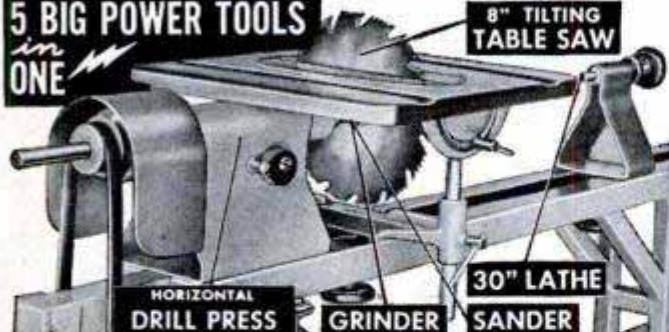
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The Owners Report on the '53 Plymouth

(Continued from page 115)

And now for my own test — The model tested was the Cranbrook four-door sedan, which I drove for 830 miles from Los Angeles over the winding Angeles Crest mountain road and across the Mojave Desert to Lone Pine, Calif., then through Death Valley heat to Las Vegas, Nev., and return to Los Angeles. Included were some tests on roads that were little more than trails.

This new 1953 model with shortened

1953 PLYMOUTH SPECIFICATIONS

ENGINE

Type 6-cyl. in-line L-head
Bore and stroke 3¼ in. x 4¾ in.
Piston displacement 217.8 cu. in.
Brake horsepower 100 @ 3600 r.p.m.
Compression ratio 7.1:1
Transmission 3-speed conventional.
Conventional with over-drive optional. HyDrive Fluid torque converter is optional

GENERAL

Steering ratio (over-all) 21.1:1
Steering wheel, lock to lock 4 turns
Turning radius 19 ft. 6 in.
Brakes Hydraulic with bonded linings
Tire size 6.70 x 15
Recommended tire pressure 24 lb. front and rear
Shipping weight (4-dr. sedan, unladen) 3007 lb. Cranbrook; 2970 lb. Cambridge
Wheelbase 114 in.
Tread, front 55⅞ in.
Tread, rear 58½ in.
Height over-all (4-dr. sedan, unladen) 63⅝ in.
Width over-all (4-dr. sedan, unladen) 73⅜ in.
Length over-all (4-dr. sedan, unladen) 189⅞ in.
Minimum road clearance 8 in.

INTERIOR DIMENSIONS

(4-door sedan models)

Front-seat width 59¾ in.
Rear-seat width 58¾ in.
Headroom, front 36⅝ in.
Headroom, rear 35⅞ in.
Legroom, front 43¼ in.
Legroom, rear 42 in.

CAPACITIES

Oil 5 qt.
Water 13 qt. (14 qt. with heater)
Gasoline 17 gal.

wheelbase (from 118½ inches in 1952 to 114 inches in 1953) is much more maneuverable and easier to park than last year's model. Cranbrook over-all length is 1 inch less than the 1952 model and it weighs 81 pounds less. I detected little difference in the ride of the new, shorter car. The Oriflow shock absorbers do an excellent job in controlling the ride over rough roads and severe bumps. Through improved suspension

(Continued to page 248)

TOPS IN TOOLS

TRUE TEMPER TOMMY AXE

Hundreds of uses! Does the work of a heavy hatchet or light axe. Dynamically balanced power for chopping, driving, nail pulling. Highest grade steel coated with rust-resisting black. 15 3/4" hickory handle, fire hardened to resist weather and wear. At your favorite hometown hardware store. True Temper Corporation, Cleveland 15, Ohio.



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caused from condensation on cold water pipes. Turn idle basement space into play or work rooms. Keep store rooms dry. Just wrap cork-filled



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there is less roll, but the springing of the front end (as in most modern American cars) is still too soft and flexible to suit me. Even so, it seemed almost impossible to "bottom" the front end regardless of the roughness of the road.

Apparently Plymouth isn't in the horsepower race, although an increase in the compression ratio from 7.0 to 7.1 gives a moderate horsepower rating of 100 at 3600 revolutions per minute. Many makers now are going to the "square" engine (near-equal bore and stroke), but the Plymouth engine definitely is in the long-stroke category (3½-inch bore and 4¾-inch stroke). This long stroke does give Plymouth a favorable tendency to "hang on" with excellent power at low engine speed. This doesn't mean that power at higher engine speeds is not good, for it is. With less weight and slightly higher compression, the 1953 car is snappier than the '52 model.

In my previous Plymouth article (1951) I remarked I would like to see overdrive as optional equipment. I am happy that overdrive equipment now is available and was included on my test car. Rear-axle ratio in the overdrive model is 4.1:1 and with conventional three-speed transmission the ratio is 3.73:1. Other optional ratios are 3.54:1, 3.90:1 and 4.30:1.

The car cruised nicely at 75 to 80 miles per hour and would easily do 85 by speedometer. The top speed was 94-96 speedometer miles per hour on long stretches.

The overdrive definitely has improved Plymouth gas economy which always has been good, as shown in the economy test.

On mountainous roads I found the Plymouth brakes to be up to par. There was little tendency to fade and brake pedal action was easy. When it comes to a comfortable riding position, Plymouth's chair-height seats are excellent. There is ample legroom and 1953 models offer more head and hip room and shoulder space than previous models, despite a slight lowering of the car itself.

Front vision through the curved one-piece windshield and directly in front of the hood is excellent because the hood is short, permitting good visibility only a few feet ahead of the bumper. This is an excellent safety feature and is valuable when parking. The wrap-around one-piece rear window also affords excellent vision. The ventilating system is excellent, but control levers could operate easier. Plymouth retains the cowl ventilator to permit direct entry of fresh air into the interior. I am in favor of this design, because less engine fumes from city traffic and dirt and dust enter through

(Continued to page 250)

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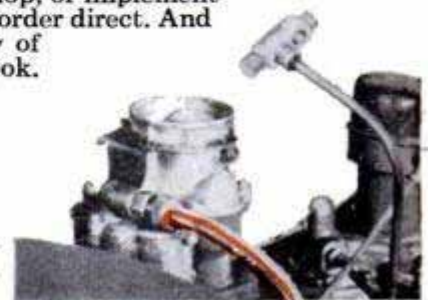
Why pay a lot of money to have your carburetor taken apart and cleaned? Clean it yourself with GUMOUT—right on the engine. Or, your favorite garage or service station can do the job for you with GUMOUT in only 20 minutes.

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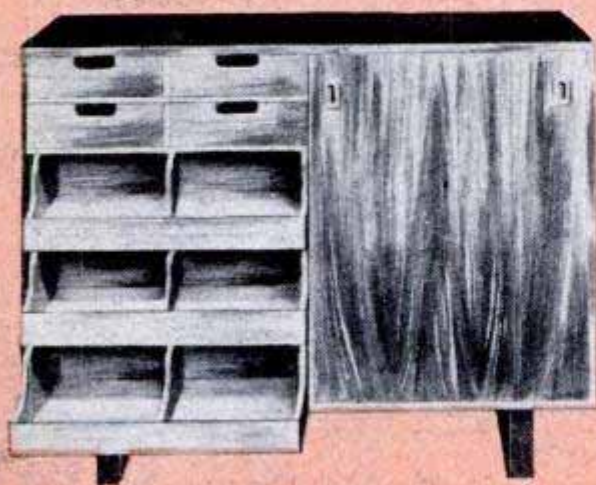
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PRICE \$229.00 (Custom-built motor included)

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IT'S A SAW
Cross-cuts, miters and rips.



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Measure-marks always visible.



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Straight, irregular or bevel shaping.



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Makes wood turnings up to 34" long.



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Cuts out any shape—quickly, easily.



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and it drills, grinds, routs, joints... does everything in woodworking!

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A 4" flat brush is an easy-to-work-with size for painting walls, floors, ceilings and other large, flat areas. And you'll find a brush with Du Pont nylon bristles picks up more paint per brushful . . . flows it on faster and easier.

Paint floors in areas about four feet square. Start in far corner and work toward door. For best results use wide, flat, nylon-bristled brush — one designed for the job.



With the tip of brush, work paint up to ceiling moldings and down to baseboards. Cover space two feet wide. Paint last strokes into area just painted to avoid overlap.



When painting ceilings, dip brush to one inch only. Raise quickly and use short, light strokes. Paint areas about four feet square. Don't poke or jab a large brush into corners.



For storage, clean brush with thinner, then scrub bristles on a board with warm water and cleanser. Rinse and comb bristles. Wrap in heavy paper to store.

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JOB AFTER JOB, you'll get best results with a well-tipped nylon paint brush. Durable Du Pont nylon bristles paint smoother . . . are clean and sanitary . . . never get brittle . . . don't break off even under the roughest treatment. And nylon bristles last from 3 to 5 times longer than ordinary bristles. Leading manufacturers make nylon paint brushes in all types and sizes. Look for the name NYLON on the handle. Be sure to pick the size brush designed for the job.



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BRISTLES**

a cowl ventilator than through the low front ducts beside the engine as on many makes.

While no modern car has completely eliminated sun glare on top of the instrument panel, Plymouth has reduced it to a minimum by avoiding a lot of reflecting chrome. The seat cushions are soft and comfortable. The back cushion is quite hard and there were some spring squeaks. The upholstery is not in keeping with Plymouth standards. One feature I like is the small number of turns required to open and close the windows. Styling engineers, however, pulled a boner by running a metal strip alongside the front-window crank handle. It is so close that the crank lever sometimes hits the strip and it's easy to pinch a finger between the crank and metal strip.

The doors are easy to operate. Plymouth eliminated the twist-type door handle (which I like) in favor of the pull type. The upper half of the horn ring should be removed, as it somewhat obstructs speedometer and instrument vision. The electrically operated two-speed windshield wipers are effective, though noisy.

The Plymouth engine is mounted in rubber. Plymouth pioneered the "Floating Power" principle in 1932. The engine is balanced on its center of gravity and rests on live-rubber cushions, which undoubtedly serve to cut vibration and prolong the life of chassis and body. A new six-bladed fan with a surrounding metal shroud around it is mounted quite high and the radiator is unusually close to the engine. This provides better engine cooling, though Plymouth never has been noted for overheating.

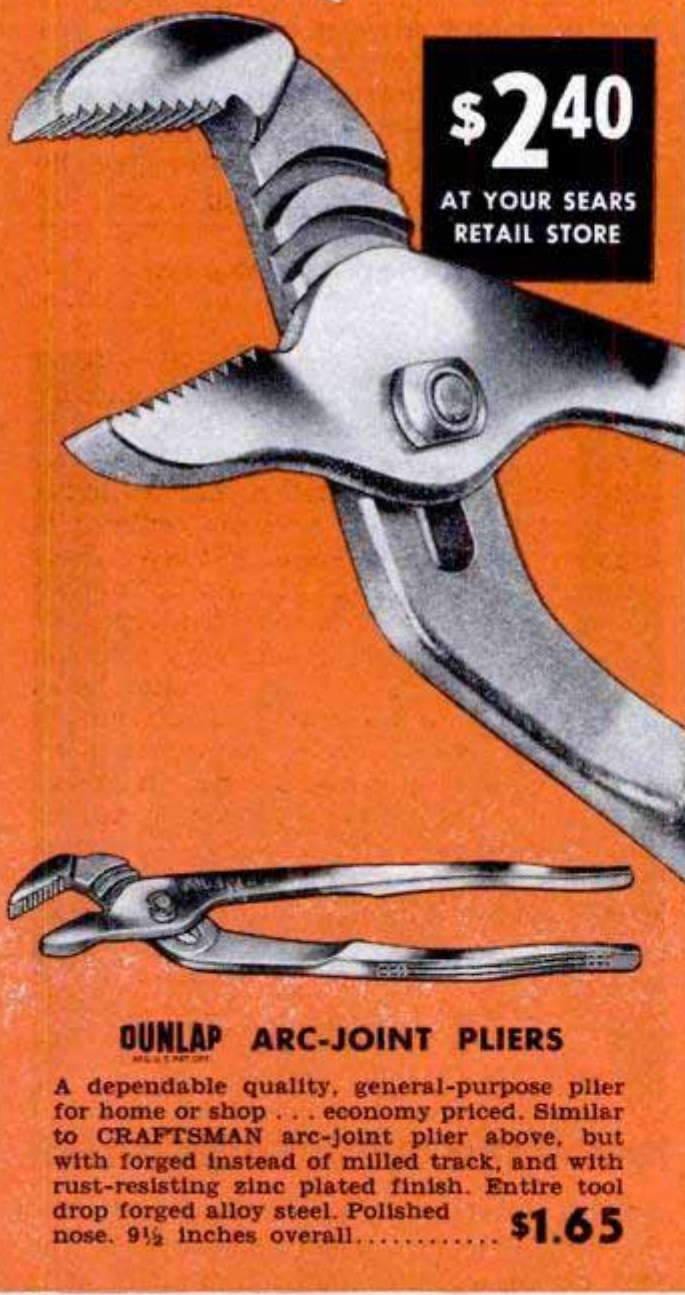
The body is well built and very solid, as no squeaks, rattles or dust or water leaks developed during the entire test. Plymouth has dropped the separate rear-fender panels; they are now integral with the body rear-quarter panels. Trunk space is larger. The gas filler pipe is now on the left corner of the rear body sill instead of on the side. This location certainly is more convenient, but I, like many owners discovered that with a nearly full tank, gas leaks out when cornering to the right or climbing steep hills. A sharper incline on the filler pipe would eliminate this complaint.

