# POPULARAR <br> <br> SOIENCE <br> <br> SOIENCE mechanios-autos hiomebuitingl 

 mechanios-autos hiomebuitingl}



## U.S. Now riles <br> World's Fastest righter <br> PACE 94

Studebaker's Jew Wagon
AGE 110



Put together these gleaming STEEL precision parts and create hundreds of toys! Illustrated "How to Make 'Em" book in every set. But you can do your own inventing! Models whistle, "choo-choo," light up and puff smoke. Tell Dad you want ERECTOR and see displays at stores. For ERECTOR and Gilbert Toy Book (plus American Flyer trains) write Gilbert Hall of Science, Dept. N, Erector Square, New Haven 6, Conn. Enclose $10 \phi$ for handling, postage.

Make this high-swinging airplane ride with ERECTOR No. $61 / 2$. No. $61 / 2$ has over 350 parts - sturdy girders, gears, wheels, etc. "Powerhouse" electric engine features many speeds (including reverse) to put action into your models. Builds pile driver, elevator, lift bridge, hundreds of other wonderful toys that work.
Square Girder Construction Precision-matched parts easily lock together with nuts and bolts. Can't wobble or warp. Build bridges that hold more than 200 pounds. Parts have lasting gleam.


Huge ferris wheel turns fast or slow; reverses. Made with ERECTOR No. $81 / 2$.
The all-electric set (No. 81/2) has nearly 16 lbs . of parts! Includes 4 -speed forward and reverse electric engine, electric lights, electromagnet! Build a mighty crane, oil drilling rig, portable derrick, etc. Heavy gauge steel chest. \$23.50*


If you are dependable, honest and willing to work to own a large-profit, lifetime business and become financially independent, we invite you to mail the above coupon for full details. We are now enlarging this 23 -year-old, world-wide chain of individually-owned service businesses. We'll establish you in YOUR OWN business and help
finance you. You use successful methods of established Duraclean dealers. This is a nationally advertised, lifetime business. You can average $\$ 5.00$ hourly gross profit on service you render and $\$ 3.00$ on EACH of your servicemen at National Price Guide charges. Easy to learn . . quickly established.

## Revive, Clean and Protect Rugs and Upholstery!

The remarkable Duraclean Service (illustrated below) restores the natural fibre lubrication of wool and other animal flbres. Resiliency returns to the pile. It rises again. Brilliant colors revive. Results in many instances are almost unbelievable.
Duraclean Service banishes the need of cleaning upholstery, rugs and carpeting by harsh machine scrubbing and soaking. It eliminates harmful solvents and strong soaps.
The aerated foam, created by the patented electric Foamovator, cleans by ABSORPTIONnot by scrubbing. Dirt, grease and many unsightly spots vanish like magic. Furnishings become clean, fresh, enlivened.

## Forestall Damage by

## Moths \& Carpet Beetles

The Duraproof Service (illustrated above) not only kills moths and carpet-beetles but is also WARRANTED to make fabrics repellent to both. The U. S. Government says, "Moths are present in practically every household. . . . No section of the country seems free from such infestations." Damage to household goods and wearing apparel is greater from moths than from fire. This modern treatment DEFINITELY PROTECTS rugs. carpets, upholstery. furs, clothing, blankets, piano-felts, auto interiors, etc

## What Dealers Say-

W. Lookiebill: "We've had 20 years of pleasant dealings. I'm 65 but am setting $m y$ sights for $\mathbf{2 0}$ more years.'
G. F. Munroe: "Took in $\$ 8,198.26$ first 12 months.
P. Freidinger: "We had a big mothproof business last year; one job alone was \$32.. $2 .$. .
R. Kimbrough: "Finished First White House of Confederacy and am to Duraclean the Governor's Mansion.
Q. Corbett (Canada): "Several hundred dollars in jobs lined up from canvassing."
H. Satterfield: Duracleaned chair for largest department store and got order for 60-75 chairs, couches \& davenports."
E. Schenk: "The customers I had on House and Garden ads were very pleased. Their furnishings came out beautiful.' A. Cllman: "It is very encouraging that every demt nstration has been a sale."
Margarette Turner: "Took in $\$ 106$ and worked 15 or 18 hours.
L. Johnson: "Each customer leads to 3 or 4 more.'

## No Shop Needed-EASY to Learn

No overhead expense. Service may be rendered in homes, offices, hotels, theaters, institutions, etc., by your service men. Auto dealers have upholstery revived in used cars. Some Duracleaners establish shops or an office - others operate from their homes.

## Start Part or Full Time

No experience needed. We show you 27 ways to get customers. Almost every building houses a potentian large towns alike. These year-round services are in constant need.

## Nationally Advertised

Your services are advertised in magazines such as Life. McCall's, House \& Garden, Ladies Home Journal, House Beauti ful, New Yorker, Better Homes \& Gardens etc. These ads give your services national prestige.

## Easy Terms!

A moderate payment establishes your own business-pay balance fromp profits. We furnish electric machines, folders, store-cards ntroduction slips, sales book, demonstrators and enough materials to return your TOTAL investment. You can have your business operating in a very few days. Mail above coupon. No obligation.
DURACLEAN CO., 3-18D Duraclean Bldg., Deerfield, Illinois

## Repeat \& Voluntary Orders

Demonstrations win customers. Duracleaners find REPEAT and VOLUNTARY orders a main income. Customers, enthused at results, tell friends and neighbors. Your service is recommended nationally by America's foremost furniture and department stores.

## Double Profits

You enjoy large profits on both materials and labor. To start. you may want to render service yourself. You have cooperation of a worldwide organization interested in YOUR success.

## FREE Booklet

Our letter and FREE 16 page illustrated book16 page illustrated booklet will explain everygently needed services, gently needed services, business grows. your large profits, easy terms and protected territory. Mail coupon TODAY. No obligation.


Mail Coupan TODAY-While Territory Is Open

# Americais Leading TVew-Idea Shagazine for 81 years <br> Founded 1872, Vol. 163: No. 6 <br> POPUMAR SCIENCD <br> ata, us s. Pat oif MOMAHIy <br> Mechanics and Handicraft <br> reg. u.s. pat. off. 

Volta Torrey, editor - Howard Allaway, minaging editor
Iloward C. Jensen, alt eiditor - Frank Rowsome Jr., assistant managing editor


#### Abstract

senion editors: Harry Walton (Mechanics \& Handicraft), Hartley E. Howe (Features), Martin Mann (Copy). associate editors: Alden P. Armagnac, Thomas Berger, Henry B. Comstock, Devon Francis, Sheldon M. Gallager, Kendall W. Goodwyn, Wesley S. Griswold, Herbert O. Johansen, Herbert R. Pfister, Robert P. Stevenson. Ruth Westphal. minwestern editor: Kenneth Wylie (Chicago) art: Harry Sammels (Director), Herbert Anthony, Eric Karminski Jr.. Frances Cooper Daniels, Mary Dee. photographi: W. W. Morris (Director), Hubert Luckett, Orlando Guerra. editorial assistants: Harriet Trowbridge, Carol Ennis, Louise Levis, Trudie Ray, Teresa Robbins, Grace A. Schwartz, Georgette Sparks. western editor: Andrew R. Boone (Los Angeles)



For Junior:
Space Helmet Radio.. 209
Helicopter Lamp...... 218
For Sister:
Prefab Dollhouse ..... 212
Doll Furniture ..... 218
Jewelry Box ..... 224
For Mother:
Plant Holder ..... 222
Serving Plate ..... 222
Cookbook Holder ..... 224
Candle Hot Plate ..... 224
Snack Table ..... 224
For Father:
Footstool ..... 226
Weather Vane ..... 226
For the Family:
Electric Panel ..... 216
Tree Stand ..... 217
Table Tree. ..... 218
For Cousins:

Diesels Even Run Bikes Now....................... 81
Infrared Rays Clarify Bible Texts................ 86
The Fastest Fighter in the World................ 94
Plug-In Workman Built in 90 Days............... 100
Event One Thousand!..................................... 107
Studebaker Brings Out 1954 Conestoga...... 110
Canada Delivers the Christmas Mail............ 116
Games Disclose Secrets of Success.............. 125
Life in a Bubble Can Be Beautiful............ 133
Fastest Freight Train...................................... 140
Rocket Water Yields Wonder Products....... 145
Wilbur Shaw Reports on the ' 54 Nash........ 152
You Can Use Aluminum Like Wood........... 159
Gus Rides with Santa Claus.......................... 178
Safety Belts Help You Drive......................... 183
How Lift Sawing Stretches Wood................ 189
Box-Camera Wizard Snaps Famous People. 192
How to Build the Fastest Clipper Ship........ 202
(More features and departments are listed on page 4.)

[^0]
## They claim



These sfafements are typica!! I.C.S. gets letters like these regularly. Coupon senders report pay raises. Others win important promotions or new, interesting assignments. Still others find happiness, job security, opportunities never dreamed possible.


Is it LUCK? The results are so impressive, so quick in coming, that some say the I.C.S. coupon is "lucky." Of course, that's not true. The real reason for these amazing results is what happens to the person when he or she mails the coupon.

Coupon is first step! Naturally, you want to make good. But you've put off doing something about it. Mailing this coupon is definite action! It shows you're fed up with waiting for the breaks. You're determined to make your own breaks! And this determination alone accounts for much of the "luck" you'll start to experience.


You get free guidance! Within a few days you get the helpful and inspiring 36-page book, "How to Succeed." It's crammed with information. For example, it tells you in detail how to plan your career. Also how to prepare for advancement. In addition, you get a free catalog on the I.C.S. course that interests you. With your new-found determination and these two books as your guides, you're ready to cash in on your hidden abilities!

391 I.C.S. courses! You'll find a partial list of courses in the coupon below. Each course is up-todate, extremely practical, completely success-tested. You study in your spare time. Set your own pace. Correspond directly with instructors. Cost is low. Diplomas are awarded to graduates. I.C.S. training rates high in all fields of business and industry. You won't find another school like it.

Call it being "lucky" or being "smart." Whatever it is, you're one step closer to your goal when you mail this famous coupon!
I.C.S.-the lifetime Christmas gift

## INTERNATIONAL CORRESPONDENGE SCHOOLS

## BOX 7665-N, SCRANTON 9, PENNA.

Without cost or obligation, send me "HOW to SUCCEED" and the booklet about the course BEFORE which I have marked X:



Try the sensational PROTO No. 234 Multi-Purpose Plier and you will want one for sure! Using a patented threepiece compound leverage design, pressure applied to the handles is increased ten times at the jaws! This plier is actually "a chest of tools in one." It securely holds square, round and even tapered objects. To make your work easier, buy one today!

Choose PROTO for Your Other Plier Needs In the extensive PROTO line, you will find the right size and style of plier for almost every job. And remember that every one has true professional quality. Send $10 \$$ for complete 68-page catalog to


2257A Santa Fe Ave., Los Angeles 54, Calif.
New-the No. 243 Multiple-Groove Joint Plier, which Handles Hundreds of Jobs. Five-Position, Tongue-and-Groove Joint Prevents Slippage.