Plymouth has a long-standing reputation of building dependable and economical automobiles. If there is any doubt as to this statement, ask any taxi driver. More Plymouth cars are in taxi service in this country than any other make of car and a large percentage of taxi drivers are enthusiastic Plymouth boosters. When riding in a taxi cab I always ask the driver what make of car he likes best. Usually the answer is "Plymouth," which is a real tribute, as probably no service is tougher. ★ ★ ★

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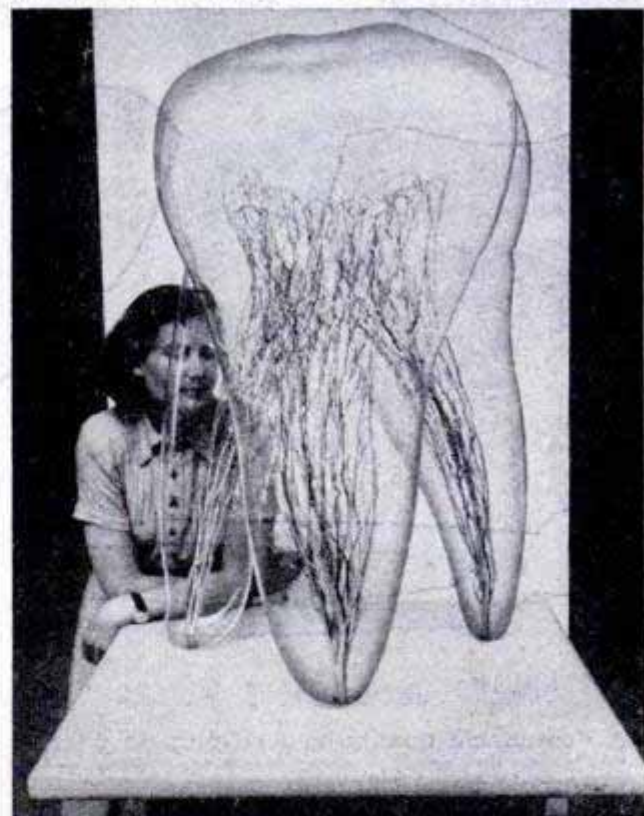
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salt-water fish on 11-pound test line." Ross D. Siragusa, whose art and skill at big-game fishing for tuna won him the distinction of top honors in the Cat Cay Tuna Tournament and whose real hobby is taking bonefish on spin-fishing tackle in Bimini Bay waters, says, "Using six-pound test monofilament and a four-ounce split bamboo spinning rod makes bonefishing look easy." And M. Ray Applegate of Muncie, Ind., who spins for bonefish at Bimini, Walker Cay, Florida Keys and in Hawaii, says, "Sixteen bonefish in one day is easy with a spin-fishing outfit, but would be difficult with any other tackle. It's lucky for fishing that spin fishermen return their fish to the waters."

Spinning can't guarantee that you'll take more fish or bigger ones; fortunately the lure of fishing always has been the fact that the angler is pitting his wits and ability against an untamed opponent. But spinning will guarantee one thing—you'll have a lot more fun playing this age-old game of fishing. ★★★

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The 500 as the Experts See It

(Continued from page 99)

If you start for Florida with seven persons and a load of baggage, you can easily and quickly get a different rate.

Q: It wouldn't add as much as some of the items being added today, would it?

VANRANST: No, but it is something that you can't see. The average buyer isn't able to evaluate it. He wouldn't know the difference. He wouldn't know whether he was on torsion bar and if it added to the cost it wouldn't appeal to him.

MILTON: I think it is probably somewhat doubtful how much better it is than the helical springs and independent suspension we now have on the family car, that is.

VANRANST: I doubt if anyone could tell the difference in ride between coil springs and torsion bar simply by riding in the car.

MILTON: However, in a racing car, they do more tricks with the torsion bar than a monkey on a vine. I am told that one reason the cars handle so well at Indianapolis, as compared with cars of my time, is this torsion-bar system. They adjust them in such a way that the cars stick to the track like glue.

Q: What would be an ideal car weight?

VANRANST: I would say the lowest you can get is probably the optimum.

Q: Wouldn't that tend to create a handling problem?

VANRANST: The big problem is traction. When you reduce weight and keep the same horsepower, your traction is less. If you keep cutting weight you will have to go to four-wheel drive.

MILTON: Here's what we think a car ought to be: Four-wheel drive with manual control to release the rear wheels so that going through the corner you would be using front-wheel drive only. Then when you hit the straightaway and are tromping on it, you have four-wheel drive again. There would have to be a quick manual release.

Q: What, in your judgment, makes a good race driver?

MILTON: The answer I shall give is anything but complimentary to drivers, but it is essentially true. In the first place, you are a guy with a colossal ego. You have read the papers and you know that Joe Doakes and Charlie Potatoes were killed, but you say to yourself, well, they were stupid or they wouldn't have been killed. I would like to get hold of one of those cars and show the boys how to do it.

So you start on that basis. Maybe it is a year or two before you start winning, but you laugh that off some way or other. Then

(Continued to page 256)

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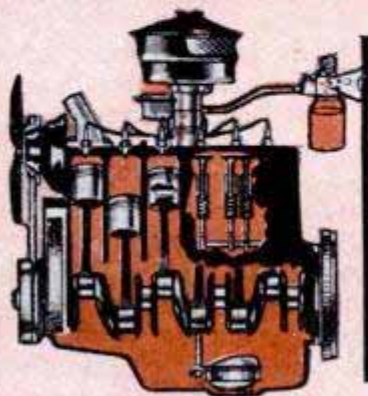


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you win a race. All your faith is confirmed. You are the best and from there on out nobody else is going to win.

Then Joe Blow comes along and beats you. Well, that was just an accident. But then he beats you again and perhaps a third time. So you cut him in—he's not as good as you are, but he's a good driver, too. Then some other drivers beat you and you cut them in. You are still the best, but you have had to cut in two or three guys with you. Then those drivers start getting bumped off. It now begins to penetrate your brains that the thing is hazardous and when that happens, you are all washed up as a race driver. And that is why I say that the popular conception of guts is strictly malarkey. I drove for 16 years and in only one race was I called upon to, and did, exhibit just a bit of that "steel nerve" you read about. Once it penetrates your consciousness that it is dangerous, and that you are apt to get torn to bits, you are all through as a race driver. That is my opinion.

Q: What are the important decisions a driver makes in the first few miles?

MILTON: He must give great attention to staying out of traffic, as much as possible. My heart goes right up in my mouth watching the first few laps of the 500. It isn't so bad when you're in it, but just stand on the side and watch those 33 cars bust into that first turn! There is a terrific cloud of dust and a lot of vacuum which is progressively higher toward the rear of the pack. First-year drivers, especially, are shocked when they discover that closing the throttle is not accompanied by normal deceleration. It's a terrific sensation—a situation that requires good headwork. I would say a primary rule is to stay out of traffic as much as possible because that is where the hazards are greatest.

Q: Are drivers any better today than when you were one?

MILTON: I don't know of any reason why drivers shouldn't be better today. The species seems to improve in all lines of endeavor.

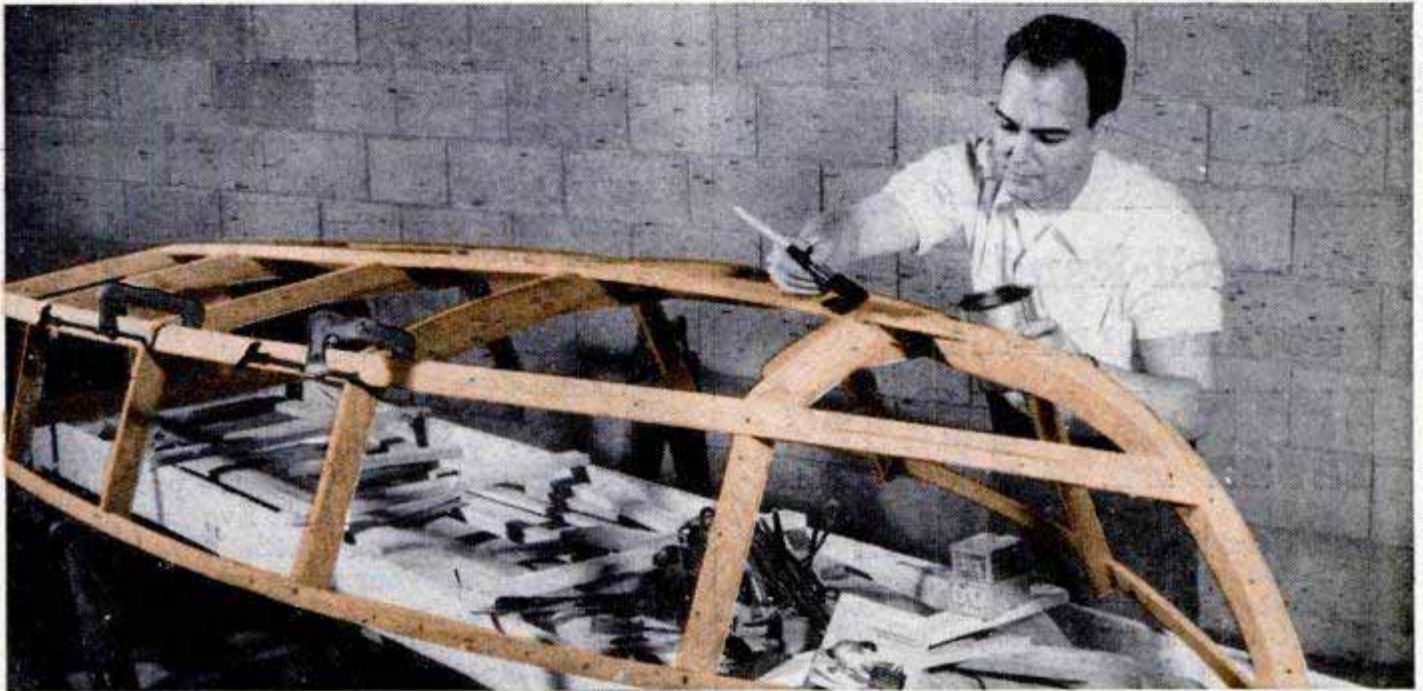
Q. How is the best way to drive a racing car at Indianapolis?

MILTON: There is at Indianapolis, or any track, what is called the groove. That is simply that part of the track which is best to take to get around the quickest and safest. At Indianapolis, if you were qualifying and no traffic were involved, you would be as close to the outside fence as you consider comfortable. I always liked to be very close—a couple of feet away. Then as you reach the end of the straightaway at a predetermined point you get off the throttle and you kind of kick the tail end up a little, just cut

(Continued to page 258)

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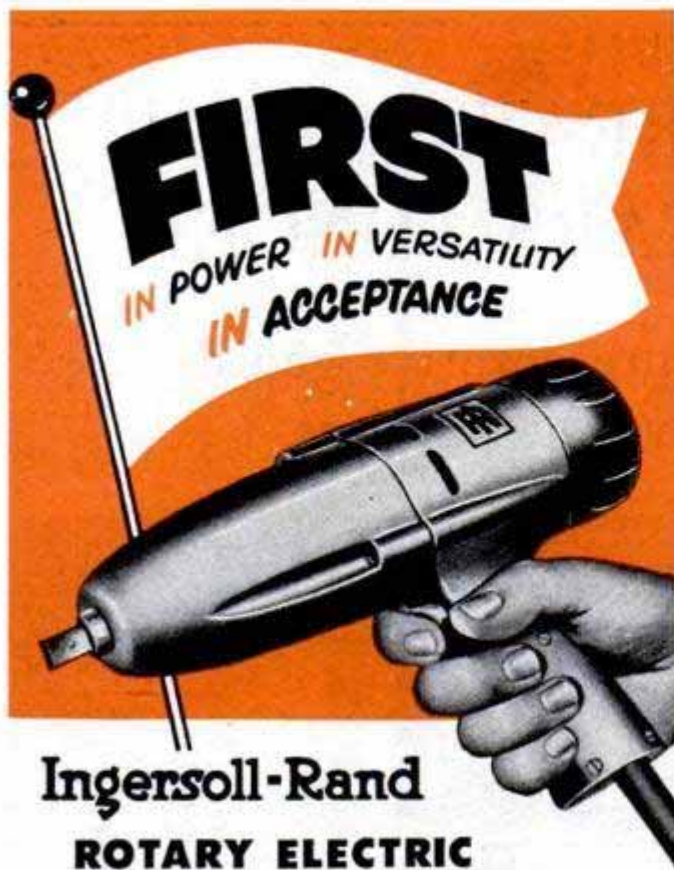
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your front wheels and set yourself for the corner a bit. You get it headed in there and start feathering the throttle and you come down low. Your front wheels are a little to the right to offset your skid and you kind of float and drift. About the middle of the turn you get progressively on the throttle and you drift out. By the end of the corner you are on it (wide open) and you come off the corner good and fast. Making high speed on a track is not all a matter of how fast you are willing to go into the corner. That is a mistake many drivers make. The trick is to get into the corner at such a speed that you can come off the turn fast. When you go in too fast, you flounder around in there and lose your speed and just creep out of it.

Q: Are there factors that make Indianapolis driving different from any other style of driving?

MILTON: The track is unlike any other track so there is a difference. Indianapolis has four curves and four straightaways—two long straightaways and two short ones. The bank is not steep so it is more like dirt-track racing than any other.

Q: What does a driver think about as he rolls around those 500 miles?

MILTON: You know pretty well who your competitors are. You have probably narrowed it down to about five cars that you are to be concerned with. You watch them, making up your mind whether they are running too fast or, if you are leading, whether you are. There is always lap money—\$100 a lap—which you want to get and just how fast dare you go to get it in relation to your over-all chances for the race itself. You keep watching your tires and listening to your engine and keep hoping you're lucky. Unequivocally, the element of luck is enormous. Your safety factor is a minus quantity when you start. There is no reason to expect the machine to stand up to the punishment you are going to subject it to. If you pull it through, then you just have to say you are a lucky guy.

Q: Does it seem like a never-ending grind?

MILTON: When you are running up in front, 500 miles is not a long race. If you are up in the contention and have a chance to win, it goes by mighty fast. But suppose early in the race you had trouble with your car and from then on it was a matter of running for what the boys call ham-and-egg money—then the "ting" is interminable and it is just all you can do to keep going.

Q: What is the greatest single improvement in racing cars since you raced?

MILTON: I would say the suspension system and everything else that goes to make up good handling. ★ ★ ★

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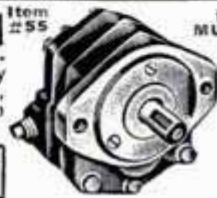
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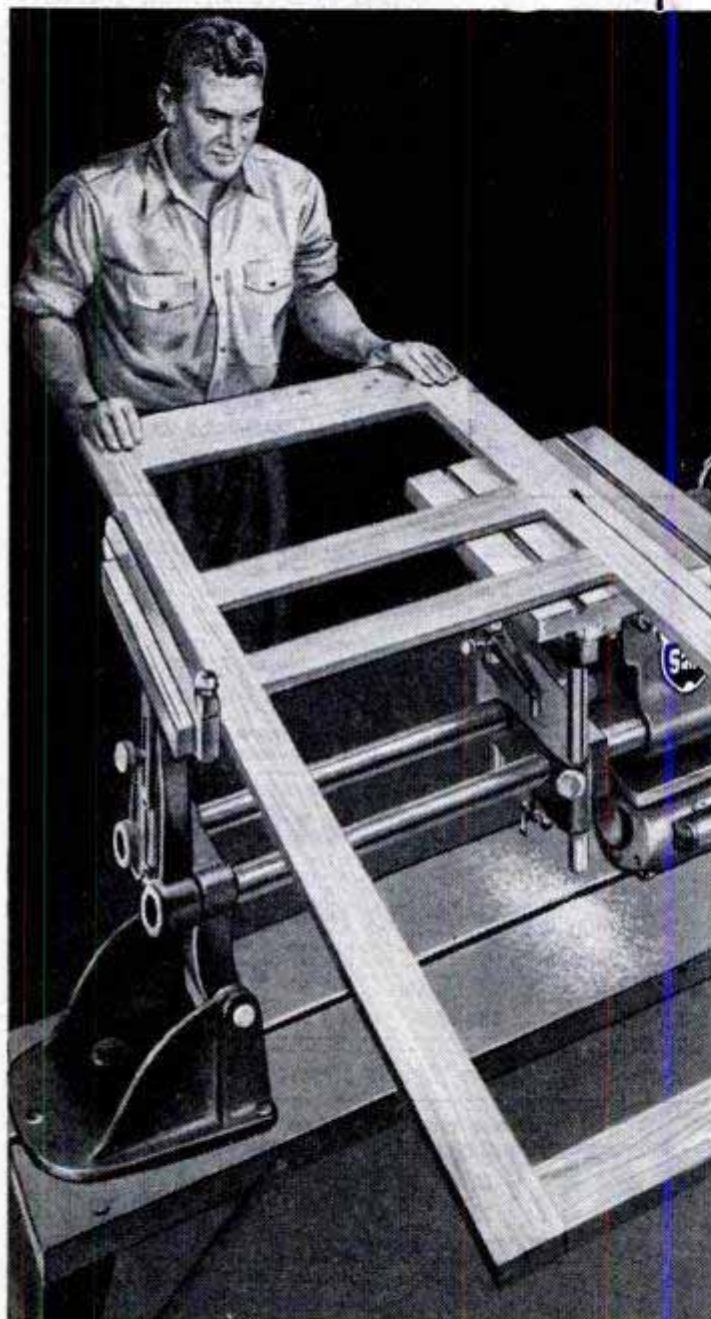
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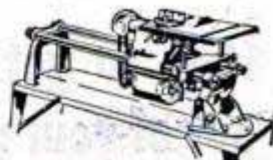
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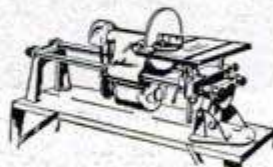
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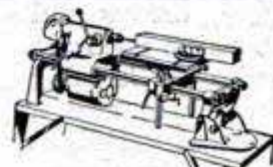
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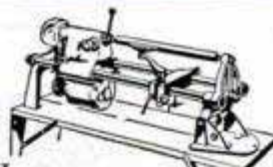
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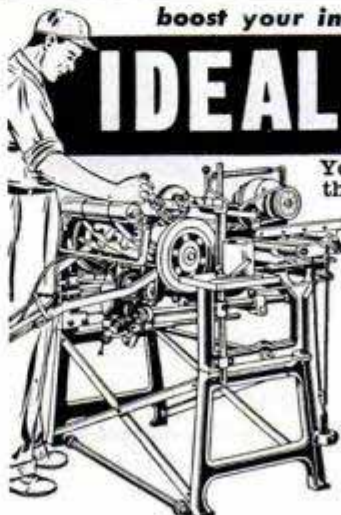
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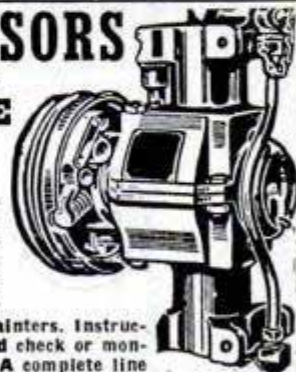
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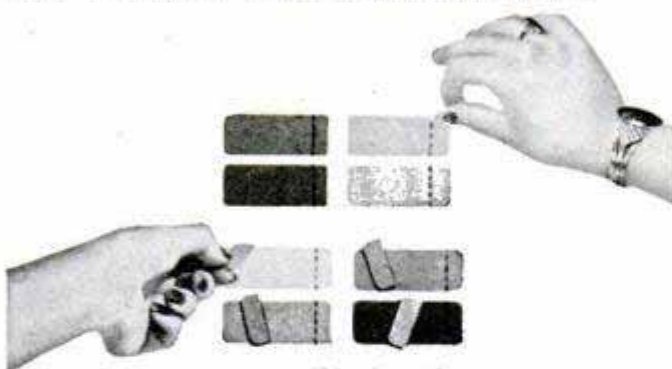
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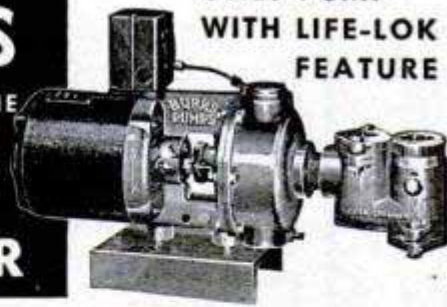
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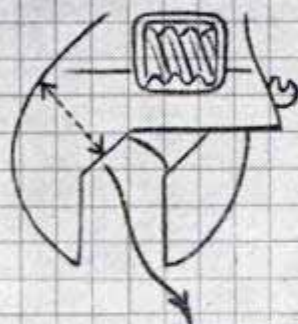
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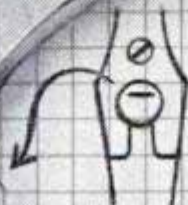
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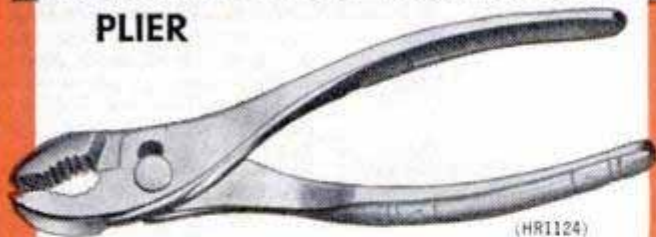
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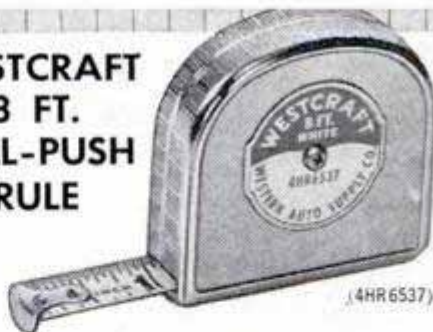
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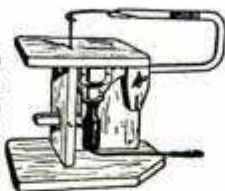
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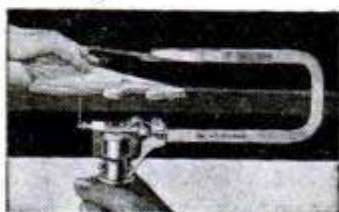


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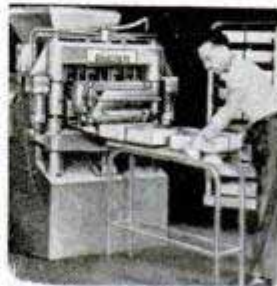
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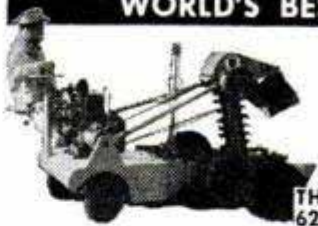
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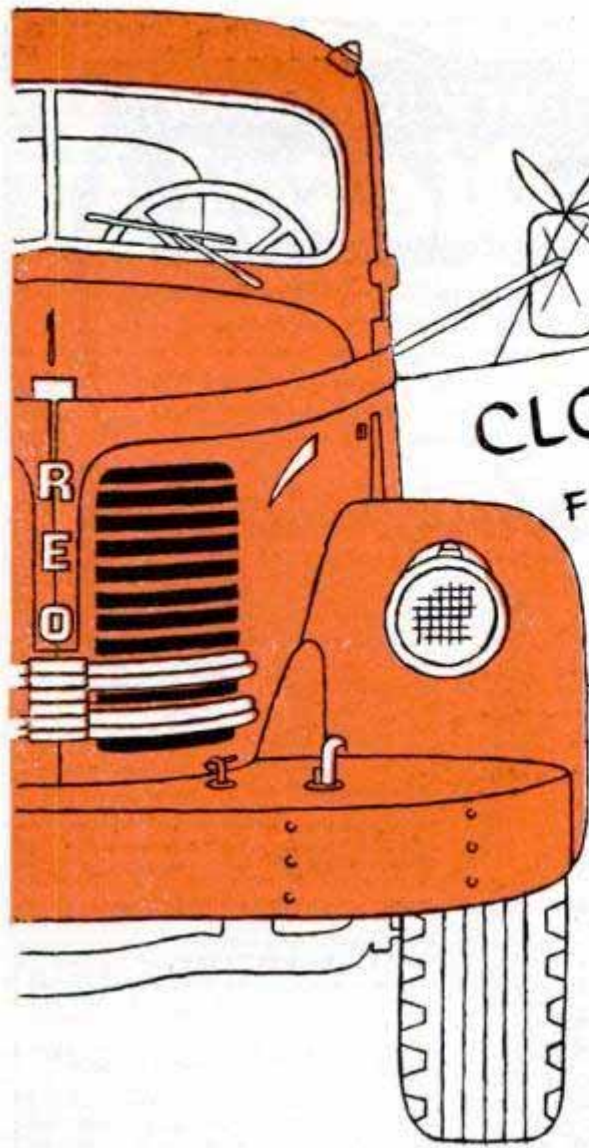
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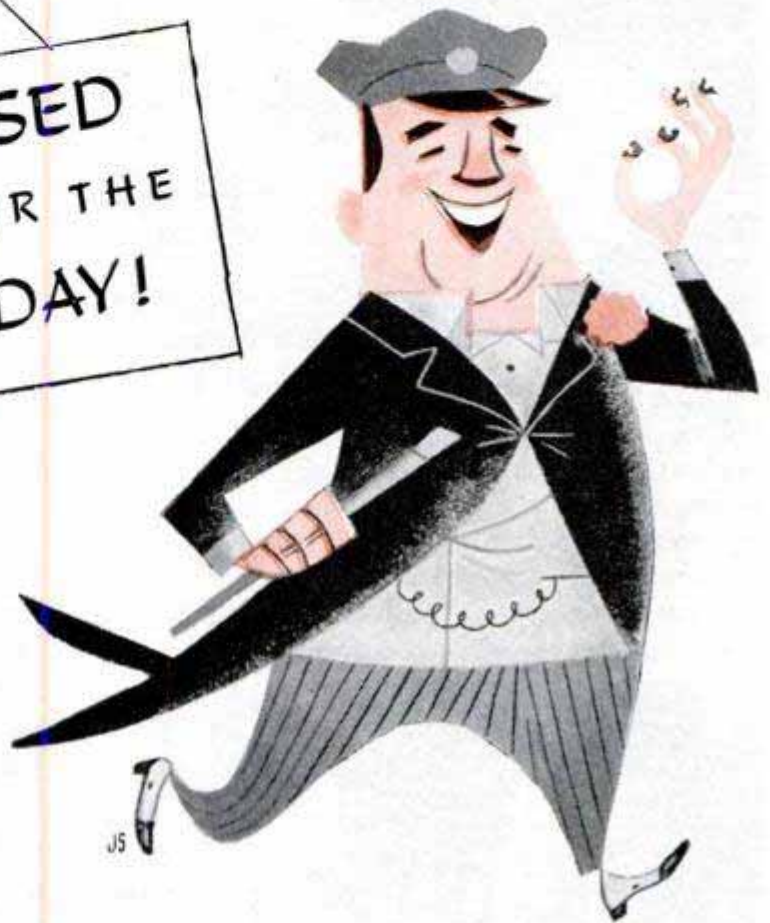