Eastern Factory: Jamestown, N.Y. Canadian Factory: London, Ont.
New Toys. ..... 92
Swiveling Sound Beam Spots Fish. ..... 99
How You Fly High in Comfort. ..... 104
Jet Proposed as Robot Raider. ..... 122
Station Wagon Runs on Three Wheels. ..... 124
Breath Operates TV Set ..... 129
Airstrip Made of Snow Guards North. ..... 130
Copter Plays Cops and Robbers. ..... 132
Mechanical Woodpecker ..... 137
De Soto Ups Horsepower for 1954. ..... 157
Mechanics and Homebuilding
New Blower Huffs and Puffs ..... 168
Unusual Doors Are Easy to Make ..... 173
How I Expanded My Garage. ..... 177
News from Auto Row ..... 187
Two Work Supports for Your Power Saw.. ..... 196
How to Make a Snow Mask. ..... 199
Wordless Workshop ..... 200
Extra Uses for a Bottle Warmer. ..... 207
Departments
Letters ..... 6
New Ideas from the Inventors ..... 113
I'd Like to See Them Make ..... 144
P.S. Last Minute News and Notes. ..... 158
Keeping the Home Shipshape. ..... 171
Now for the Handy Man ..... 174
Hints from the Model Garage ..... 181
New Tools. ..... 195
New Shop Ideas. ..... 227

NEXT MONTH
How Anyone Can Plaster


Metal lath that can be nailed over an old wall, plus casily worked lightweight plasters and new textured paints, make it possible to do a good-looking job in a weekend or two. For January, Popular Science Monthly will show you how to use these popular finishes to make old walls look new, new ones look better.


## How silent is the night?

Watching the serenity of Christmas skies, we are conscious of deep silence. Yet the stars are talking to us all the while-talking in radio waves that are full of meaning to scientists probing the depths of space.

The important discovery that some stars produce radio waves was made by a Bell Laboratories scientist while exploring atmospheric disturbances which might interfere with transoceanic telephone service. His discovery marked the birth of the fast-growing science of radio astronomy. It is telling us of mysterious lightless stars that broadcast radio waves, and it promises exciting revelations about vast regions of space concealed by clouds of cosmic dust.


Directional radio antenna used by Karl G. Jansky, in the discovery of stellar radio signals at the Holmdel, New Jersey, branch of Bell Telephone Laboratories. In 1932 he detected waves of 14.6 meters coming from the direction of Sagittarius in the Milky Way.

It is another example of how Bell Telephone Laboratories scientists make broad and important discoveries as they seek ways to make your telephone serve you better.

## NEWS FROM SCIENCE ABOUT YOUR HAIR



## V-7

-new grooming discovery outdates messy oils

Not an animal, vegetable or mineral oil, V-7 in new Vitalis Hair Tonic is a completely new greaseless grooming agent.

## PROOF

you don't need grease to correct dryness

New research on human hair shows that even very dry hair regains its normal moisture content faster with new Vitalis than with any leading cream or oil hair tonic.

## KEEPS YOUR HAIR NEAT AlL DAY -GREASELESSIY

Even hard-to-manage hair stays neatly in place with Vitalis. No gummy film or "oil-slick" look.


## Letters

## Dowsing Defended and Doubted

At the end of his article on water witching [Oct., p. 99], Howard Meyerhoff said he didn't know why the stick he had held had bent down where there was underground water. He said he wished he did know.

I can tell him. I have witched a good many wells, and I can tell to within a few feet where a well lies, even if it's 100 feet below the surface.

You can even witch over a river and your fork won't work unless there is a vein of water-bearing mineral gravel beneath it.

It's the minerals in the gravel that make the switch bend down, not the water. I can prove that if anyone should want me fo.

Frank C. DeMars, Minneapolis.
Being a confirmed skeptic, a graduate chemist with some training in geology, I had always thought that there was nothing to

this business of dowsing until a nurseryman demonstrated the art to me near Niles, Mich. I, of course, thought he was a nut, but he handed the dowsing rod to me, and the thing began to work! I didn't want to believe it, and I tried to explain it to myself as a result of suggestion, etc. However, the rod continued to work for me and still does. I tried it with many of my friends, and I have found that perhaps one to three in 10 people can feel the pull of the rod in certain places.

Although I will agree that the rod is attracted by some force, I do not agree that it necessarily points to water. There is ground

6 popular science


If your heart is set on a larger income and all that it means . . . better home-fine car-larger bank account-more of the good things of life. . . .

If that's your ambition and you are really serious about it, then you owe it to yourself to get the REAL FACTS about Accountancy, and the many good-pay opportunities that can be YOURS through LaSalle's famous Problem Method plan.

It matters not whether you've had a single day of experience in this field-or whether you have already started but want to climb higher. LaSalle's expert training is designed to take you from where you are.. to where you want to be ... in higher positions and a lifetime career of security and good income. WHY YOU CAN'T FAIL TO GAIN You see on this page a panel of experts who know Accounting from A to Z . . . all the way from simple bookkeeping, on up through advanced accounting, cost accounting, auditing, income tax, and coaching for the C.P.A. degree. These are only part of LaSalle's instruction staff. But what is most important to you..
. . . These C.P.A. experts know how to impart their knowledge to others . . . how to help you prepare quickly yet thoroughly for success in this very lucrative field.

The proof? What stronger proof could there
be than more than 4,000 Certified Public Accountants (approximately $10 \%$ of the U.S. total) who have trained with LaSalle? Or the hundreds of thousands of men and women whom LaSalle has helped qualify rapidly for more money, a brighter future, in a high-pay-lifetime career? These thousands came to us with different backgrounds of experience and varying degrees of ambition. Many have reported raises and promotions after only a few weeks of training. Thousands of them have written to say they are now earning $50 \%$ more-even double their former incomes-often in less than a year. These letters are published in book form for your inspection. They were written by real people, with real income, problems and ambitions-people who might be your next-door neighbor.

Yes, if you are really sincere in wanting to better your positionstart your income climbing-enjoy a lifetime career of high standing and high reward-this friendly staff of experts can help you.

LaSalle's famous staff of Accounting authorities are helping thousands prepare for fast promotions and bigger pay. They can do the same for you!

## SAMPLE LESSON SENT FREE MAIL COUPON BELOW

You don't have to wonder what LaSalle's Accountancy plan is like. You will be sent a free sample lesson, which does not obligate you in any way. Study it-keep it -see for yourself how simple, clear, and easy it is to master. This is an actual lesson right out of the regular training-to show you exactly how LaSalle's Problem Method has trained more than $1,300,000$ men and women from all walks of life.
Also . . . the 48-page book, "Accountancy, the Profession That Pays," gives all the latest facts about the new and growing opportunities in five different fields of profitable employment.
This can be an important day in your life. A coupon like the one below has started hundreds of thousands of men and women toward a bigger job, a larger income. It can do the same for you.

 telling everybody a Weller Soldering Gun tops your "want" list because it makes all kinds of homecraft and hobby jobs easier, faster and better. So if you don't get one, it's because the old guy kept it for sled repairs and his toy factory. Even at the North
Pole, there are endless uses for the new Weller Soldering Guns!

While you're thinking about it . . . the $y$ 're gift wrapped for Christmas and a sure-fire idea giving, too!

water in all soil, and there is a water table at some depth almost everywhere.

Divining rods seem to be attracted to the bases of large trees, to large piles of rock, brick, concrete blocks, etc. I do not know what they point to, but I am sure that they point.

Join C. Lee, Terrace Park, Ohio.
A neighbor of mine once solicited the services of the local "water diviner," an oldtimer who had quite a reputation, and let himself in for drilling a whole series of wells.

The first theee wells all dried up within a couple of years after drilling. Finally he tried a fourth, locating it where the water diviner suggested-an inconvenient 220 yards from the house. The drillers went down 129 feet and obtained an extremely strong vein of sulfur, which is still producing very well after 22 years!

> Capt. Harold E. Wells, Eglin Air Force Base, Fla.

If any person has any doubts about its being magnetism that causes the forked stick to turn down when and where it does, I would ask him to get a good green forked stick (willow or peach is good) and a dip needle, try them out side by side, and be convinced of the truth.

Lucian L. Gunn, Hardy, Neb.

## "New" Wing Really Rather Old

That French airplane with the long, narrow "new" wing that you showed us in your July issue [p. 69] isn't so new, if my memory's right. The Bellanca Air-Cruiser had one like it many years ago.

Jim Barrett, Kansas City, Kan.
So it did, and here's a picture of that pioneering Bellanca Air-Cruiser in flight in


1927, the year it was designed and built. Note that it also had a retractable landing gear, which a lot of people had talked about

## SAVE wide wholesale

Send today for full information and our amazing offer-see, play and hear this superb instrument in your own home-let your friends and family confirm this imported professional model as the accordion of your dreams! Immediate delivery assured from the world's largest selection of leading Italian makes.

## PLAY AS YOU PAY

Leading professionals acclaim our instruments as unsurpassed. "A wonderful surprise, truly an 'artist's instrument' ", "In a class by itself for beauty and tone", are typical expressions. Easy to own and play with our FREE lessons. TRY BEFORE YOU "BUY - No obligation. Trade-ins accepted.
Get full details of ultra-quality features and our almost unbelievable offer of big discounts to students, professionals, teachers and beginners. Boys and girls learn with ease and make quick progress-playing comes naturally. Children deserve this wholesome outlet leading to desirable associates.

## Read These-Culled from Hundreds

Words cannot express our delight with the accordion, it is indeed a splendid instrument. Again let us express our heart. felt appreciation for having provided the instrument at such a reduced price. Everyone expresses delight with it. All are utterly amazed at its versatility of tone production. It cerlainly creates a splendid impression for your company

Aubrey B Martin. Wheeling W Va.
"Received our accordion today we are pleased with such a wonderful instrument. I have talked to my neighbor who taught accordion for 20 years and he praised this accordion highly as a wonderful instrument."

Theodore M. Swiateck
Denver, Colorado

I am writing vou from my studio and enclosing a check for down payment on my accordion which I am very pleased with indeed! I thank you for your very generous trade in allowance on my old accordion. Thank you also for your very courteous !etters:
"I like the way you do business - trigger action and so courteous."

Bill Balduzzi, Terre Haute, Ind.
"My accordion arrived yesterday and am thrilled and happy over the beautiful instrument and pleased with the tone it gives. It is all that you said it was and more."

Mrs. Fred Richter Clear Lake, Wis.

## ACCORDION MANUFACTURERS \& WHOLESALERS OUTLET

 2003 W. Chicago Ave. Dept. 2P123 Chicago 22, III.All this is FREE*

## WITH YOUR ACCORDION

- Home study course of instruction.
- Your name in chrome letters on instrument.
- Year's supply of music.
- A de luxe music stand.
- Music Portfolio.
- Life Time Guarantee.
* For Limited time only


## EASY <br> TERMS



Imagine a powerful, magnificently toned radio like this at such an unbelievably low price! High fidelity, superior tone, extra range and power. Patented motor noise filter, automatic volume control, big speaker and control head adaptable to instrument panel. So easy to install, it can be put in your car while you wait.

but no one had tried out commercially until then.

## They Swap Tape Recordings

I wonder if your readers have heard of the new hobby called "tape-respondence," the exchange of tape-recorded letters. Many

people today are finding pleasure in swapping all sorts of tape recordings-such as radio programs and music-with others all over the world.

They even have a club-Tape-Respondents, International. It was formed by Fred Goetz, 3488 22nd St., San Francisco, who took up the pastime in 1948 and has since exchanged well over 1,400 wires and tapes with fellow hobbyists.

Don Ley, Dunkirk, N. Y.

## Club for Parakeet Fans?

Thanks for the wonderful article and pictures on breeding parakeets [Oct., p. 140]. Some friends and I promptly bought a few birds. They are 90 -percent finger-trained and amuse us with their silly tricks.

I think Wilbur Crane and Alan Hinton should start a club for parakeet fans. Seems to me there must be thousands of owners of the birds who would be glad to join for a small monthly or yearly fee and get a ready source of answers to questions that might come up about their pets.

> Louis Haber, Bronx, N. Y.

## Rear-Engine Cars in Snow

The man from Vancouver who recently wrote you that "until light-alloy engines are produced equaling today's standards, the rear-engine family car is only a dream" has provoked me to add my nickel's worth to the running argument on this subject. I can only wonder whether he has ever driven a rear-engine car.

Right now I own two, and I can say with conviction that in a country like mine (and the Vancouver man's), where there is plenty of snow, the rear-engine car really comes into its own. It will not take any great tech-

"Am doing Radio and time. Now have my own shop. 1 owe my success to Madison, Iowa.
"Am with WCOC. NR1 course can't be beat. N
trouble passing list class Radio-phone license exam.' Jesse W. Parker, Mari dian, Mississippi.
"By graduation, had paid for course, car, testing equipment. Can service toughest jobs."-E. J.
Streitenberger, New Bose. Streitenber
ton, Ohio.

## VETERANS <br> UNDER GI. BILLS

 the day you enroll, that show you how to fix sets. Multitester built with parts I send helps you make $\$ 10, \$ 15$ a week extra fixing sets while training. Many start their own Radio-Television business with spare time earnings.
## My Training Is Up-To-Date

## You benefit by my 40 years' experi-

 ence training men at home. Well illustrated lessons give you basic principles you need. Skillfully developed kits of parts I send (see below) "bring to life" things you learn from lessons.

Nothing takes the place of PRACTICAL EXPERIENCE. That's why NRI training is based on LEARNING BY DOING. You use parts I furnish to build many circuits common to Radio and Television. As part of my Communications Course, you build many circuits, including low power transmitter shown at left. You put it "on the air," perform procedures required of broadcast operators. With my Servicing Course you build modern Radio, etc.; use Multitester you build to make money fixing sets in spare time while training. You can stay at home, keep your job, learn Radio-TV in spare time at low cost. Mail coupon for book showing other equipment you build and keep.
The Tested Way To Better Pay !

Television Making Good Jobs, Prosperity - Even without Teevision, Radio is bigger than ever. 115 million home and auto Radios are big market for servicing. 3000 broadcasting stations use operators, technicians. Government, Aviation, Police, Ship, Microwave Relay, Two-way Radio Communications for buses, taxis, trucks, R. R. are growing fields. Television is moving ahead fast.


Radio-TV Needs Men of Action -Mail Coupon
Without obligating you in any way, I'll send an actual lesson to prove that my training is practical, thorough; 64 -page book to show good job opportunities for you in Radio-TV. Terms for NRI training are as low as $\$ 5$ a month. Many graduates make more in two weeks than total cost of training. Mail coupon now. J. E. SMITH, President, National Radio Institute, Dept. 3 NB , Washington 9. D. C. OUR 40TH YEAR.


nical knowledge to see the advantage of heavily loaded rear wheels pushing lightly loaded front wheels in snow.
G. W. White, Severn Park, Ont.

## Cobb Beat Them All

The men in our company of medics have been having a little argument over racing cars. I say that there is one that has made 1,000 miles an hour. Am I right?

Pvt. Vincent D'Anton, APO 6, San Francisco.

No, not by quite a few miles an hour. The world's absolute speed record for automobiles is 394.196 m.p.h. John R. Cobb set it in a Railton Special on the Bonneville, Utah, salt flats on Sept. 16, 1947.

## Rewards of Letter Writing

Your magazine must be read throughout this whole wide world. Last spring, after you had put out an especially good issue about cars, I wrote and told you how much I'd enjoyed it.

You printed my letter in April, and since then I've heard from a cousin I had lost

track of and from a fellow car enthusiast way down in Australia.

Wally Benefiel, Medicine Lodge, Kan.

## Right Slant on Engines

I enjoyed your article about hot-rod rail-sters-"I Ain't Got No Body," July, p. 122very much. But there is one thing I don't understand. You state that "some engines slant toward the rear for traction." I don't see why slanting the engine would give it more traction.

Donn Moore, Oak Harbor, Ohio.
There is a slight power loss at the universal joints in any car, due to the angular displacement as the propeller shaft revolves. This displacement can be reduced if the engine is cocked higher in front.


## THE NEW MODEL 170-A




The majority of inoperative tubes stop functioning due to open fllaments, inter-element shorts and other faults which can be located by the continuity and leakage method. The Model 170-A will test ALL the tubes used in your TV set for open filaments, inter-element shorts, burned out tubes, etc. A safeguard resistor included in the circuit network of the Model 170-A limits the output to approximately one onethousandth of an ampere. This insures positive safety for the non-technical user and also eliminates the possibility of ever burning out a tube under test. The Model 170-A is capable of testing EVERY type of tube used in any and ALL TV sets (including picture tubes).

$$
\begin{aligned}
& \text { ADDED FEATURE:- } \\
& \text { Also included, detailed instructions for using Model } \\
& \text { 170-A as ELECTRIC CONTINUITY TESTER. } \\
& \text { Check electric toasters, fuses, heating Irons, } \\
& \text { broilers, heating pads, clocks, fans, fluorescents, } \\
& \text { other bulbs, etc. }
\end{aligned}
$$

Housed in molded bakelite case. Complete with test leads and detailed easy-to understand instructions and tube charts. Only

## SHIPPED ON APPROVAL NO MONEY WITH ORDER - NO C.O.D.

Kapner Hardware, Inc
Dept. A-90, 2248 Second Ave., N. Y 29, N. Y.
Please RUSH one Model $170-\mathrm{A}$. If completely satisfied I agree to pay $\$ 4.95$ within 10 days. If not, instrument will be returned (no explanation necessary).
Name
Address
City
FREE PREMIUM
$\square$ Check here if you remit $\$ 4.95$ with order, and we will nclude 6 Key Chains wth Tube Tester - all post paid. Money-back guarantee, of course!

## HEARING BAD?

If so, you will be happy to know how we have improved the hearing and relieved those miserable head noises, caused by catarrh of the head, for thousands of people (many past 70) who have used our simple Elmo Palliative Home Treatment in the past 16 years. This may be
 the answer to you prayer. NOTHING TO WEAR. Here are SOME of the symptoms that may likely be causing your catarrhal deafness and head noises: Head feels stopped up from mucus. Dropping of mucus in throat. Hawking and spitting. Mucus in nose or throat every day. Hearing worse with a cold. Hear - but don't understand words. Hear better on clear days. Worse on rainy days. Head noises like crickets, bells, whistles, clicking, escaping steam or many other sounds. If your condition is caused by catarrh of the head, you, too, may likely enjoy such wonderful relief as many others have reported. WRITE TODAY FOR PROOF AND 30 DAY TRIAL OFFER.

THE ELMO COMPANY
DEPT. 4PS9
DAVENPORT, IOWA

## 473 man warro As Local Manufacturers of this New Masonry

CAVITEX is today's masonry-colorful, streamlined, scientific. Yet with price appeal to override competition. Size and proportion in direct line with modern architectural trends. Dimensions strictly according to modular standards. All the strength safety and endurance of masonry at its peak point.
Outstanding
Opportunities For
Responsible Operators


Cavitex can be made locally-of local materials with local labor. Freight and distribution costs are saved. That's why Cavitex can be sold so low, yet still allow $100 \%$ or more mark-up on material and labor. We supply basic equipment on easy rental terms. Exclusive privileges in franchiseprotected territories. Hundreds of territories open. Write or wire today for "Opportunity, Unlimited"-free. If requested, we will tentatively reserve territory desired.
W. E.DUNN MFG.CO., 410 W. 24th St., Holland, Mich.

## . 22 RIFLE BARGAIN

## CARBINESTYLE

 (BRAND NEWI) 34 inches long 4 Ibs. cision made riffe. simplifight preconstruction . one screw take digged assembly. Has automatic ejector with self adjusting sporting rear sight, blade front sight. Barrel has action. Genuine walnut thru-out. Highly polished bolt Shorts and Long wifle (regular shoots American Longs, ing accuracy at 100 yard range! Replacement parts easily secured if ever needed. Low cost skilled labor makes possible our amazing bargain price. Supply Limited. 10 DAY NO RISK TRIAL. If not satisfied return for full refund. Transportation collect. C.O.D.'s UNITED ARMS CO., 9043 S . Western, Dept. CHOB-2055, Chicago 20 .


I'll Send You This Handsome SAMPLE CASE-FREE


# INVENTORS 

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentåble. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

## CLARENCE A. O'BRIEN \& HARVEY JACOBSON

Registered Pafent Atforneys
32-M DISTRICT NATIONAL BUILDING
WASHINGTON $5, ~ D . ~ C . ~$


## You Can Influence Others With Your Thinking

TRY IT SOME TIME. Concentrate intently upon another person seated in a room with you, without his noticing it. Observe him gradually become restless and finally turn and look in your direction. Simple-yet it is a positive demonstration that thought generates a mental energy which can be projected from your mind to the consciousness of another. Do you realize how much of your success and happiness in life depend upon your influencing others? Is it not important to you to have others understand your point of view - to be receptive to your proposals?

How many times have you wished there were some way you could impress another favorably - get across to him or her your ideas? That thoughts can be transmitted, received, and understood by others is now scientifically demonstrable.

## This FREE Book Points the Way

The tales of miraculous accomplishments of mind by the ancients are now known to be fact-not fable. The method whereby these things can be INTENTIONALLY, not accidentally, accomplished has been a secret long cherished by the Rosicruciansone of the schools of ancient wisdom existing throughout the world. Write for the free copy of the fascinating sealed book, "THE MASTERY OF LIFE," which explains how you may receive this unique wisdom and benefit by its application. Address: Scribe B.T.Z.