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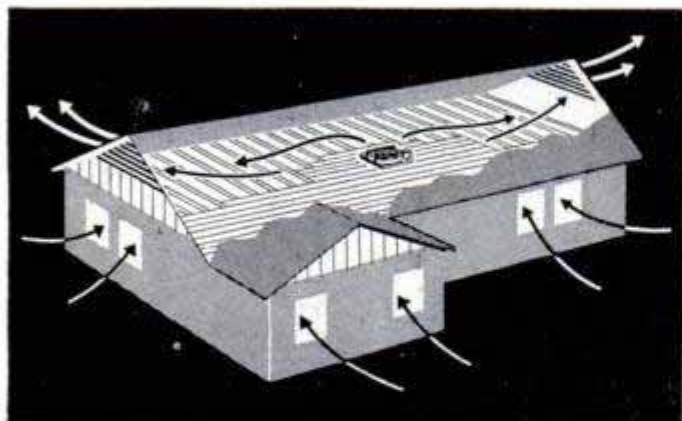
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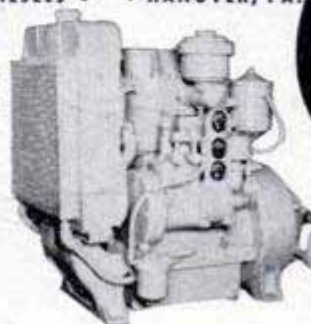
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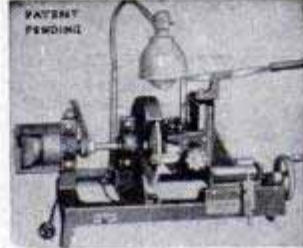
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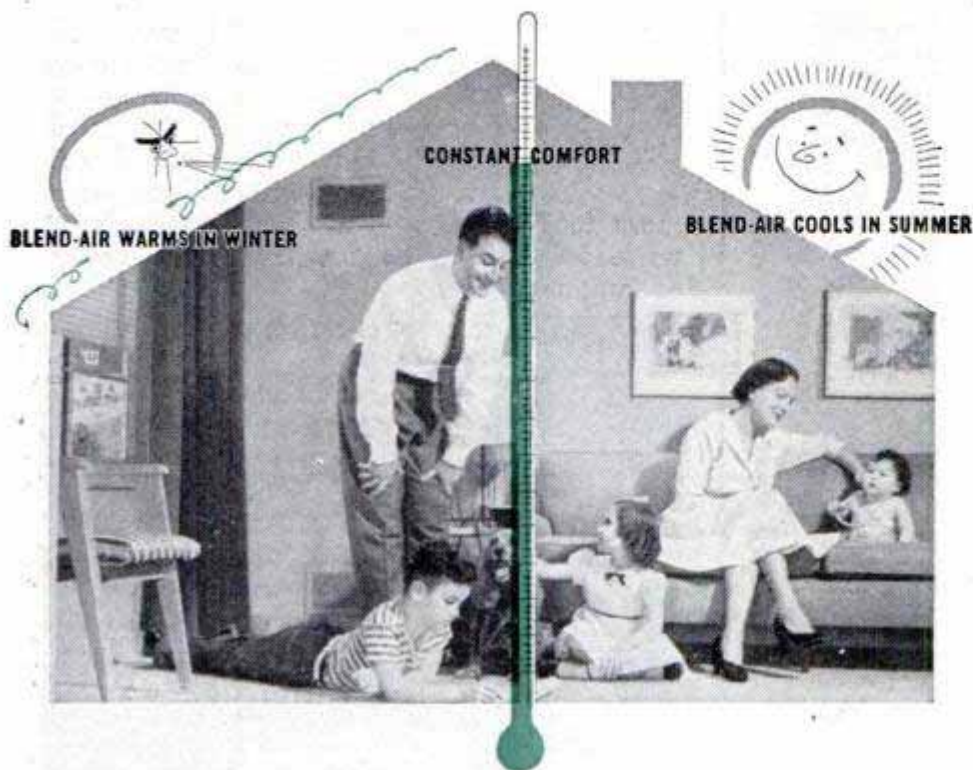
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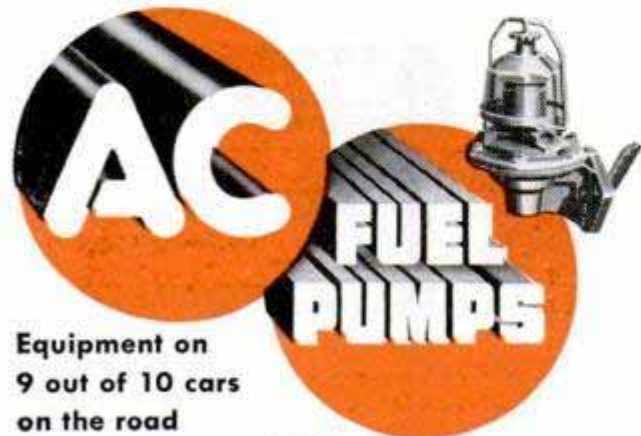
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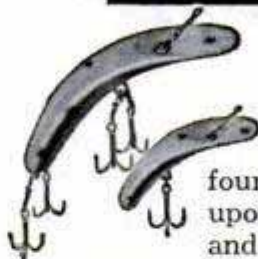


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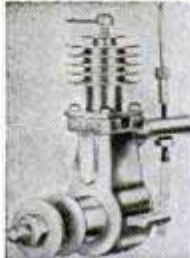
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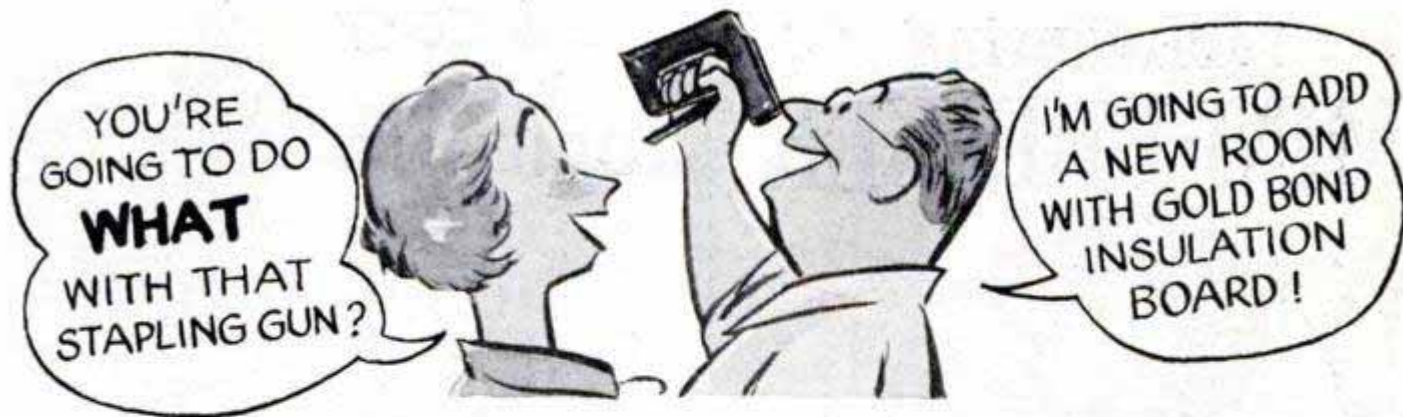
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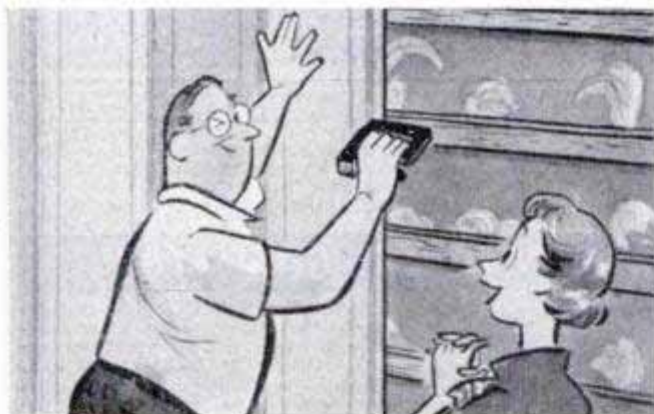
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28 Lawn Ornament Patterns, 25c. Other Patterns: 15-20" high; Dutch Girl, Dutch Boy, Pirate, Bull Terrier, Mexican Girl, Mexican Boy, Dwarf, Penguin, Flower Girl, 15¢ each. 25 Novelty Patterns, 30¢. All 62 Full Size Patterns, \$1.00. Strother Pattern Service, Dept. DH-8, Box 128, Belington, W. Va.

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Super-sensitive! Only 1 1/4 lbs.! Fits pocket—uses flashlight battery. Find a fortune in uranium. Order Now! Send \$5.00, balance C.O.D. MONEY BACK GUARANTEE. FREE CATALOG—scintillator and larger uranium and metal detectors. DEALERS WANTED.

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Especially designed Hot Rod Gaskets having enlarged cylinder openings to provide piston clearance on popular hot rod engines.

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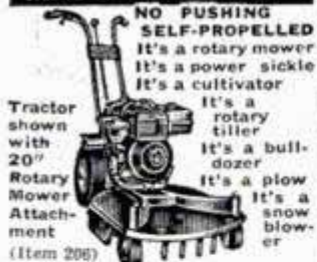
Get them at your nearest automotive wholesaler . . . and while you are there—ask for a copy of the FREE Fel-Pro GASKETING MANUAL . . . the booklet that contains more than 30 helpful gasketing tips learned from Fel-Pro's many years' experience in manufacturing gaskets by the millions for car factories and the replacement field.

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It's a rotary mower
It's a power sickle
It's a cultivator
It's a rotary tiller
It's a bulldozer
It's a plow
It's a snow blower

Tractor shown with 20" Rotary Mower Attachment (Item 206)

Where else can you get a power tool that does so many jobs? Works for you year 'round. Does terrific job cutting grass or weeds. Or, prepares mellowed deep seed bed without labor. Built-in power take-off to drive pumps, saws, generators, etc. Safety clutch—can't burn out. More versatile and efficient than tractors costing twice as much. Converts in minutes to Tiller, Power Sickle, etc. Basic self-propelled 2 hp tractor with Briggs or Clinton famous engine. Only **\$119.50**
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VENTILATING FAN

(Item 10) Mount in wall or ceiling to ventilate any area. Over range, removes kitchen smoke and odors. Easily installed in furnace pipes. Forces even heat to all rooms. Powerful continuous duty motor. 110-120 v. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lbs., \$6.85; 9" Fan, wt. 6 lbs., \$7.85; 10" Fan, wt. 7 lbs., \$8.85; 12" Fan, wt. 8 lbs., \$9.85.



HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs., Item 10E \$11.95. 12" Fan, wt. 10 lbs., Item 10D \$12.95

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Our Commando Motor Bike is trouble-free—carries amazing 5 yr. guarantee. Goes to 150 miles per gal. on all roads. Speed to 40 mph. No oil or gas fumes. Easy automatic pedal or pull starting. Has new principle of automatic transmission. No belts or chains—power transmitted directly to rear wheel. Accelerates quickly. Complete motor and kit ready to attach to your bike in 1 hour. Get free **\$125.00** Complete Motor and Chassis **\$199.50**

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Heavy duty, made by B. F. GOODRICH for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Ideal for midget autos. Employs reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation (data included). 3 sizes: 1/2-1 hp., wt. 54 lbs., 1-2 hp., wt. 95 lbs., 2-3 hp., wt. 105 lbs. Reg. List \$228, \$252 and \$352. Our prices... **\$79.50, \$89.50 and \$114.50.**

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Heavy duty, precision built, smooth, positive acting with built-in relief valve. Hi-Lift with screw extensions. Govt. surplus at a fraction of orig. cost. (Handle included.) 3 ton (Item 208A) **\$9.45**
5 ton (Item 208B) **\$11.45**
17 lbs. **\$11.45**



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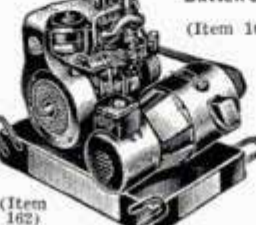
PORTABLE LIGHT PLANTS
PUSH BUTTON START A.C. PLANT 500-700 watts—115 v. —60 cyc. A.C. Powered by a rugged 2 hp. easy-starting Briggs gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts., trailers and camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Item 24. Wt. 85 lbs. Be prepared if war or storm knocks out power lines. **\$143.50**
\$242 value.

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110-120 V. 60 cyc. A.C. Absolutely the best made—exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by easy starting Briggs or 6 hp. Wisconsin engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and complete instructions included. (Item 31) Wt. 220 lbs. Reg. price \$585.00, Special at **\$299.50**
Generator only and control box **\$169.50**
2500 Watt Plant (Item 21) Push Button Start. A big plant at a low price. Wt. 238 lbs. **\$329.50**
3000-3500 WATT PLANT (Item 198) 110-220 v. 60 cyc. A.C. Belt drive with Wis. Engine. Push button start. Wt. 350 lbs. Heavy duty **\$399.50**
Generator only for belt drive, Wt. 116 lbs. (Item 198A) **\$239.50**
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(Item 162) Push Button Start, 115-230 v. 60 cycle A.C. A brute of a power plant with a rugged 18 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth \$995.00. With self starter. **\$645.00**
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Same plant but with Crank Start. (Item 166) **\$585.00**
Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price **\$345.00**
We make fully automatic controls to operate any of above light plants. Write for details.



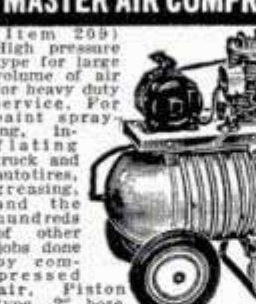
(Item 162)

DIESEL ENGINE

GET QUICK DELIVERY SAVE BIG MONEY
Powerful, smooth running for industry, farm, irrigation, saw mills, pumping, etc. Economical operation, cutting costs to the bone. Electric starting. Complete with clutch. Power take off. Ready to run. Best made. Easy electric starting. Factory priced to save our customers big money. Order from these four rugged units or write for complete details:
27 Horse Power Engine... **\$895.**
42 Horse Power Engine... **\$1,515.**
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72 Horse Power Engine... **\$2,115.**

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(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and auto tires, greasing, and the hundreds of other jobs done by compressed air. Piston type. 2" bore compressor with built-in air filter. Master built with hi-strength alloys and precision bearings. Stainless steel tank, 12"x24", 2100 cu. in. cap. Safe up to 500 lbs. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Low factory prices. With 1/2 hp. 110 v. A.C. motor (Reg. \$175.00) **\$98.50**
(Item 209) With 3/4 hp. motor, Reg. **\$119.50** (\$109.50) (Item 209A) **\$119.50**
With 2 hp Briggs Gas Engine (Reg. \$199.50) **\$109.50**
(Item 209B) **\$109.50**
Write for prices of compressors only. A complete line of spray guns and air tanks available.