## The Rosicrucians

San Jose, (AMORC) California


| A FEW e MORE INSURES YOU "FAMILY-SAFE", | YEAR AFTER YEAR WE SAY-"IT'S DANGEROUS TO PAY LESS." |
| :---: | :---: |
| CHOOSE! | DISCOUNT?" or our Extra safe |

GOODFYEAR XXXXX Tirestone


 | BLATTS WORLD-FAMOUS Finest. (NOT RECAPS.) |
| :--- |
| $\mathbf{3 2}$ MONTHS |
| GOLDEN RULE |
| GUARANTEE |

## 32 MONTHS GOLDEN RULE

 $600-16$ \$5.05|700-16 \$5.85 ${ }^{640-15}$ \$4.721800-15

| $650-16$ | 5.64 | $750-16$ | 8.78 | $710-15$ |
| :--- | :--- | :--- | :--- | :--- |
| $650-16$ | (6) | 6.79 | $550-17$ | $4.25760-15$ |

$\$ 5.95$

| 50-16 | 5.64 | 8.787 | 5. | 4.95 |
| :---: | :---: | :---: | :---: | :---: |
| 16 (6) | $6.79550-17$ | 4.25760 .15 | 5.63700 | 5 |
| (6) | $6.79550-17$ | 4.25176 | 5.63700 | 5.25 |

4.84 WHITEWALLS \$1.50 EXTRA $525-18$ 4.25 FINEST HEAVY DUTY TRUCK TIRES 32 MONTH GUARANTEE $\begin{array}{ccccc} \\ 700-15 & \text { ( } 6 \text { ) } \$ 8.73 \mid 700-17 & \$ 9.83 / 700-20 & \$ 10.76 \mid 1000-20 & \$ 17.95\end{array}$

 | $750-16(8)$ | 10.65 | $600-20$ | 8.64 | $825-20$ | $18.691000-22$ | 17.97 |  |
| :--- | :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| $825-15$ | 12.53 | 32.6 | 10.96 | $900-20$ | 16.49 | $100-22$ | 18.25 | We select your tires, as if MILITARY TREAD our future depended on it 32 month Guar. No Recaps Buy in Confidence, our fine Slightly Used Tires nearest store

## AVIATION Buy sum mor With a Schooling

750-20 H. Duty 900-16 H. Duty


: ATV llth \& SPRING GARDEN ST., PHILA., PA. send ck. order from your 2827 N.W. 7th AVE., MIAMI, FLA. or M.O.


Factory Refread Snow Tires 30 Mo. Guarantee 'New Tire Traction'". Goodyear, Firestone \& Others. RUSHED
at PARKS
NOW! A\&E MECHANIC LICENSE COURSE
45-week course, all phases aircraft \& engines.

## Start Jan. 4, 1954

FLIGHT COURSES-Private. Commercial, Instrument, Instructor, Multi-Engine.
DEGREE COURSES-B.S. degree in 3 yrs. from Saint Louis University-Aero. Engineering, Maint. Engineering, Aero. Administration.

All Parks Schooling Approved for Veterans. Write Today.

```
PARKS COLLEGE E East St. Louis, m.l.
```



No classes. No time wasted going to and from school. Progress as fast as your time and abilities permit. Standard H. S. texts supplied. Thousands enroll each year in this 56-year-old school. Send for FREE descriptive booklet.

AMERICAN SCHOOL, Dept. H946
Drexel at 58th St., Chicago 37, III.
Without obligation, please send FREE descriptive booklet.
Name
Address engines.
..


国

## JNYENTOBS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman \& Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are your laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you. "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an 'Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

## McMORROW, BERMAN \& DAVIDSON

Registered Patent Aftorneys

PATENTS - COPYRIGHTS • PATENTS
142-V VICTOR BUILDING, WASHINGTON 1, D. C.


Your engine is built with close tolerances . . . mirror-finished to overcome the friction of highspeed operation. Clean oil keeps it this way to give you maximum pep, power and long life. In modern, high-compression engines, sludge and dirt increase friction . . . sapping engine power and causing excessive wear.

## FRAM Cleans the Oil that Cleans the Motor

That's why $20,000,000$ engines today are equipped with Fram Oil Filters. Fram-clean engines keep their power longer. Make it a practice with your car to replace the oil filter cartridge regularly. And replace it with a genuine Fram. There's a reason. Fram Cartridges trap more dirt. They even remove invisible dirt. They're engineered to your car manufacturer's specifications. And only Fram Cartridges are guaranteed best you ever bought or your money back.

## FRAM FILTERS...

## Best Life Insurance Your Car Ever Had




Size 26:00, 10 ply tire, smooth Size 17:00, 6 ply, smooth tread. tread, uses tapered axie size 3 in. $x 21 / 2$ in. $101 / 2$ in. wide. Overali heluht 9 in. Static ionad 6.3001 hs . $\frac{\text { Weight } 54 \text { lbs.. Price } \$ 47.50 \text { ea. }}{\text { Size } 5: 00 \times 4,6 \text { ply smooth }}$ Size 5:00 x 4, 6 ply, smooth
tread. Uses straight $5 / 8$ in axle. $31 / 4$ in. wide. Overall height 13 in. Static Load 1.800 lbs. Weight 8 lbs., Price $\$ 12.50$ ea. Size 6
heavy duty

noller bearing, ${ }^{2}$ solid rubber tire high, $21 / 2^{\prime \prime}$ wide, $1^{\prime \prime}$ straight Weight 4 lbs Price 53.50 Uses tapered axie, smooth tread. $13 / 4 \mathrm{in}$. 8 in. wide, Overall height 17 in. Static Loar ${ }^{2}, 000$ liss. Size 8:00x4, 4 ply, smooth tread Size 8:00x4, 4 ply, smooth tread
-uses straight $11 / 4$ in. axle. 6 in . wide. Overall height 17 in . Static Load 900 lbs.
Weight 13 lbs., Price $\$ 27.50$ ea. Size $101 / 2 \times 4,6$ ply ribbed tire. Uses straight $5 / 8 \mathrm{in}$. axie. $31 / 4 \mathrm{in}$. wide. Overall height $101 / 2 \mathrm{in}$.
Static Load 1.200 ibs.
Weight 4 ibs. Price $\$ 3.50$ ea. Weight 8 ibs., Price $\$ 9.95$ ea. Prices F.O.B. Chicago. Include approx. postage on order: paid for

 products from France, Germany, India, etc., sent to you. Established Import-Export firm offers men or women FREE plan for big profit, world-wide, mail-order business at home; or travel abroad. No capital or previous experience needed. Overseas bargains bring high U. S. prices. Write today for FREE plan!

Mellinger, Dept. 24C,1717Westwood, Los Angeles 24, Cal.


NOW...get EVERYTHING YOU NEED to prepare to earn REAL MONEY in

## television

## Opportunity Fields

BRIGHTEST

## Enjoy highly interesting work ... and a wonderfully promising future

America's great billion dollar Television field now offers you a chance of a lifetime to get started toward a good'job or your own profitable business. With so many new TV stations coming on the air, Television is expected to grow as never before! Millions of TV sets must be produced, tested, installed and serviced. And-Television is only one branch of this vast opportunity field of Electron-ics-for which D.T.I.'s amazingly effective training prepares you.

Right in your own home you may now get one of today's most interesting . .. PRACTICAL WAYS to prepare for your start in TELEVISION, including Radio and Etectronics. No previous.experience or advanced education are needed-because D.T.I. brings you a 3 -WAY COMBINATION method that speeds your understanding and progress. You (1) Learn from well illustrated lessons, you (2) Learn by Seeing from D.T.I.'s wonderfully effective home movies and (3) you Learn by Doing from electronic parts that provide the practical experience you need.

You get and KEEP the same type of basic electronic equipment used in our modern Chicago Training Laboratory. You get home training that includes the knowledge and experience gained from training thousands of students first hand. In other words, you get LABORATORY TYPE TRAINING . . . RIGHT IN YOUR OWN HOME. But why not get the whole exciting story. Mail coupon today.

## EMPLOYMENT SERVICE

Get an honest-fogoodness EMPLOYMENT SERVICE to help you get a good job after graduating - or assistance in starting your OWN TV-RADIO SALES \& SERVICE BUSINESS.

## MILITARY SERVICE

If you're subject to military service, the information we have for you should prove very helpful. Mail coupon today.
$1 f$ preferred, you can get All of your training in D.T.I.'s CHI. CAGO LABORATORY $\cdots$ one of the nation's finest. Write for detaits

## EARN AS YOU LEARN

After you get part of D.T.I.'s training, with equipment at home, you may then, in your spare time, begin to earn real money servicing Radio and TV sets.

## BUILD AND KEEP A BIG $21^{\prime \prime}$ TV SET

For added practical experierice, you build and keep this top quality 21 INCH TV Set that provides TV reception at its finest (D.T.I. Effers another home training but without the TV set.)


## SEND FOR FACTS T(1)A!!

DeFOREST'S TRAINING, INC., 2533 N. ASHLAND AVENUE, Dept. PS-12J, CHICAGO. 14, ILLINOIS
I would like your Opportunity Bulletin showing " 89 Ways To Earn Money In Television-Radio-Electronics"; also, complete facts about the training opporfunities made possible by your organization.

Name Age

Address $\qquad$ Apt. $\qquad$

City $\qquad$ Zone $\qquad$

## You'll Love the Feel of Its Cushion Bite!

## MEDICO Crest filter pipe ${ }^{5} 50$

with Guaranteed BITE-PROOF
NYLON BIT


Also available in MEDICO V.F.Q. \$2


When filter turns brown in Medico, throw it away, with nicotine, juices, flakes, and tars it has trapped. Insert a fresh filter for cooler, cleaner, dryer smoking. Imported Briar.

OTHER MEDICO VALUES
Medico Clear-Vue . . . $\$ 1.89$
Medico Medalist . . . . $\$ 1.50$
Medico Cigarette
\& Cigar Holders . . . $\$ 1.00$
Medico Filterette
Disposable Holders, 3 for $25 \$$
Wide variety of shapes and sizes
Write Medico Pipes, Inc., N. Y. 22, for Booklet R



## WATCHMAKIIG FREE Sample Lesson

Watch repairing's fun . . . profitable too! An exciting hobby or fascinating career. Chicago School of Watchmaking offers complete home study training in professional watch repairing at amazing low cost. All equipment included at no extra charge. Or, if you prefer. attend $s=1001$ in person. no experience needed. Write today. No obligation.

## GHICAGO SCHOOL OF WATGHMAKING



## WHOLESALE! <br> 

FULL PRICE


## Blue-black finish - Knurled Styrene Stock



KRUGER CORP., Dept. 12, Kruger Building, 2801 W. Valley Biva., Alhambra, Calif.

Please send........ Kruger pistols at $\$ 3$ each Payment of \$........enclosed (Sorry, no COD's)

NAME
ADDRESS
CITY STATE

## LET ME PROVE ICan Make YOU a. a New Man!

I'VE done it for thousands of other fellows. Let me prove I can add solid inches of handsome, rippling muscles to YOUR arms, legs, shoulders, back . . . make you an outstanding specimen of strength and selfconfidence. My secret of "Dynamic Tension" does it in just 15 minutes a day. You'll be amazed at the results and so will your friends.
Charles Atlas - winner FREE-My 32 Page of titte "World's Most Perfectly Developed Man" Illustrated Book is Yours-Not for $\$ 1$ or 10c-But FREE
32 pages packed with valuable advice, actual photographs of fellows who became new men almost overnight . . . with "Dynamic Tension." Book can mean turning point of your life. It's yoursABSOLUTELY FREE Send for it TODAY. Address me personally: CHARLES ATLAS, Dept. II2, 115 East 23rd St., N. Y.


## CHARLES ATLAS, Dept. 112,

115 East 23rd St., New York 10, N. Y.
Send me-absolutely FREE-your famous book, "Everlasting Health and Strength' - 32 pages, crammed with photos, answers to vital questions, valuable advice. I understand book is mine
to keep, and sending for it does not obligate me in any way.
Name $\qquad$
Address
(Please print or write plainly

## Whisk away even a 7 day beard WITH THE WHISKER ELECTRIC SHAVER

Precisiön-built,
with .002" thin blade that shaves all beards smoothly, closely.