(Item 209)

DIESEL LIGHT PLANT

(Item 1660) Diesel Master—11-12 kw. 115/230 V. A.C. single or 3 phase. 1800 rpm, direct connected. Designed and engineered for permanent power installations. Assures efficient, dependable low cost operation where heavy current is important. Wt. 1350 lbs. Regular list **\$1895.00**
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10-11 kw. GAS DRIVEN PLANT. 115-230 V. 60 cycle A.C. powered by 4 cylinder Wisconsin air cooled engine. Belt driven. With self starter. Constructed similarly to Item 162 but much larger. Item 217 wt. **\$1245.00**
900 lbs. Factory price **\$1245.00**



(Item 1660)

HEAVY DUTY D-C ARC WELDER

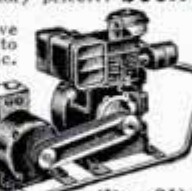
Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to 3/4" plate using 1/4" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-to switch and dial control gives wide range of welding heats. Run welder at 2800 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, gear, and double V belt or flat pulley. You can pay more, but you can't buy a better welder. (Item 58) Wt. 110 lbs. \$400 value at **\$99.75**
DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Spec. **\$119.50**
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Special. **\$2.45**
100 ft. length (1 pc.) **\$5.85**
Wire only (Item 50) No fittings. **\$5.00**
NEOPRENE CABLE No. 14-2 (Item 185) Wt. 9 lbs. \$9.95

Heavy Duty Power Cable

12-2 Cond.—stranded, very flexible, rubber covered, special outside conductor for grounding power tools, etc. Finest heavy duty power cable made. 50 ft. (Wt. 8 lbs.) Item 199. **\$6.95**
100 ft. (Wt. 16 lbs.) **\$12.95**
Item 200. **\$12.95**

32 Pc. SOCKET SET



Highest quality guar. non-breakable sockets made by Husky. Beautiful, matched chrome alloy, absolutely the best. Complete range of 21 sockets from 1/4" thru 7/16" in 1/4" drive and 7/16" thru 1-1/8" in 1/2" drive; 2 extensions, reversible 1/2" ratchet, adaptor bit, slide head, all angle coupling, 2 end wrenches, 1/2" speeder handle and sturdy metal tool box. For prof. mechanics who want the best. Wt. 14 lbs. (Item 59) Easily worth **\$16.95**
\$41.50 **\$16.95**

45 Pc. SOCKET SET

(Item 205) Contains a complete set of sockets in 1/2" drive, 3/4" drive and 1/4" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautiful matched chrome thin wall alloy sockets in a sturdy handsome steel tool box. Wt. 17 lbs. List price \$62.00. **\$26.95**
Factory Special. **\$26.95**

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Permanently magnetized tempered and hardened tool steel blades. Plastic handles—unbreakable and shock-proof. Picks up and holds screw in tight spots. Makes impossible jobs easy. You get following types: Midget, stubby, close quarter, cabinet, thin blade, machinist, heavy duty, extra heavy duty. Fully guaranteed. Easily worth \$4.95. Item 106: **\$1.95**
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3-Pc. ADJUSTABLE WRENCH SET

Made of finest steel alloy, chrome plated. Prices are exactly half actual value. Take the place of a whole set of tools. Packed in leatherette pouch.
Set A—4-inch, 6-inch, and 8-inch wrenches. (Item 107). Wt. 2 lbs. only **\$2.95**
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Every extra quart is a danger signal—and so are loss of power and smoke from the exhaust. They're symptoms of worn-out piston rings. And the sooner you replace those rings, the more money you'll save.

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TOUGH ON OIL-PUMPING
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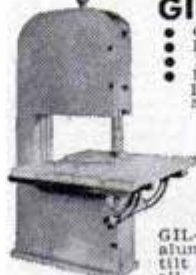


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- Floor model 34" high, table always stays level

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- Cuts to center of 24 inch circle
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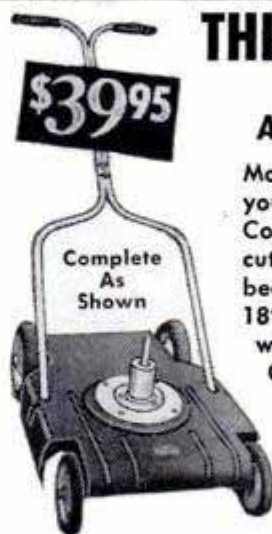


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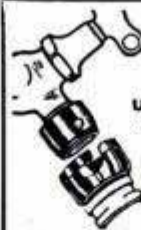
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WEAVER HYDRAULIC HAND PUMP New With Built in Check & relief valve. For oil or Hydraulic Fluid. Rated 1000 P.S.I. \$75.00 Value **\$12.95** post-paid

VALVE GEARS BARGAIN SPEED REDUCER. 5-1 or 10-1 ratio 90 degree angle 1 1/2" splined shaft with 3 mount- (Add 50c ing holes rated 2 H.P.) **\$5.95** Postpaid

SENSATIONAL SELSYNS - Two or more connected together work on 110V A.C. For controlling distance operations, etc. Instr. incl. Post-positions incl. Per Pair **\$7.95** paid

D. C. GENERATOR. Brand new. Navy Type for Farm-House-Ranch. Delivers 450 Volts D.C. at 3450 R.P.M. Ball bearing supported. Fan cooled armature. Self lubricating bearing. #211220-A. Wt. **\$7.50** 21-lbs. Now only.

ROMEC WOBBLE PUMP. Hand lever operated. Ideal for Camp, Farm, Ranch, for fuel transfer to boats, etc. Self priming, including built in relief valve. Ideal for water, oil, insecticides, liquids. **\$8.95** post-incl. paid

VOLTMETER, DC. The Basic Element of this meter is 30 volts DC Voltmeter with zero center. Internal resistance is 300 Ohms. Dial may be easily calibrated to read DC Volts. Brand New. **\$3.95** post-\$25.00 value

SOLENOID #804 Equipped with lever arm which gives a 1/2" or 1 1/4" travel. Compact, powerful as actuator & to operate locks, switches, toy applications, etc. For 24V D.C. & applicable for 110V A.C. Instructions **\$4.95** post-incl. \$2.95 ea. Per pair.

Hydraulic Solenoid Control Valve
BENDIX, No. 81560. For remote control operation and to operate one single action or double action hydraulic cylinders with 24 V. D.C. Connections are P.S.I. connections are .550"-18thd. Armature cable for 115 V. A.C. Instructions & Data included. **\$3.50** ea. **\$6.50** pair \$35.00 value.

RIGHT ANGLE DRIVE with 1 to 1 ratio through 90 degree bevel gears. Drive and take off shaft are 3/8" dia., Self lubricating. Size 3 1/2" x 2 1/2" x 1 1/2". Rated 1/2 H.P. at 1750 R.P.M. Ideal for use with power tools, etc. Has three 3/16" mntg. holes on 1-5/16" **\$3.50** post-center. Price

BOMB INTERVALOMETER Type B2. Applicable to operate electric equipment lights, displays, signals, photography, etc. Can be set to release current supply at fixed time interval or split second timing. Size 5"x9"x3 1/2". \$50.00 value. For 24V. D.C. & applicable for 110V. A.C. Instructions incl. **\$8.95**

INSECTICIDE PUMP SPRAYER AND FIRE EXTINGUISHER. Four gallon size includes approx. 3 ft. of high pressure hose with fine mist nozzle. Used, good condition built to give years of heavy duty service. Wt. 15 **\$2.50** ea., add lbs. Price. **\$2.50** postage

CUNO OIL FILTER-Brand New Aircraft type. Filters oil without cartridge replacements. Just turn handle and cartridge is clean. Standard 3/8" inlet and outlet ports to accommodate 14 gallons per minute. STOP CHANGING OIL. Instructions **\$4.95** post-incl. paid

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GEAR HEAD MOTOR Heavy duty 1/4 H.P. 3400 R.P.M. Series wound, Reversible, including built in reduction gear with 14:1 ratio Gear shafts runs 600 R.P.M. For 24VDC & applicable for 110VAC. Ideal for rotating antenna, window display & other low speed drives. #291 **\$8.95**

Stock No. 2832 is 1/4 H.P. 28V. D.C. 4000 R.P.M. With simple instructions to convert to 28-32V. A.C. Gov't. cost **\$4.95** \$82.84. New.

Stock No. 4949 is 1/8 H.P. 24 V. D.C. 2000 R.P.M. Mfg. by Pesco, applicable for 115 V. A.C. Instructions incl. Base mounted **\$3.95**

DELCO MOTOR 6 Volt DC. Shaft is 1/4" in dia., 1 1/4" long. Size 5"x3" two mount- \$2.95 post-incl. \$1200-2000 RPM. Price

AIRCRAFT STARTING MOTOR. Operates on 12 to 32 volts. Gives high torque, slow speed and tremendous power. Applicable for pulling or moving heavy loads. Makes ideal winch or heavy duty hoist. For belt or direct drive. Mfg. by Jack & Heintz. O. Cost over \$300.00. Ship. Wt. 55 lbs. **\$9.95** f.o.b. Stock #JHG4. **\$9.95** KCMO.

ECLIPSE MOTOR & GEAR UNIT. Brand New including 24V. D.C. Motor. Gear ratio 4:1. can be adapted for 2:1, 3:1, 4:1, 20:1. Ideal for GARAGE DOOR OPENER, HOIST, PUMP JACK, HAY-LIFT, LAWN MOWER DRIVE, DRIVE FOR POST DRILL, etc. Gear unit applicable for 110 A.C. Diagrams & instructions incl. Gov't cost \$221.00. Wt. 23 lbs. **\$9.95** f.o.b. only. **\$9.95** KCMO.

BEAM ROTATOR MOTOR New Powerful geared motor for TV aerials. Ham, FM, etc. Light weight, rugged. Shaft Speed is 9 R.P.M. Torque 75" lbs. & built in mounting bracket. For 24V.D.C. & applicable for 110V.A.C. Instructions incl. Stock #AJ31 **\$8.95** \$50.00 value

VICKERS CONSTANT DIS-PLACEMENT HYDRAULIC PUMPS. Brand New Stock No. PF-713-20. For any type liquid pumping job. 375 gal. per hr. at 3750 R.P.M. 1000 P.S.I. 410 cu. in. per rev. Gov. cost over \$150.00. **\$17.50** post-Data and instr. incl.

VICKERS PRESSURE & RELIEF VALVE. Adjustable 1/2" AC tube ports. **\$5.50** New. #501

PESCO POSITIVE DISPLACEMENT HYDRAULIC PUMP Gear type De ivers 198 G.P.H. at 1500 P.S.I. Rated 1500 to 4300 R.P.M., 1500 to 1750 P.S.I. Pump will operate in either direction & any position. 3/4" pipe ports and flange mounting. O. Gov't cost over \$150.00. Data incl. **\$15.50** #349

PESCO Centrifugal HEAVY DUTY PUMP Including built in motor. 1/4 H.P. Applicable for 24V. D.C. /A.C. or 110V. A.C. The motor is explosion proof constructed for gasoline fuel, oils, water, fuel booster, etc. 3/4" hose connection. Rated capacity, pressure instructions incl. Gov't cost \$172.00 Stock #659 **\$9.95**

PESCO LARGE VOLUME UTILITY PUMP For Water, Oil, Insecticides, etc. Including built in relief and pass valve. Capacity 400 G.P.H. 1/2" drive spline shaft. 3/4" pipe inlet and outlets. Engineering data incl. **\$7.95** post-Stock #6001 only

Adel Self-Priming ELECTRIC PUMP For pumping light oils, oil burners, fluid heaters, fuel pump, tool post grinder coolant, pressure lubricating pump, etc. 1/30 H.P. rated 1200 R.P.M. Applicable for 24 V. D.C./A.C. or use on 110 Volt A.C. Size 6 3/4"x3 1/2"x3 1/4". rated 3 G.P.H. Diagram and instr. **\$9.95** post-incl. \$50.00 val.

ROTARY PUMP for pumping WATER FROM POOLS, OR BASEMENTS, SUMP, pumping lubricants. For Garden & lawn sprayers. For use with hydraulic cylinders, vacuum, in dental lab, etc. Capacity 180 G.P.H., 200 lb. pressure, 29 in. vacuum. 500 to 3000 R.P.M. Steel shaft Std. 1/2 in. Stock #101. Instr. incl. **\$7.50**

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AIR OR OIL HYDRAULIC CYLINDERS

Stock #10 This is a double action 1" bore, 4" stroke 3/8" shaft, clevis mounting, overall length 9". Capacity 700 lbs. with 1000 P.S.I. or 9800 lbs. with our stratopower **\$4.95** post-pump 1400 P.S.I. **\$4.95** paid

Stock #27-Single Action for Air or Hydraulic 2 1/2" Bore, 2 1/2" dia. shaft, 5 1/4" stroke, use as snubber or Hyd. Cylinder. \$35.00 value. **\$6.95**

Stock #11-Double action 1 1/2" Bore, 6" Stroke, 3/4" Dia. shaft, Clevis mounting base and shaft end. Capacity 1160 lbs. with 1000 P.S.I. input. **\$9.95** post-\$50.00 value

Stock #303-Double Action 2" Bore, Stroke 1 1/4", 1 1/4" Dia. shaft. Overall length shaft retracted 23". 2000 lbs. capacity with 1000 PSI gives 2800 lbs. with **\$14.95** f.o.b. our stratopower. Wt. 14 lbs. **\$14.95** KCMO.

Stock No. 22 Hydraulic Cylinder Double Action output 1250 lbs. with 1000 P.S.I. input. Gives 1758 lbs. with our STRATOPOWER PUMP 1400 P.S.I. or will produce 34168 lbs. with 3000 line pressure. Can also be operated on low pressure system. 4" Bore. 10 1/2" Stroke 1-5/16" Dia. Shaft, clevis mounting. O. Gov't. cost **\$25.50** f.o.b. \$300.00. **\$25.50** KCMO.

PESCO HYDRAULIC FLOW EQUALIZER & PRESSURE BALANCER VALVE. Brand New. Guarantees equal flow and equal pressure for Two cylinders or Two systems. Capacity 340 G.P.H. 1500 P.S.I. Data & instructions incl. A \$75.00 value. Stock 1-D-397 **\$14.50** post-only.

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VICKERS Four Way Hyd. Control Valve #137 For two double action cylinders allowing operator to raise or lower the both cylinders simultaneously or raise one and lower the other at predetermined rate **\$14.50** post-paid speed.

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FOUR WAY BANK VALVES In one unit with common inlet and outlet. Built in relief valve and built in metering valve. 4 way valve independently controlled; poppet type. pressure balance with neutral **\$17.50** post-position. 3/4" A.C. tube size

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VICKERS UNLOADING VALVE Brand New-By passes full amount output of the pump while the cylinder is not in operation. Takes starting load off of electric motor driving the pump. 1/2" AC TUBE PORTS **\$8.50** post-Price

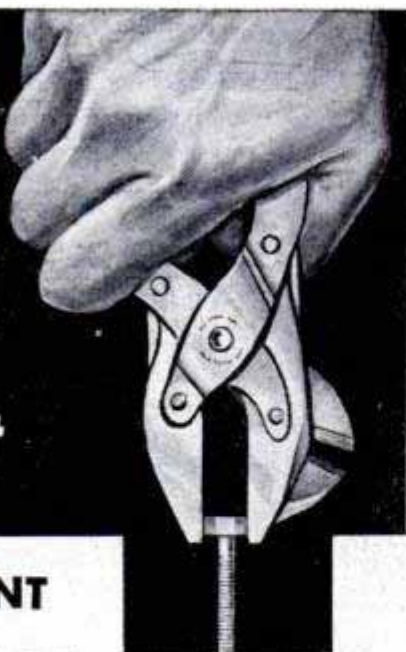
ALTERNATING SHUT-OFF VALVE Brand New. High pressure. Operates by worm-gear cam operating poppets to alternately close & open either pair of four ports. Standard 3/8" pipe **\$5.50** post-ports. \$50.00 value only

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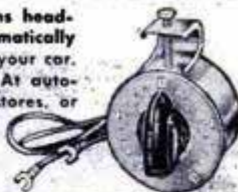
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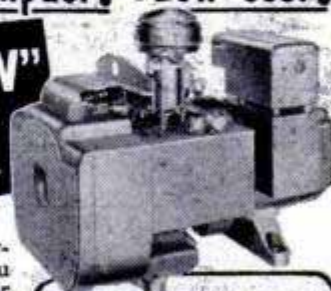


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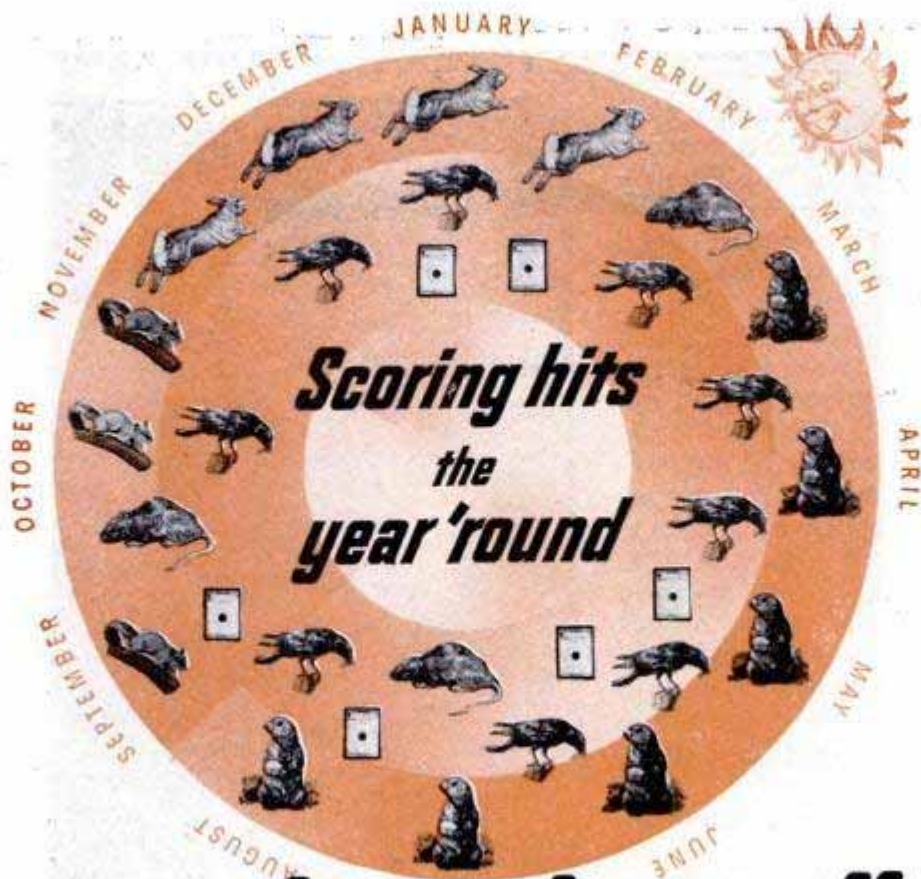


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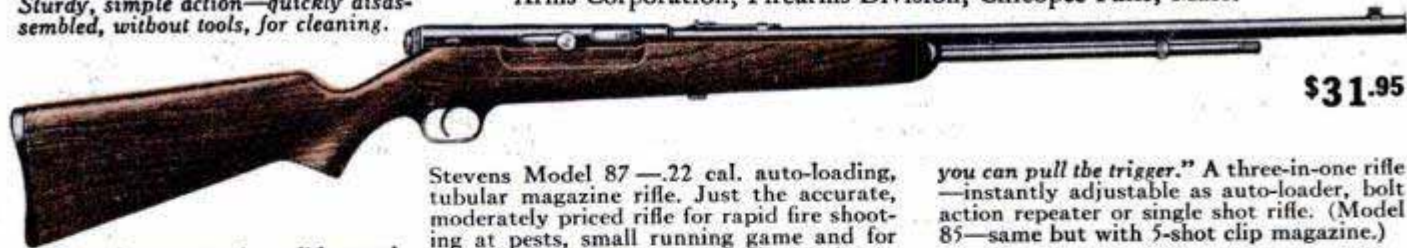
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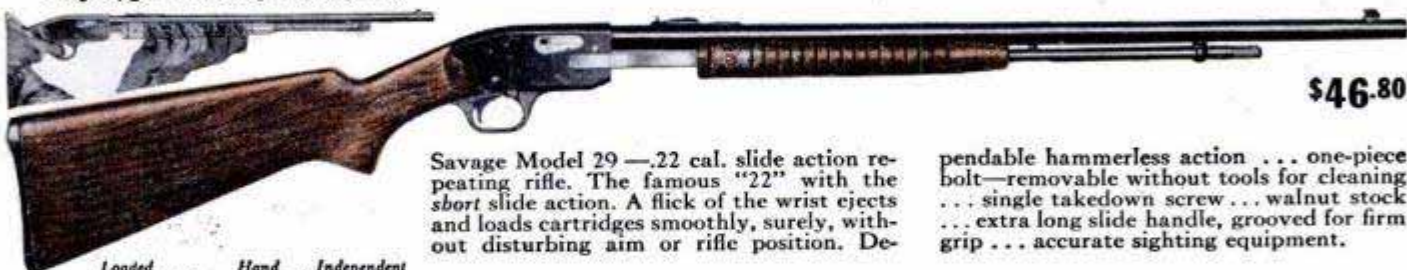


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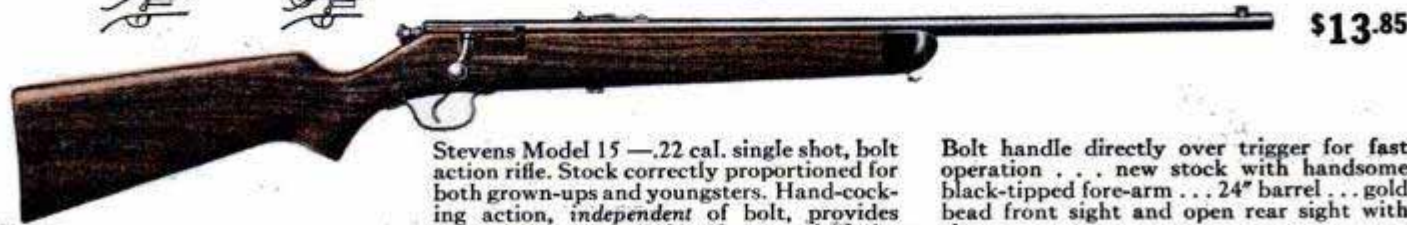
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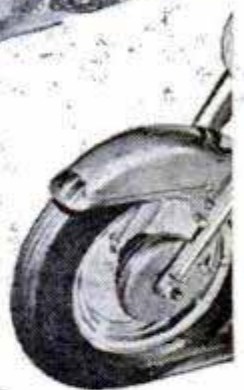


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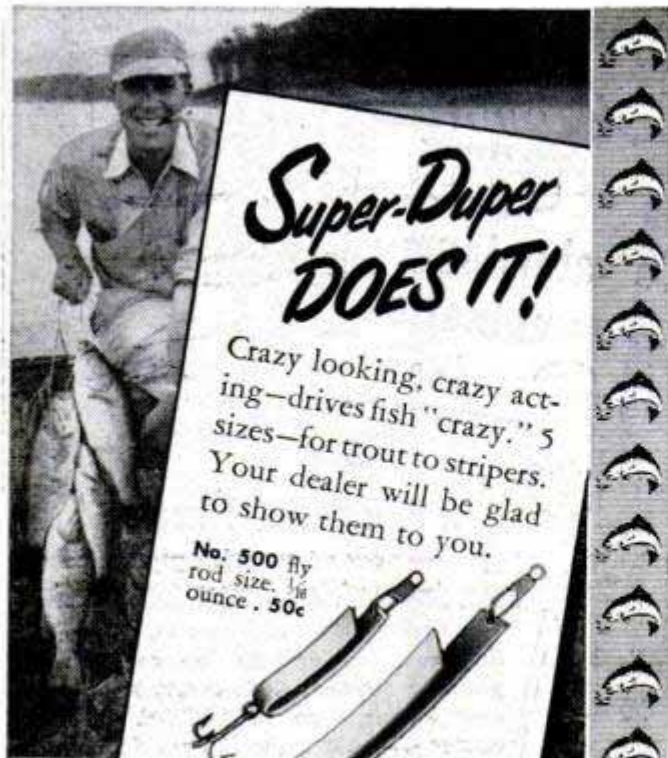
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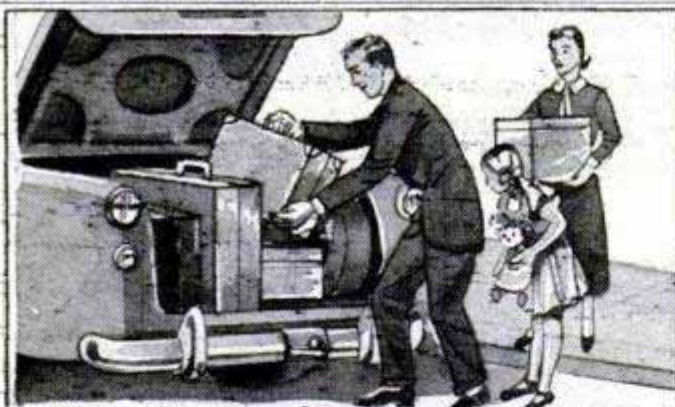
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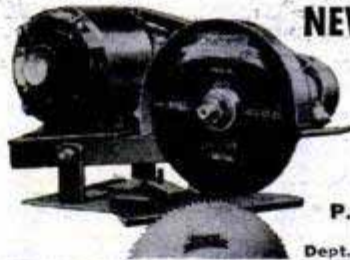
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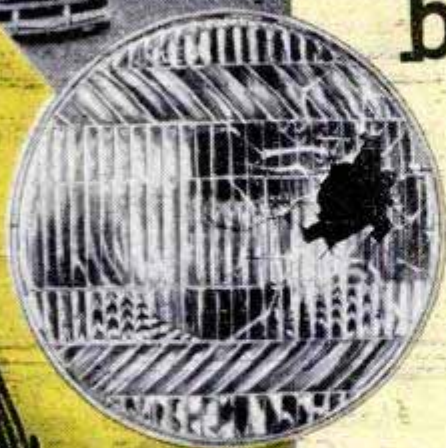
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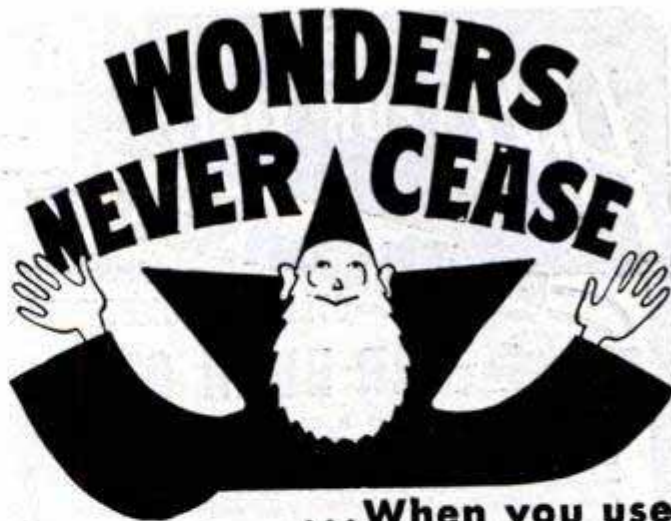