## Whether you shave once a day,

 or once a week you'll like WhiskER Electric Shaver. Its clipper-like blade is designed for all beards, is definitely less irritating. 110 v AC model; no TV or radio interference. See your barber or dealer. If he cannot supply you, send $\$ 15.95$-we pay postage; or send $\$ 2$, you pay balance plus postage and COD. 10-day money-back guarantee.
## CADET ELECTRIC

## HAIR CLIPPER

The same fine quality clipper used and sold in many beauty shops. See your shop, or dealer. If you prefer, send $\$ 10.95-$ we pay postage; or $\$ 2$, you pay postman balance, postage and C.O.D. EIICTRO TOOL CORP., Depl W533.m.Racine, Wis.

## Paris Thminily thucks

and $d E P \mathrm{P}$

## JEEP TOPS and CURTAINS

 All Brand New . . . Not SurplusMade of Heavy Canvas Duck . . . Waterproof MILITARY TYPE models, Top and Curtains, complete, less bows.. $\qquad$ $\$ 59.50$ TOP and CURTAINS, HALF CAB . . . MODELS CJ2A and CJ3A, complete with hardware, less bows.
$\$ 65.00$
TOP and CURTAINS Complete, MODELS CJ2A and CJ3A. with hardware for entire Jeep,
$\$ 88.80$
When ordiering piease state exact model.

## JEP MOTORS MOUN <br> UNITED AUTO PARTS CO...世世 <br> 1901 TROOST•GR.1800•KANSAS CITY. MO.

## Men and Women Trained af Home For Prosperous Business In <br> 

Tools, Supplies, everything necessary to get started sent. Illustrated training shows how-progress rapidly. No previous experience necessary. Make over old furniture, sell for many times cost to you Establish full or part time money making business. Free booklet explains plan. Send name, address to

COMMERCIAL TRADES INSTITUTE
1400 Greenleaf, Dept. UI-12 Chicago 26. III.

## BUILD LUGGAGE AT HOME WE SELL YOUR PRODUCTS!

Only New Home Money-Making Plan in Years! Make Luggage and cases for traveling, photographers, musicians, salesmen, electronics, tools, portables, 1001 other items. Also repair Luggage. No special equipment needed. BIG Profits. We supply complete instructions-everything. Write for free details and Business Plan. ABARSI CASECRAFT Dept. C-5, 805 W . Sunset BIvd., Los Angeles 12, Calif.

## See Your House Before You Build $\$ / 95$ MOYT RUST Scale Kit

Make exact model on your plan. A few hours fun will prevent costly mistakes. Colors, finishes, furniture, appliances, instructions, patented clasps included in Kit M-43. Postpaid for $\$ 4.95$ with order. Or write for description.
HOYT RUST, 173 Marion Street, Denver 18, Colo.

## HYPNOTISM

Learn to apply this tremendous POWER. Develop will-power, self-confidence, self-control. ANYONE can master this exciting, profitable profession in short time by training at home, with Guaranteed Results. DON'T DELAY...Write to America's oldest Hypnotic School for free information now-today!

## INSTITUTE OF APPLIED HYPNOLOGY

 Dept. 212120 Central Park South, N. Y. 19, N. Y.
Please send me Free information:
NAME
ADDRESS
CITY.
STATE.
COUPON
AND
mail

"How to Succeed." 36 pages packed with worthwhile success tips. Step-by-step plan of action. Pocket size edition. Absolutely free. Send coupon below.
I.C.S.-the lifetime Christmas gift
I. C. S., Scranton 9, Penna.

## IMTERNATIONAL CORRESPONDENCE SGHOOLS

BOX 7666-N, SCRANTON 9, PENNA.

\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|c|}{Without cost or obligation, send me "HOW to SUCCEED" and the booklet about the course BEFORE which I have marked X:} <br>
\hline ART \& - Heating \& - Petroleum - Nat'l Gas \& $\square$ Electrical Drafting \& POWER <br>
\hline - Commercial Art \& $\square$ Painting Contractor \& $\square$ Pulp and Paper Making \& - Electric Power and Light \& $\square$ Combustion Engineering <br>
\hline Magazine Illustrating \& $\square$ Air Conditioning \& $\square$ Plastics \& $\square$ Lineman \& $\square$ Diesel-Electric <br>

\hline \begin{tabular}{l}

<br>
Fashion Illustrating Cartooning

 \& 

Electrician <br>
BUSINESS

 \& 

CIVIL, STRUCTURAL <br>
ENGINEERING
\end{tabular} \& $\underset{\square}{\text { HIGH SCH SChool Subjects }}$ \& Electric Light and Power

Stationary Steam Engineering <br>
\hline $\square$ Sketching and Painting \& - Business Administration \& $\square$ Civil Engineering \& $\square$ Mathematics \& $\square$ Stationary Fireman <br>
\hline Show Card and Sign Lettering \& $\square$ Certified Public Accountant \& Structural Engineering \& $\square$ Commercial \& RADIO TELEVISION <br>
\hline Automobile Mechanic \&  \& $\square$ Surveying and Mapping \& M GECHANI \& - Practical Radio-TV Eng'ring <br>
\hline Auto Elec. ${ }^{\text {a }}$ Achnician \& Stenography and Typing \& $\square_{\text {S }}$ Structural Drafting \& AND SHOP \& $\square \mathrm{Radio}$ Operating <br>
\hline $\square$ Auto Body Rebuilding \& $\square$ Secretarial \& $\square$ Reading \& $\square$ Mechanical Engineering \& Radio and TV Servicing <br>
\hline and Refinishing \& $\square$ Federal Tax \& $\square$ Construction Engineering \& $\square$ Industrial Engineering \& $\square$ Television-Technician <br>
\hline Diesel-Gas Engines \& $\square$ Business Correspondence \& $\square$ Sanitary Engineering \& $\square$ Industrial Supervision \& Electronics Work <br>
\hline Aeronautical Engineering Jr. \& $\square$ Personnel and Labor Relations \& DRAFTING \& Mechan ical Drafting \& RAILRO <br>
\hline Aircraft Engine Mechan \& $\square$ Advertising \& 俍t Drafting \& $\square$ Machine Design-Drafting \& Locomotive Engineer <br>
\hline $\square$ Airplane Drafting \& R Retail Business Management \& $\square$ Architectural Dratting \& $\square$ Machine Shop Practice \& Diesel Locomotive <br>

\hline | BUILDING |
| :--- |
| $\square$ Architecture | \& Managing Small Business \& $\square$ Electrical Drafting Mechanical Drafting \& Tool Design \& Air Brakes $\qquad$ Car Inspector Railroad Administration <br>

\hline Arch. Drafting \& $\square$ Sales Management \& $\square$ Structural Drafting \& Machine Shop Inspection \& TEXTILE <br>
\hline $\square$ Building Contractor \& $\square$ Short Story Writing \& Sheet Metar Drafting \& $\square$ Reading Blueprints \& - Textile Engineering <br>
\hline Estimating Carpenter and Mill W \& $\square$ Creative Salesmanship \& Mip Drafting \& $\square$ Toolmaking \& $\square$ Cotton, Rayon, Woolen Mfg. <br>
\hline Carpenter Foreman \& CHEMISTRY \& ECTRICAL \& - Gas-Electric Welding \& ing and Spinning <br>
\hline $\square$ Reading Blueprints \& $\square$ Chemical Engineering \& Electrical Engineering \& $\square$ Sheet Metal Work \& $\square$ Loom fixing Throwing <br>
\hline House Planning \& Chemistry \& - Electrician \& Sheet Meal Pattern Drafting \& Finishing and Dyeing <br>
\hline Plumbing \& $\square$ Analytical Chemistry \& \& \& Textile Designing <br>
\hline \multicolumn{2}{|l|}{Nam} \& \multicolumn{2}{|l|}{Age Home Address} \& <br>
\hline \multicolumn{5}{|c|}{ing Hours $\quad$ A.M. to P} <br>
\hline \multicolumn{2}{|l|}{\multirow[t]{2}{*}{Occupation}} \& \multicolumn{3}{|l|}{\multirow[t]{2}{*}{Canadian residents send coupon to International Correspondence Schools Canadian, Ltd., Montreal, Canada. . . . Special tuition rates to members of the U. S. Armed Forces.}} <br>
\hline \& \& \& \& <br>
\hline
\end{tabular}

## You'll be glad you gave the RCA Tape Recorder

年笑
No other gift gives more than the RCA Push-Button Tape Recorder. During the Christmas season-throughout the year-you'll use it again and again to remember family, friends, good times and important occasions. Try the easy, Push-Button action ... hear its true-to-life tone at your RCA Dealer's.

(®)
RADIO CORPORATION OF AMERICA

## "I'M MAKING MORE THAN \$1000 a Month

 Haven't Touched Bottom Yet!"-reports Charles Kama, Texas, one of
many who are "cleaning up" with orders
for PRESTO, Science's New Midget Miracle Fire Extinguisher. So can YOU!


Science's
New Midget Miracle "PRESTO"

AMAZING new kind of fire extinguisher. A Tiny "Presto" (about size of a flashlight!) does job of bulky extinguishers that cost 4 times as much, are 8 times as heavy. Ends fires fast as 2 seconds. Fits in palm of hand. Never corrodes. Guaranteed 20 years! Almost 2 million sold!

$$
\text { Sells for Only } \$ 3.98
$$

Show it to civil defense workers, owners of homes, cars, boats, farms, etc. and to stores for re-sale-make good income. H. J. Kerr reports $\$ 20$ a day. Wm. Wydallis, $\$ 15.20$ an hour. Write for FREE Sales Kit. No obligation. MERLITE INDUSTRIES, Inc., Dept. 1112, 201 East 16th St., New York 3, N. Y. IN CANADA: Mopa Co., Ltd., 371 Dowd St., Montreal 1, P.Q.
(If you want a regular Presto to use as a demonstrator, send $\$ 2.50$. Money back if you wish.)

## WRIST CIGARETTE LIGHTER

Fits wrist
like ofine
wotch double feature lighter arrangement. Beautiful high quality, imported, gleáming chrome finish wrist cigarette lighter, mounted on matching full wrist or 2-pc. expansion band. Just for GIFT Giving atach lighter on one side and your
 watch on the other side. Men and women owners marvel its perfect performance. Just press once and lid opens; press again and ... it lights - neter fails! Strikingly different and popular! Also unique for GIFT-giving! And, ONLY \$4.95 ppd., plus FREE miniature table lighter (shown). No C.O.D.'s. Money-back guarantee. Indicate chorice of band in order!

## MANSHOLT NOVELTIES <br> 2156 S. 40th St., San Diego. Calif.

## GET INTO ELECTRONICS

You can enter this uncrowded, interesting field. Defense expansion, new developments demand trained specialists. Study all phases radio \& electronics theory and practice: TV; FM; broadcasting; servicing; aviation, marine, police radio. 18 -month course. Graduates in demand by major companies. H. S. or equivalent required Begin Jan., March, June, Sept. Campus life. Write for catalog.

VALPARAISO TECHNICAL INSTITUTE
DEPT. 503
VALPARAISO, INDIANA
 all sought-after-sent FREE to secure names for our mailing list. We'll also include other interesting offers for your inspection-PLUS a FREE copy of our fascinating, "How to Collect Stamps." Supply limited, so rush name, address, and $10 c$ to help cover actual postage and handling costs. Address:
Littleton Stamp Co., Dept. 12-PS,Littleton, N.H.


## "What's he got that I haven'tgot?"

LOOK at the successful men you know. "What have they got" that you haven't?

Very little, probably. In most ways these men are no brighter or naturally more capable than average. Many of them probably have no more formal education or better natural aptitudes than you.

But that little extra they have is important. They have the special knowledge and ability for which business is glad to pay well-they know the what, why and how of business. They have also the con-
 fidence and aggressiveness which come from knowing that they know and can apply their knowledge.

You may add that extra-may get that same profitable knowledge and ability-that same confidence and aggressiveness-if you are willing to pay the price in earnest, necessary study. For LaSalle has spent over 40 years developing, testing and proving, with over a million student members, spare-time success training in certain specialized business fields. What scores of thousands of men and women-many just like you-have done, you should be able to do.

You need not leave your home or interrupt your job; you need pay comparatively little money. But you must be ambitious and willing to study seriously. And soon after you start training, the results will begin to show up in your own confidence and in your work. For what you learn at home tonight is so practical that often you can apply it on the job tomorrow.

How much do you want success-more money, a promotion or a new job, prestige and responsibility? If you really want it, you will use this coupon to find out what LaSalle training can do for you. It costs only a postage stamp, but a coupon like it has been the starting point to real success for scores of thousands-and can be for you.

## LASALLE EXTENSION UNIVERSITY A Correspondence Institution

 Dept. 1283-R - 417 S. Dearbern - Chicago 5, III.I want to know how LaSalle can help me win success in the field I have checked below. Please send me your free 48 -page booklet about that field and your success training in it-plus "Ten Years' Promotion in One," a book which has helped many men.

| Higher Accountaney | $\square$ Salesmanship |
| :--- | :--- |
| C.P.A. Coaching | $\square$ Traffic Management |
| Bookkeeping | $\square$ Foremanship |
| Law: LL.B. Degree | $\square$ Industr'l Management |
| Business Management | $\square$ Stenotypy |
|  |  |
|  | (Maehine Shorthand) |

Name. Age.......
$\qquad$

City, Zone and State...................................

# LASALLE <br> EXTENSION UNIVERSITY A Correspondence Institution 

[^1]

## VITALIZER

## A PROFESSIONAL TYPE ELECTRIC VIBRATOR

FOR USE IN THE HOME!
At last-a really fine Vibrator that's within the reach of everyone! Now you can enjoy the wonderful Swedish rotary-type massage that makes tired, aching muscles feel so good and is so good for you!

- Just slip VITALIZER over your hand; flexible spring straps, mounted on comfortable sponge rubber cushion adjust to fit any hand. Flick the handy on-off switch. Thousands of vital massage pulsations pass through your finger tips to arms, legs, body, scalp . . . help stimulate circulation, relieve fatigue, tone up muscles. - The pressure of your fingers determines the degree of massage . . . gentle or vigorous. VITALIZER is lightweight, beautifully designed, precision-engineered for years of service and enjoyment. Pleasant, easy to use and amazingly low in price for a quality massage instrument.
- Only $\$ 9.95$, plus 50 c insured postage and handling. AC only. 6' cord. Fully guaranteed, of course. Order now :


## HUGH CLAY PAULK

304 Kansas Ave.
Dept. S-10
Topeka, Kans.
 BENJAMIN AIR RIFLE CO., 852 Marion St., St. Louis 4, Mo., U.S.A.


7 Days Use of Practical Book "BASIC HOME CARPENTRY" Shows How to Save Money on 1,001 Jobs Around the House!
320 idea-filled pages and 500 show-how pictures. plans and diagrams make every carpentry job easy-from building a tool box o adding a new wing to your house. Over 175.000 copies sold Use it 7 days FREE. If delighted. remit only $\$ 1.95$ plus few cents postage. Or return the book and pay nothing. Send no money Just mail post card to WM. H. WISE \& CO.. Inc., Dept. 812 50 West 47 th Street. New York 36. N. Y.

## INVENTORS <br> IF YOU WISH TO PROTECT YOUR INVENTION, You should take steps to protect it by a U. S. Patent. Write me for <br> "INVENTION RECORD" FORM <br> CARLMDLLI <br> REGISTERED PATENT ATTORNEY

WOOLWORTH BLDG., 35th FLOOR, 123C
NEW YORK CITY


## INVENTDIRS

## Send for

PATENT INFORNATION
Book and
INVENTOR'S RECORD
without obligation
GUSTAVE MILLER
123-PS Warner Building Washington 4. D. C.

## REGISTERED PATENT

 ATTORNEYPATENT ATTORNEY \& ADVISOR U. S. NAVY DEPT. 1930-1947 ASSOCIATE EXAMINER U. S. PAT. OFF. 1922-1929 PATENT LAWYER

## INVENTORS

Whether an invention is patentable can be substantially determined by a search of the U. S. Patent records. Without obligation, write for information explaining the steps you should take to secure a patent.

## JOHN N. RANDOLPR <br> Registered Patent Attorney

205 Columbian Building
Washington 1, D. C.


The following are the usual preliminary steps to take toward patent protection.
Make a disclosure of your invention; sign, date and have this document witnessed by two or more people who understand your invention; authorize your registered patent attorney or agent to conduct a preliminary search among previously granted U. S. patents for similar types of invention; secure a report on the probable patentability of your invention and à recommendation of the further course to take.
We shall be glad to send you without obligation our instructive booklet, "Patent Protection for Inventors" and our "Evidence of Invention" disclosure form.

840-P MERLIN BUILDING, WASHINGTON 6, D.C.


## You Have NO MONTHLY PAYMENT CONTRACT

 to sign... you pay for your training as you learn and earn...ENROLL NOW! Be Ready in Little as 10 MONTHS! Now you can get into Radio-Television, today's fastest growing big money opportunity field, in months instead of years! My completely new "package unit" training plan prepares you to quatiry as a Radio-Television Technician in as short a time as 10 months, or even less! I offer you my training with no monthly payment contract to sign-thus NO RISK and NO OBLIGATION for you! This is America's finest, Includes most modern and really practical training. Includes FMy training gets you ready to handle any practical job in the booming Radio-Television industry. Start your own profitable Radio-Television Service Shop or accept a fine paying job. I have trained hundreds of successful Radio-Television technicians-and I can train you regardless of lack of previous experience. Mail coupon and get all the facts-FREE! VALUABLE EQUIPMENT INCLUDED WITH TRAINING Much of your Sprayberry Training is actual construction, demonstration and experimentation. You get priceless practical experience this way. You build the 6 tube sprayberry Short Wave and Broadcast Training Radio Receiver, the sprayberry Television set, multi-range test meter, signal generator, signal tracer, cathode ray oscilloscope and many other projects. All this equipment is yours to keep. You have practically every-
thing you need to set up your own profitable Radio-Television shop. All lessons and books I send you remain your own property. OUR 21st YEAR TRAINING MEN FOR RADIO-TELEVISION

## Earn Extra Money While You Learn

All your Sprayberry Training is given IN YOUR OWN HOME during your free time. Keep on with your present job and income while learning Radio-Television. With each Sprayberry "Package Training Unit", I include money-making plans and special Business Builders for spare time Radio-Television service money opportunity for men to install UHF antennas-I tell you how! If you expect to be in the Armed Forces later, there is no better preparation than Radio-Television. Mail coupon below . . . get facts FREE. No salesman will call.

FREF TO YOU 3 BIG RADIO-
TRL TELEVISION BOOKS

## I invite you to get all the facts-

 I want you to have ALL the facts-without cost! Rush coupon for my three big Radio-Television books! "How to Make new illustrated Television Bulletin new in an actual sample Sprayberry Lesson-ALL FREE. No obligation and no salesman will call. Mail coupon! SPRAYBERRY ACADEMY OF RADIO Dept. 55-D, 111 North Canal Street
## SPRAYBERRY ACADEMY OF RADIO <br> Dept.55-D, 111 N . Canat St., Chicago 6, HI.

Please rush to me all information on your 10 MONTH Padio-Tclevision Training Plan I understand this does not obligate me and no salesman will call. Include 3 books FREE.

Name.
Address
City . . . . . . . . . . . . . . . . . Zone. . . State
O Are you Experlenced? No Experience


## find Hidden Treasure ... and METAL

with The Model 100 Metal Detector


The Model 100 Metal Detector is available as factory-assembled, tested unit at $\$ 79.90$; in kit form, $\$ 39.90$. Kit includes step-bystep construction procedure illustrated by clear diagrams, tubes, batteries, transformer, headphones, coils and all other components; no drilling or machining required-nothing more to buy. Guaranteed order today. Prices f.o.b. Washington. Remit $25 \%$ with C.O.D. orders. Canadian orders add $5 \%$; send full payment to:
ELECTRONIC APPLICATIONS, Inc. Dept. M, P.O. Box 4975, Washington 8, D. C.

Litcrature on request

LOW OVERHEAL-LAKLK VOLUME SALES \& SMALL PROFITS WHAT GOOD IS A TIRE WITHOUT A TUBE?
TUBE GIVEN WITH EVERY TIRE AT NO EXTRA COST
20 YEARS AT THIS ADDRESS


An established Policy of Careful selection, assures you many happy miles. Be wise-try one-you'll buy our quality \& price!
WHY PAY MORE?
FALL SPECIALS-AT LOW PRICES
GOOD USED TIRES NOT RECAPS SEND THIS AD YOU GET WHAT WE ADVERTISE EVERYBODY $10 \%$ Off ONEVERY 20 MONTHS WRITTEN GUARANTEE
 ALL WHITE WALLS $\$ 1.00$ EXTRA Military Treads $750 \times 20 \$ 14.05$
Thousands of tires shipped all over U. S. A. All tires shipped F.O.B Phita Send Check or M.O. with

STAND ARD 834 N. Broad St., Philadelphia 30, Pa.

## Wafch Repairing Pays Big Money Learn af home

5 Watch repairers in great demand. Train step-by-step in 10 easy lessons. We furnish all tools and 15 jewel watch and practice movement. Turn spare time into cash. A licensed school. Low cost. Send for FREE book today.
ILLINOIS SCHOOL OF WATCH REPAIRING
2870 Elston Ave., Dept. PS123, Chicago 18, III.
 Other Crafts Complete supplies, everything you need
KIT KRAFT, Dept. 341373 Merrose Ave., Hollywood 46, Calif.


## START YOUR FUTURE TODAY!

## Get the facts on NATIONAL SCHOOLS' famous Shop-Method Home Training!



A BRIGHT FUTURE awaits you in booming Radio-TV industry. More than 100 million radio sets, 20 million TV sets, now in use! Backed by National Schools' famous ShopMethod Training from America's Radio-TV Capital you can command good wages in the opportunity-career of your choice-engineer, service-repair, inspector, designer - in radar, electronics - or your own profitable business! Make that bright future come true... start now! WE GIVE YOU COMPLETE PARTS, INCLUDING HIGH-MU TUBES! Yours to keep. You learn by doing, actually build generators,
 R-F oscillators, and this big Super-Het receiver! WE GIVE YOU THIS STANDARD PROFESSIONAL MULTITESTER! Locates trouble, adjusts delicate circuits-a valuable profit-earner
 for you when you become a qualified Radio-TV technician!