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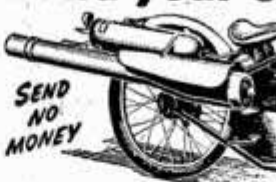
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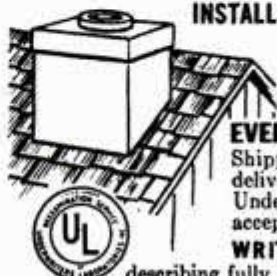
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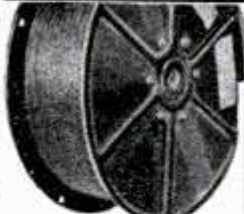
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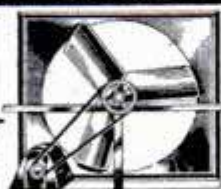
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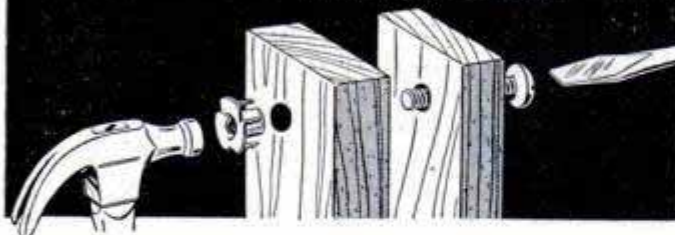
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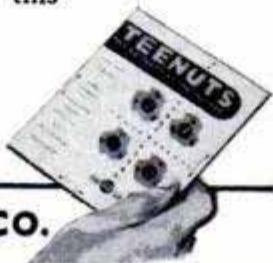
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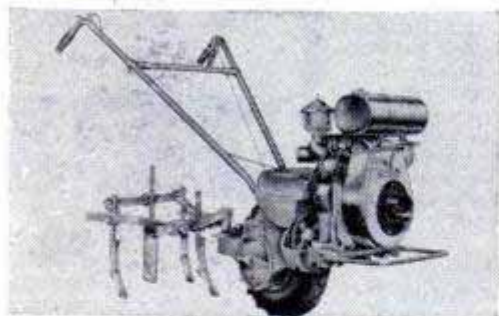
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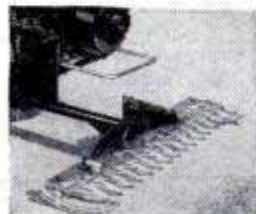
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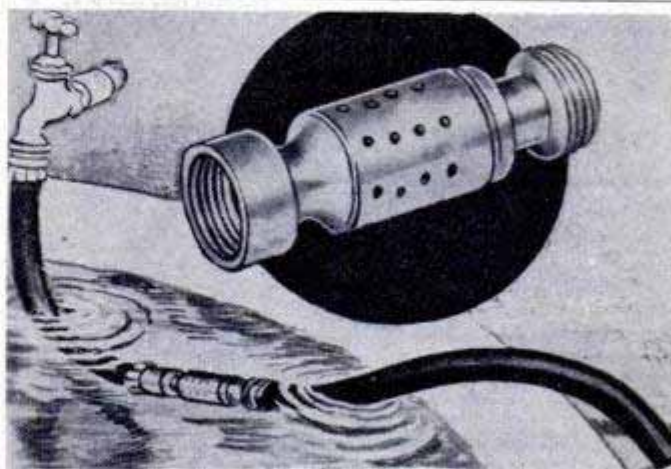
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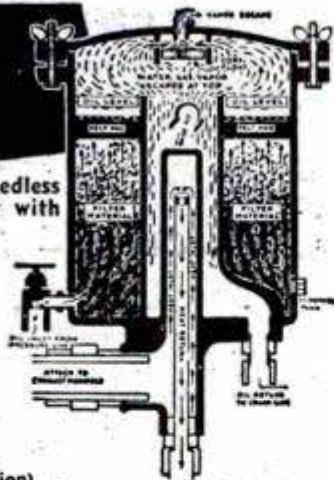
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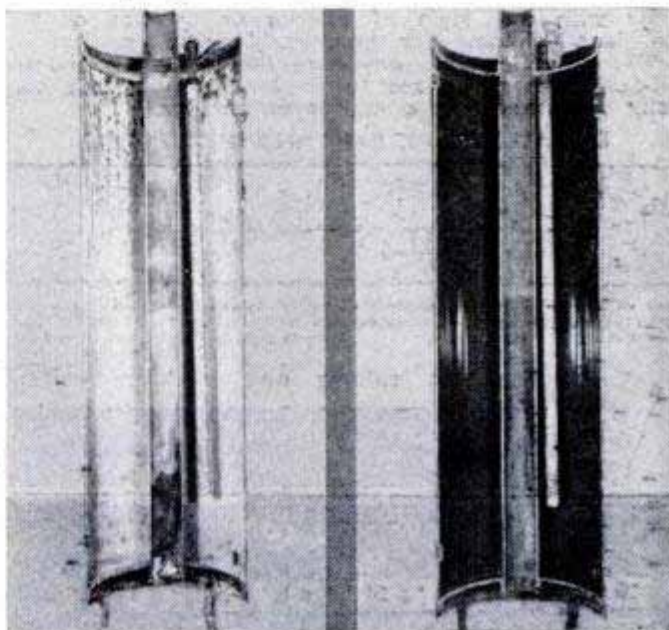
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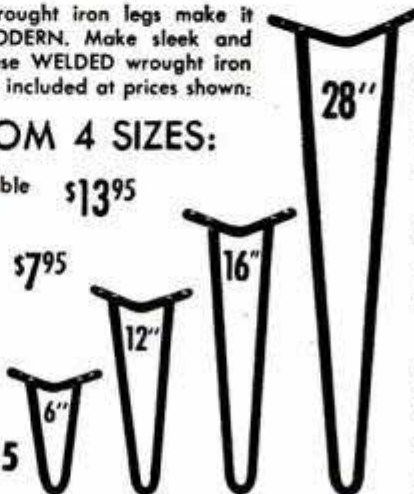
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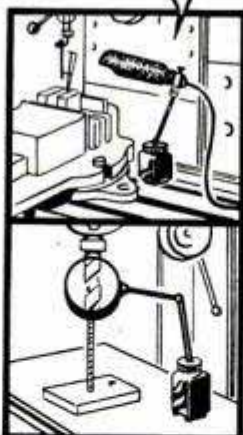
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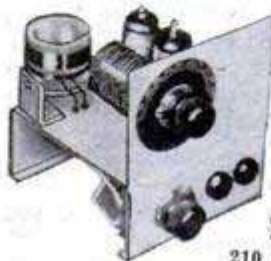
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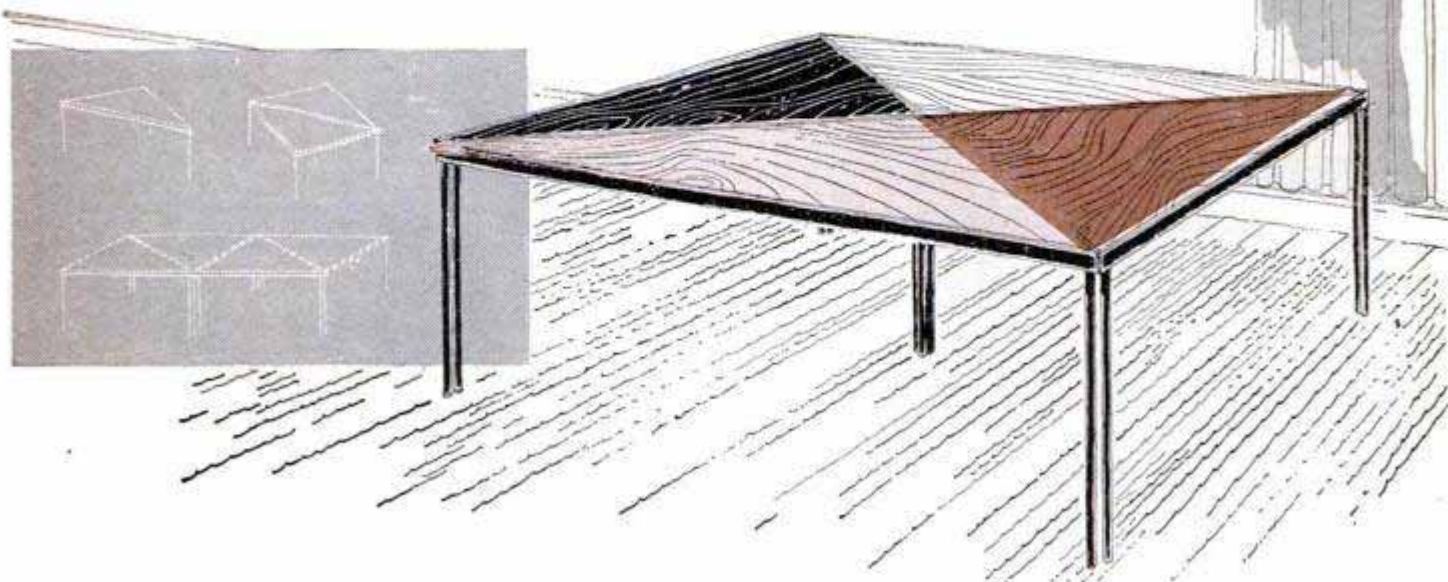
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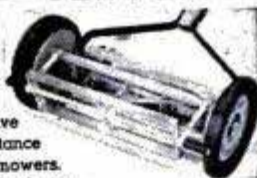
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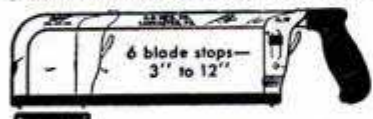
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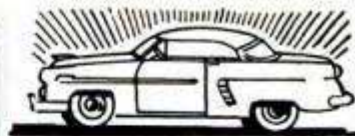
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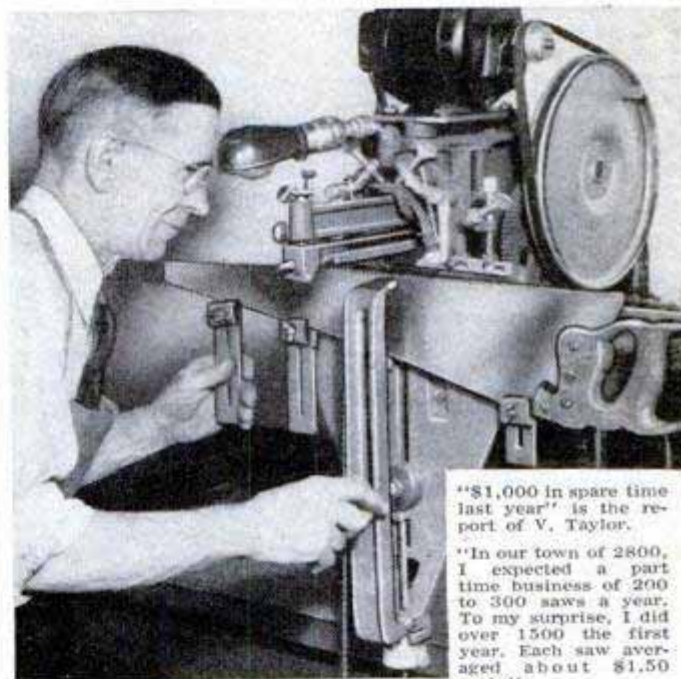
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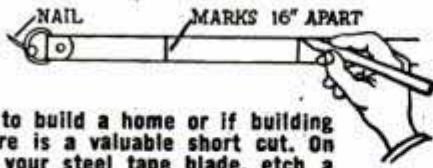
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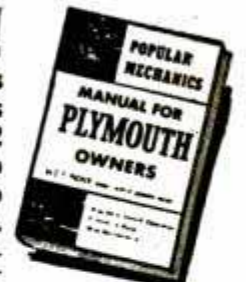
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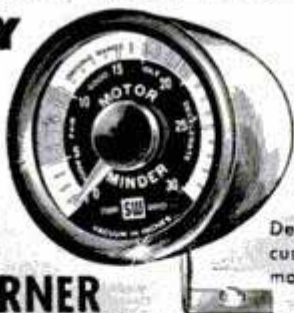
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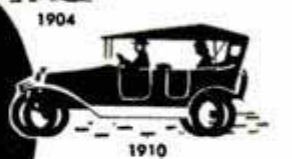
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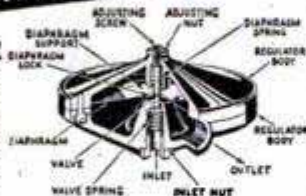
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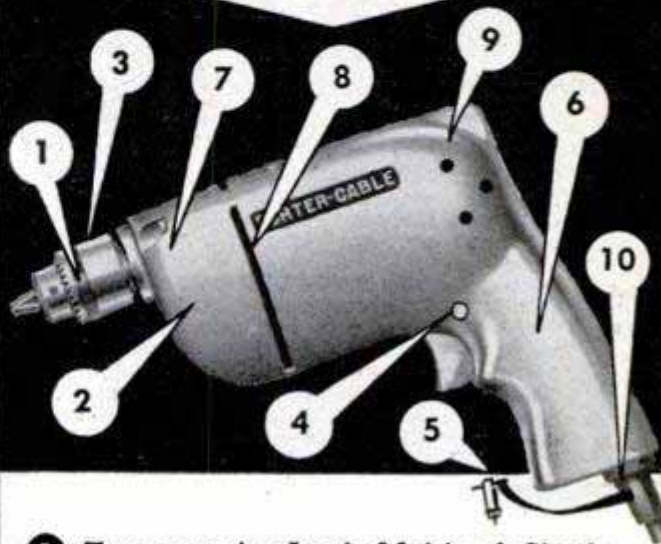
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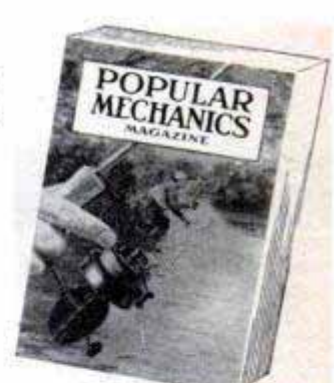
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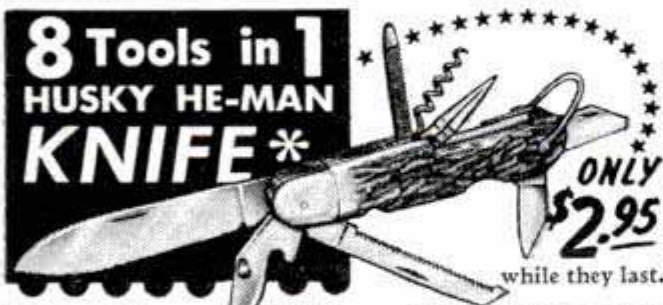
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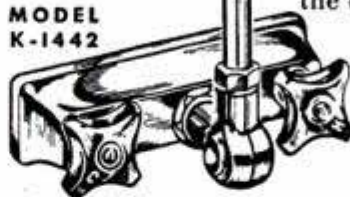