## LET NATIONAL SCHOOLS of Los Angeles, California, a Resident Technical Trade School for nearly half a century, train you at home for a high-paying future in these big-future industries. <br> Earn While You Learn!

Make extra money repairing friends' and neighbors' cars, trucks, radios, TV sets, appliances. Every step fully explained and illustrated in National Schools' famous "ShopTested" lessons. Latest equipment and techniques covered. You master all phasesstart part-time earnings after a few weeks!
YOU RECEIVE FRIENDLY GUIDANCE, both as a student and graduate. Our special Welfare Department is always at your service, to help you with technical and personal problems. You receive full benefit of our wide industry contacts and experience.
DRAFT AGE? National Schools training helps you get the service branch, and higher pay grade you want.

## APPROVED FOR G. I. TRAINING

These courses also offered in Spanish and Portuguese

## AUTOMOTIUE-DIESE1 <br> \& ALLIED MECHANICS

EXPANDING AUTO-DIESEL INDUSTRY needs more and more trained men! 55 million vehicles now operating, 6 million more this year-plus 150,000 new Diesel units! Garages, car dealers, transit lines, defense plants, manufacturers, are desperate for the kind of trained specialists produced by National Schools' "Shop-Method Home Training." Start now on the road to lifetime security. Mail the coupon today!
WE GIVE YOU THE TOOLS OF
YOUR TRADE! This fully-equipped, all-metal Tool Kit is yours to keep. We also give you a complete set of precision drawing
 instruments, and Slide Rule. These professional tools help you learn, then earn!

## NATIONAL SCHOOLS

Technical Trade Training Since 1905 LOS ANGELES 37, CALIFORNIA
In Canada: 811 West Hastings street da: 811 west Hastings
Vancouver 4, B. C.
Both Home Study and Resident Courses Offered

[^2]
## Enjoy New Driving Comfort with the Sensational <br> PNEUMATIC <br> SPRING BOOSTER

Front AIR LIFTS are specifically designed to give you new driving comfort. They dampen the suspansions, cushion the bumps and eliminate costly repairs.

You'll appreciate the ease with which you can drive the roughest roads and the severest turns with AIR LIFTS to steady your car.

For comfort, stability and safety install AIR LIFTS in your FRONT coil springs. To assist your rear springs $\dot{1}$. if you are carrying overloads REAR AIR LIFTS. Installation is simple nothing to dismantle. economical and guaranteed.


## What Kind Of A Man Are You?

Weak, frail, without energy and ambition? If you are undeveloped, run-down, with all sorts of complaints hindering you, whether a victim of physical excesses, overwork, worry, drugging, al-


STRONGFORT coholism, tobacco, over-stimulation or youthful errors, then it is high time for you to act.

## STRONGFORTISM

The world-renowned modern science has fulfilled its mission in America and Europe for hundred thousands of just such men and women, who adopted the principles of this real revelation and who found supreme health, strength and organic stability.

If you need such help, write for the enlightening booklet "PROMOTION AND CONSERVATION OF HEALTH, STRENGTH AND MENTAL ENERGY' today. Please enclose $\$ 1.00$ for expenses and immediate airmail reply to the

## LIONEL STRONGFORT INSTITUTE <br> MUNICH 50 - BAVARIA - DEPT. 6W <br> Germany, American Zone

$\left.\begin{array}{l}\text { U. S. Patents } \\ \text { No. } 2,351,906 \\ \text { No. } 2,461,872\end{array}\right\}$
Steel-Grip Finger Guards Lower Your Hand Protection Cost
Hundreds of factories save time and injuries by protect ing workers with Steel-Grip Open End Finger Guards. For handlingrough, sharparticles, buffing, grinding, sanding, punch press work, and hundreds of other jobs. Protect fingers or thumbs, front or back, from cuts, abrasions or blisters. Various designs in leathers and other materials; elastic web back for snug, cool, comfortable fit. Sizes for men and women. Send $10 \notin$ for sample. Catalog of Safety Apparel Free.
INDUSTRIAL GLOVES COMPANY A Corporation
1425 Garfield St., Danville, III. (In Canada, Safety Supply Co., Toronto)
FAMOUS INDUSTRIAL SAFEGUARDS SINCE 1910
 Dept. 1912D Pleasant Hill, Ohio
 WHOLESALE

## ELECTRIC GUITARS

HEARING AIDS
accordians, amplifiers, double-necks, triple-necks, pick-up mikes, mandolins, tripie-necks, pick-up mikes, mandolins, 1954 MODELSWHOLESALE FREECATALOG Specify Catalog, Musical Instruments or FREE home study course with instruARIN ments. No dealers. CARVIN CO. Box 28 Baldwin park, PS-12

LIVSTUDY AT HOME for Business Success and LARGER PERSONAL EARNINGS, 43 years expert instruction-over 114,000 students enrolled. LL.B. Degree awarded. All text material furnished. Easy payment plan. Send for FREE BOOK-"Law and Executive Guidance"-NOWI
AMERICAN EXTENSION SCHOOL OF LAW Dept. PS-69, 664 N. Michigan Ave., Chicago 11, Illinois


## ELECTRIC

 REFRIGERATORSWASHING MACHINES

VACUUM CLEANERS

ELECTRIC RANGES

MOTORS
SEWING MACHINES

TOASTERS
WAFFLE IRONS
MANGLES
HEATING PADS FREEZERS

ELECTRIC FANS ELECTRIC IRONS LAMPS

ETC., ETC.

TROUBLE DETECTOR (Checks shorts, wattage, continuity, etc.) is sent to all students

Sharpening Lawn Mowers. SPARE OR FULL TIME Mr. C. E. Hardy of Missouri says, "I am doing a fine business with the Universal Grinder. One Customer sends another. I spent 40 c for a newspaper
 $\$ 500$ worth of business." G.E. of Ark. says, "I have had my Universal Grinder 2 months and made a net profit of $\$ 227$.'

## ONLY ON THE NTEDCA LAWN RDNNED

can the inside face and edge of the stationary blade, as well as the reel blades, be ground to proper clearance ALL IN ONE SET-UP, without removing any blade from either hand or power mower. Send Today for Free Details. ROGERS MFG. CO. Dept. P-123 LINDSEY, OHIO

Learn this fascinating big money paying profession at home in your spare time. Learn by doing, by working with your hands building, testing, repairing electrical appliances of all kinds. Electrical appliance repairmen are needed everywhere-wherever electricity is used. You need no special previous training or experience. Age is no handicap. CHRISTY has trained over 33,000 men in all parts of the world. Men who today command big wages or own profitable businesses of their own.
pay later from earnings while learning
CHRISTY shows you how to make money while still learning, what to charge, how to set up your own shop, how to build power tools from spare parts, etc. It will pay you to write today.

CHRISTY TRADE SCHOOL, Dept. D. 3401
4432 N. Kedzie Ave.. Chicago 25. III.
Send me your FrEEE book on Electrical AppHance Repairing and specal form for "paying later from earnings made

CITY.
$\qquad$
$\qquad$

WTIE BIG WONET
 COUPON/ać FRFE BCOK


## * GET OX"UNCLE SAMS" PAYROL $*$ START AS HIGH AS $\$ 3,795.00$ A YEAR

MEN—WOMEN PREPARE NOW FOR 1954 EXAMINATIONS
Mail Clerks and Carriers, Rural Carriers, Stenogra-pher-Typists, Clerks, Messengers, and many others.
36-page book on Civil Service FREE

## Mail Coupon TODAY ACT NOW

FRANKLIN INSTITUTE (Not Government)
Dept. G-80, Rochester 4, $\mathbf{N}$. Y.
Sirs: Rush to me, without charge, copy of $36-$ page book. "How to Get a U. S. Government Job," list of positions, and full particulars telling how to qualify for them.

Name.
Street.........................................................................................................
City.

## No other book makes so many iobs so Easy

 INCLUDING ELECTRICAL WORK-silencing floor squeaks-chimney repairs-plumbingcarpentry. . . . In fact, Better Homes \& Gardens Handyman's Book shows you how to do 1600 jobs around your home.
INSTRUCTIONS ARE SO EASY that a beginner can follow them. And they're clarified even more by simple diagrams and photographs. Good results are assured!

## GUARANTEED TO SAVE $\$ \mathbf{\$}$

In plumbing bills! In carpenters' bills! In electricians' bills! We GUARANTEE the Handyman's Book will pay for itself within 6 months. Owners tell us we're too modest! On sale where books are sold, or order by mail. Only $\$ 3.95$. (Canada \$4.50.) Send coupon today.

## BETTER HOMES \& GARDENS,

409 Meredith Bldg., Des Moines 3; Iowa
Please send me the Handyman's Book. I enclose check $\square$ OR $\square$ money order for $\$ 3.95$. (Canada $\$ 4.50$.) If not entirely satisfied, I may return book in 10 days and my money will be refunded.
Name
Address
City
$\qquad$

## CASH IN ON <br> ROTO-SPLAY ROTATING DISPLAY - ELECTRICITY OPERATES WIIH $\bullet$ No Winding - No Wiring • No Win - No fire Hazard

## "GOLDMINE FOR MEN WHO CALL

 ON MERCHANTS"One of the fastest sellers ever to hit the for the So valuable Sears Roebuck bought Woolworth, Eastman Kodak. And no wonder! ROTO-SPLAY is a moving turntable that can be put in windows, on counters or shelves. No springs to get out of order. No cords or plugs, so it
can be put anyplace for displaying mercan be put anyplace for displaying mer-
chandise. Think of it-8 weeks of MOVING DISPLAY for the cost of two 10 c flashlight batteries. Most small merchants want two or three-big stores buy quantities at our low price! You can make $\$ 10$ to $\$ 15$ and up on every such sale. A fast working salesman should cell 30 to 40 a day! Merchants know So your sales are easy. Get the facts quick. Write at once and make a "clean-up" while you can be first. Facts are FREE. Send your name and address today-sure!

## MAXILUME COMPANY

125 W. hUBBARD St. dept. rs-912 Chicago 10, ILL.
only


Runs Night and Day for 5 to 8 Weeks on Two 10c Flashlight Batteries.