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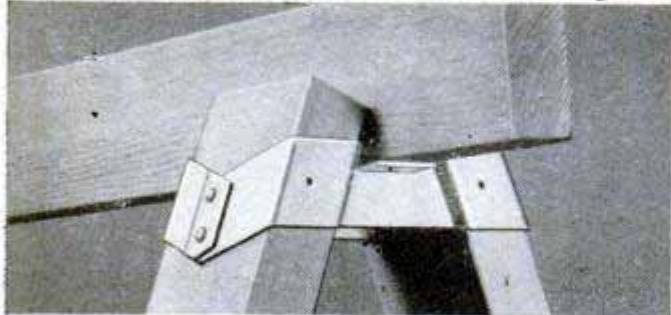
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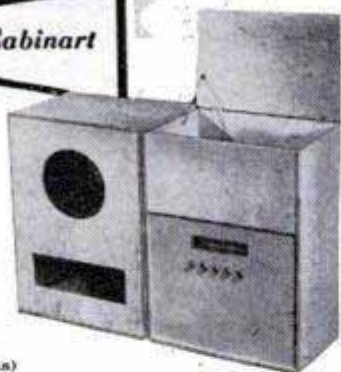
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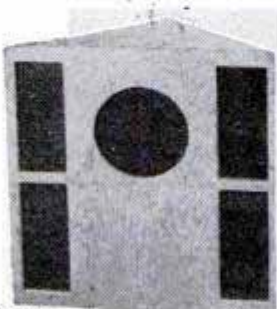
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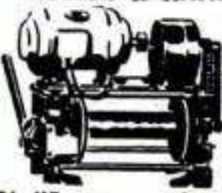
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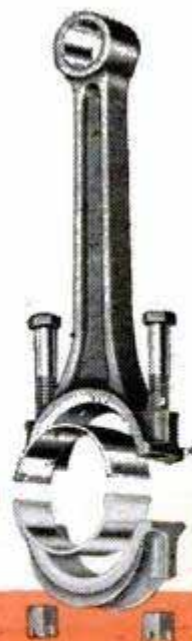


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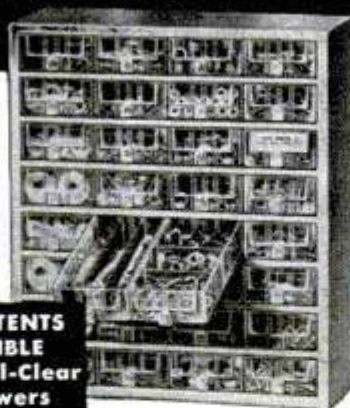
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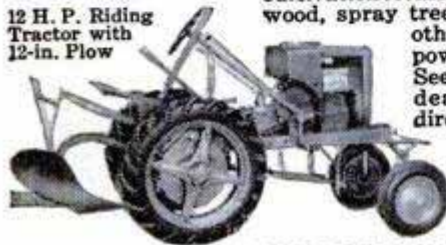
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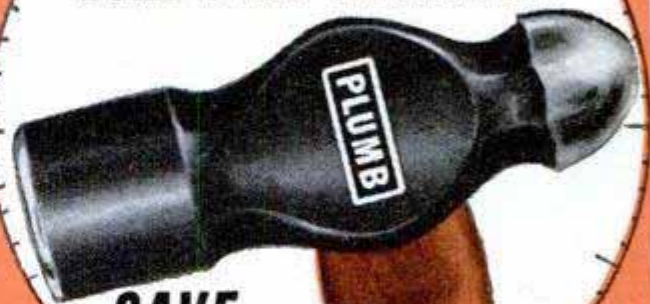
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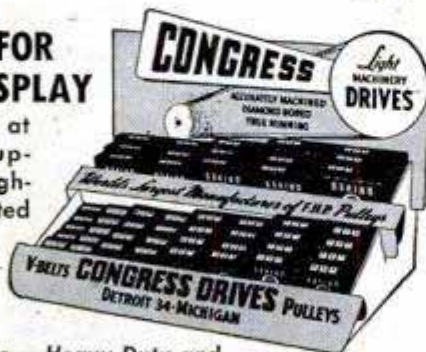
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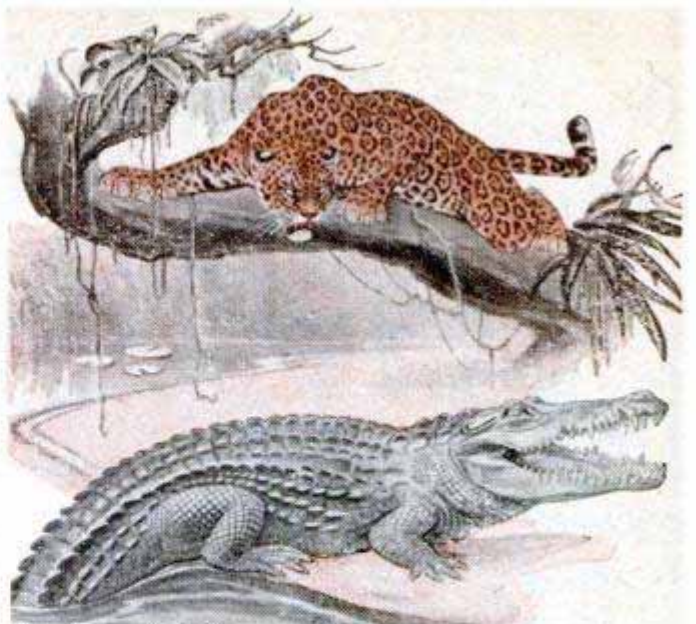
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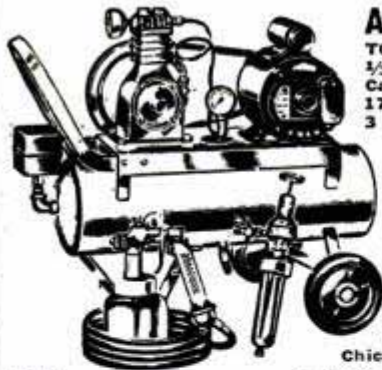
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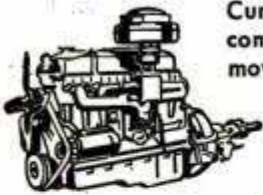
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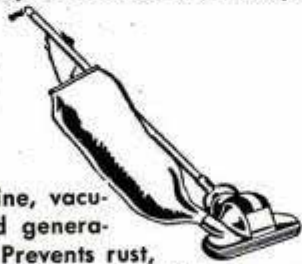
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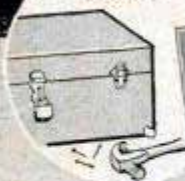
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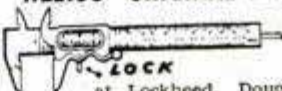
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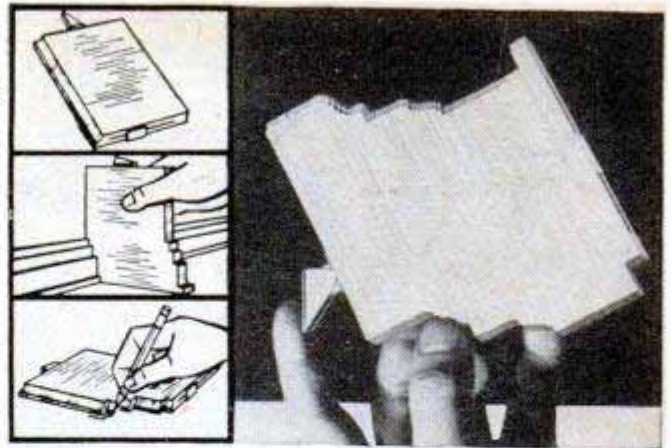
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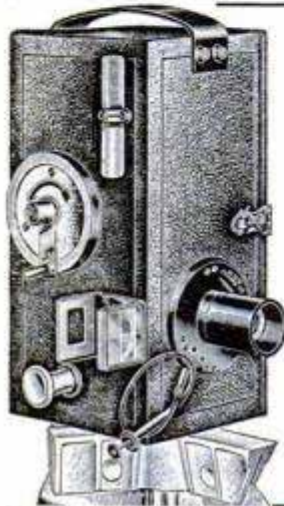
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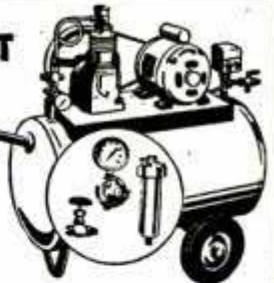
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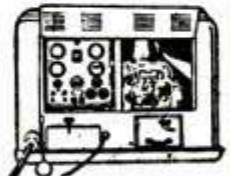
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Same unit with 2 1/2"x2" duplex compressor, 1 h.p. motor, 7.35 c.f.m..... **\$195.00**

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GEAR HEAD MOTORS Right Angles, 110 V., AC

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- 75 K-Ohm—1/2 Watt
- 1 Megohm—1/2 Watt Carbon
- 150 K-Ohm—1/2 Watt
- 1 Megohm—1/2 Watt Carbon
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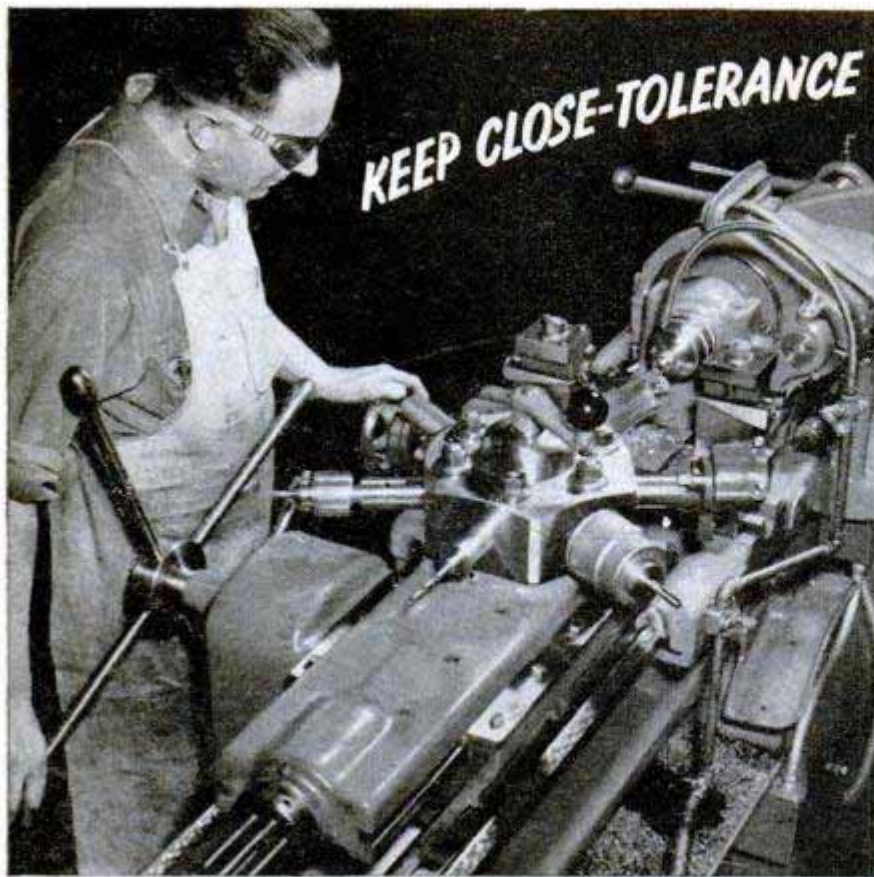
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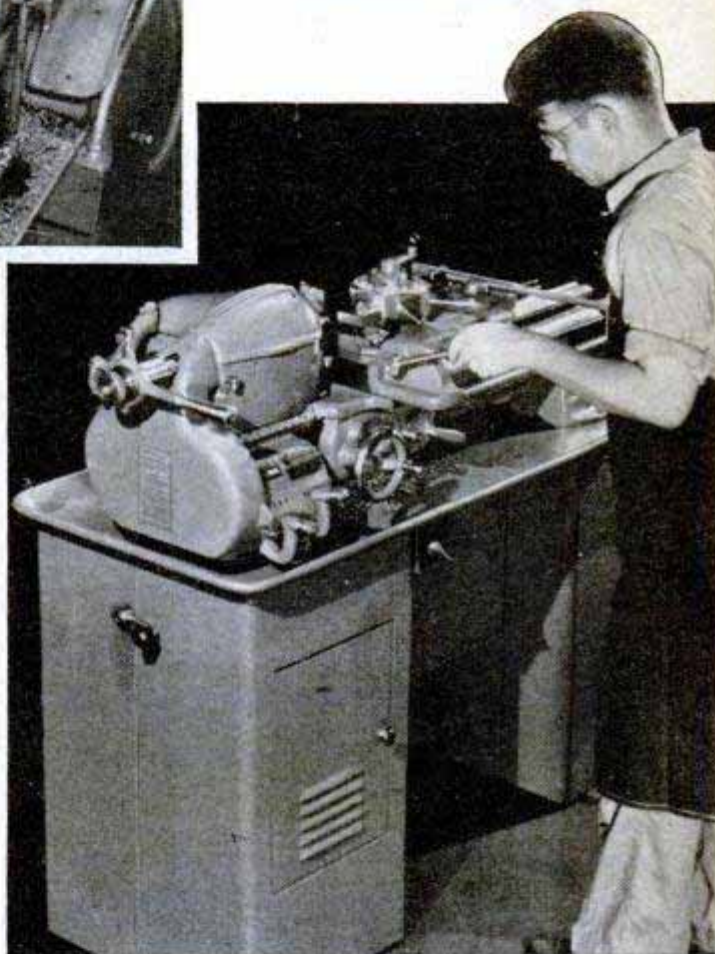


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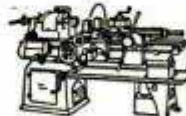
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