DIRECT-CURRENT WELDER BUY At AC-Transformer Welder Price! REGULAR VALUE $\$ 350.00$ Buv whotesali $\$ 85: 00$ Special Price Only 1 f.o.b. PAYS FOR ITSELF IMMEDIATELY! BRAND NEW! BELT DRIVEN! Ideal for field use where electricity isn't available. 1,001 uses on farm, in shop, 2800-3000 RPM off any convenient power source (tractor, etc.) WELDS, CUTS. BRAZES: steel; cast iron; bronze; aluminum; tool steels; stainless steels. COMPARE FEATURES. Welds straight or reverse polarity. Compact size. Special reactor-type series winding for EVEN arc. Rheostat for perfect pin-point heat control. Oversize ball bearings. 2-Groove v pulley. Output is 20 to 200 amps. (intermittent 250). Direct current makes arc striking and welding easier!
ACCESSORIES AT A BUY! Extra long $15-\mathrm{ft}$. welding and ground cables. Insulated ground clamp. 300 amp. electrode holder. Assorted
electrodes. Dual-lens Helmet. Simplified instructions. COMPLETE OUTFIT (shipping wt. 95 lbs .) only $\$ 98.50$ f.o.b.
FULL i-YEAR GUARANTEE. You can't go wrong. Send for our 10-DAY FREE TRIAL OFFER
Use it for 10 days. Be $100 \%$ satisfied or money back. FREE CATALOG of Welders, Motors, Electrical BUYS!
ROBERTS ELECTRIC CO., Dept. 110, 849 W. Grand, Chicago 22, III.


## LOW PRICE OF $\$ 4.95$

Order your revolutionary new "HIT" miniature camera today! Greatest value ever offered in a fine imported camera. Low price includes genuine pigskin carrying case, also roll of film.
Smaller than a matchbox! Precision made, easy to use. Additional films 30c per roll or six rolls for $\$ 1.50$. Develops beautiful $2^{\prime \prime} \times 2^{\prime \prime}$ prints. Ten exposures per roll. Wonderful Christmas gift for young and old.

Shipped C.O.D. plus postage charges. Write today to Hit Sales, P. O. Box No. 524, Maywood, illinois.

## FREE FOR ASTHMA

If you suffer with attacks of Asthma and choke and gasp for breath, if restful sleep is difficult because of the struggle to breathe, don't fail to send at once to the Frontier Asthma Company for a FREE trial of the FRONTIER ASTHMA MEDICINE, a preparation for temporary symptomatic relief of paroxysms of Bronchial Asthma. No matter where you live or whether you have faith in any medicine under the sun, send today for this free trial. It will cost you nothing. Frontier Asthma Co., 142-W Frontier Bldg. 462 Niagara St.

Buffalo 1, N. Y.


ILCUSTRATED
CARTOON BOOKLETS!
 - WII Twese smel llusmarie carTOON BOOKLETS Of COMNC CMAREGTES - 10, ALC OUFEREWT, II POSTPAID - sonetr yo rosin cap.'s! RETHNT



Build your own home and save the builders' profit - plus savings in lumber and labor with Sterling Ready-Cut-Homes. Anyone can assemble with simple, easy to follow plans furnished. Every house complete with all lumber, roofing, nails, glass, hardware, paint, doors and windows marked ready to erect. Freight paid. Complete building plans ready for filing at low cost. Sold separately if desired. Write today!
priced from \$2150 up
Five Easy Payment Plans
Send 25 c for NEW COLOR CATALOG INTERNATIONAL MILL AND TIMBER CO. DEPT. P.S. 123, BAY CITY, MICHIGAN

WRITTEN ALL TIME SERVICE GUARANTEE


WAS $\$ 50.00$

## under O.P.A. <br> OUR PRICE ONLY

Guaranteed Inca-Bloc, Shock-Protected Dampresist, Dust Resist construction. Anti-magnetic. Proved in Army, Air, and Navy service. Has sweep second hand radium dill genuine imported 17. jewel Swiss lever movement. You save sensationally on new de-luxe watches sold with WRITTEN ALL TIME SERVICE GUARANTEE, because we buy out distress and surcius stocks. Order

plus $\$ 1.50$ tax now. Wear 10 days. Money back if not delighted. Order men's style- $\$ 14.95$ plus $\$ 150$, $\$ 15.95$ plus $\$ 1.60$ tax. Send only $\$ 1$ down payment with der, pay balance on arrival. Or enclose full payment plus tax and we pay postage. Handsome expansion band included free if you order now. AIR MAIL XMAS DELIVERY GUARANTEED MEADE CO. Dept. 47, 175 FIFTH AVENUE NEW YÓRK 10, NEW YORK

## DRILL SAW

REAM CUT


## IDEAL AS A XMAS GIFT

DRILL, SAW, REAM . .. metal, pipe, wood, plastic, Tran site, etc. Use with any electric drill, slow drili press, lathe or milling machint. Drills own starting hole-upper part of bit is used to cut, saw or ream circles, ovals, squares, or scrolls. Easy to operate. Ideal for carpenters, mechanics, electricians, plumbers, hobbyists, many others. Abrasive resistant, high speed steel. Flutes ground from solid. Wil withstand severe continuous use without breaking. Resharpened at no charge. Takes place of up to $\$ 50$ in tools. $1 / 4^{\prime \prime}$ diameter, $2^{\prime \prime}$ cutting sections, total length $31 / 2^{\prime \prime}$. Available in three types-All Purpose. Wood. Heavy Metal. Specify type needed. Set of 3, \$1I.50. Details on request. Shipped same day. Money-back guarantee. Dealer inquiries invited. ORDER
NOW! SEND CASH, CHECK OR MONEY NOW! S

Manufactured and distributed by
INTERNATIONAL TWIST DRILL CORP.
618 Wyandotte, Rm. 690, Kansas City 5, Mo.



Establish your own profitable PHOTO-EN. GRAVING business. Make cuts for newspapers, printers, and advertisers. Make etched name plates, plaques etc. Instructions furnished, no experience necessary. Sold direct from factory since 1931. First five hundred cuts sold locally or by mail will pay for plant and pay you well for your time. Write for FREE catalog.

TASOPE DEPT. PS-12, AURORA, MO.

## FREECRAFT CATALOG



120 PAGES ... Craft Supplies, Tools, Designs, Instruction Books from America's Largest Most Complete Handcraft Stock.
Send for your free copy NOW !
GRIFFIN CRAFT SUPPLIES
5626-B Telegraph Ave. - Oakland 9, Calif.

## ANALYZE HANDWRIIING

MORE INCOME... MORE PRESTIGE AND MORE SUCCESS!
FASCINATING, uncrowded profession-business, full or spare time. Free illustrated lesson and yearbook shows how men and women in home and business find opportunity in analyzing handwriting. Understand People-Make Money. Free lesson and information about amazing opportunities if over 2 I.G.A.S., Inc., 900 Wilhoit Building, Springfield, Missouri


Men afflicted with Bladder Trouble, Getting Up Nights, Pains in Back, Hips, Legs, Nervousness, Dizziness, Physical Inability and General Impotency send for our amazing FREE BOOK that tells how you may correct these conditions and have new health and Zest in Life. Write today. No Obligation.
Excelsior Institute, Dept. B-5, Excelsior Springs. Mo.

verything Needed Complete To Put It Toqether In One Evening


Scientifically cor rect design for rest-
ful, healthful, relaxing. Adjusts for
reclining comfort. heart, nerves most popalar chair in the home. Fire-
stone foam rubber and washable, plicost $\$ 100$ or more in any store. Shipped all ready to put together in less than one evening by anyone who can use a screwdriver. No cutting, no drilling,
no skill needed. A woman can do it. Order now! Everything needed for only $\$ 34.95$, f.o.b. Balto. State color wanted: forest green, sapphire, blue lipstick red, walnut brown. Enclose $\$ 5$ deposit, pay balance on arrival Money back guarantee. If not satisfied, return in 10 days. Make Money Selling and Assembling Contour Chairs for Friends.

Bestecraft, Dept. 51, Mathieson Bldg., Baltimore 2, Md.
"l'll always be grateful to your training which helped me get my present fine position as Assistant tion
"Thanks to your training, I qualified for a good job as a Receiver Tester."
-Paul Frank Seier

"Your excellent instruction helped me get my present job as an airport radio mechanic "
echanic. and installing radio an and TV setsthanks to your Parts Manag - Norman Weston

# C. Lane, B.S. M.A 

President: Radio-Television Training Association Executive Director: Pierce School of Radio \& Television

ENOUCH EOUPWENT $T O$ SEI UP YOUR HOME LABORATOTY As part of your training, I give you ALL the above equipment you need and more to prepare for a BETTER PAY TV iob. You build and keep a professional GIANT SCREEN TV RECEIVER complete with big picture tube, takes any size up to 21 -inch ....also a Super-Het Radio Receiver. RF Signal Generator, Combination Voltmeter-Ammeter. Ohmmeter, C-W Telephone Transmitter, Public Address System, AC-DC Power Supply, Everything supplied including all tubes!
'MORE MONEY AND A CAREER Y, ARE WAITING FOR YOU HERE!

## EXPERT FM-TV TECHNTCIAN

## TRAINING! SAVE VALUABLE TIME!

 My FM-TV Technician Course can save you months of training if you have previous Armed Forces or civilian radio experience! Train at home with kits of parts, plus equipment to build BIG SCREEN TV RECEIVER, and FREE FCC Coach. ing Course! ALL FURNISHED AT NO EXTRA COST!
## FREE FCC COACHING COURSE! Im-

 portant for BETTER PAY JOBS re quiring. FCC License. You get this training AT HOME and AT NO EXTRA COST Top TV jobs go to FCC licensed technicians,GOOD SPAKE TIME EARNINGS! A1. most from the very start you can earn extra money while learning, repairing Radio-TV sets for friends and neighbors. Many of my students earn up to $\$ 25$ a week... pay their entire training from spare time earnings . . . start their own profitable service business. Act now!

## OPTIONAL: TWO WEEKS TRAINING

 IIN NEW YORK CITY AT NO EXTRA COST! You get two weeks, 50 hours, of intensive Laboratory work on modern electronic equipment at our associated school in New York City -Pierce School of Radio and Television. And 1 give you all this AT NO EXTRA COST whatsoever. after you finish your home study training in the Radio-FM-TV Technician course and FM-TV Technician Course.
## NEWI PRACTICAL TV CAMERAMAN

## 3 STUDIO COUESI

ing) I train you at home for ar men with as the man behind the TV camera. Work with TV stars in TV studios or "on location" at remote pick-ups! A special one-week course of practical work on TV studio equipment at Pierce School of Radio \& TV, our associate resident school in New York City, is offered upon your graduation

## MALL COUPON FOR 4 FREE ADDS!

 NO OBLIGATION WHATSOEVER!My schools fully approved to train veterans under new G.I. Bill! If discharged after June 27, 1950 - CHECK COUPON! Also approved for RESIDENT TRAINING in New York City at Pierce School of Radio and Television qualifies you for full subsistence allowance up to $\mathbf{\$ 1 6 0}$ per month. Write for details.

RADIO-TELEVISION TRAINING ASSOCIATION 52 EAST 19th STREET, NEW YORK 3, N. Y. Licensed by the State of New York Approved by the VA

## NO SALESMAN WILL CALI? <br> Mr. Leonard C. Lane, President <br> Dept. P-12A

 RADIO-TELEVISION TRAINING ASSOCIATION 52 East 19th Street, New York 3, N. Y.Dear Mr Lane: Mail me your NEW FREE BOOK, FREE SAMPLE LESSON. and FREE aids that will show me how
can make BIG MONEY IN TELEVISION. I
understand $I$ am can make boligation and no salesman will call. (please print plainly)

Name
ADDRESS
CITY $\qquad$ ZONE STATE
$\square$ Radio-FM-TV Technician Course
FM-TV Technician Course
TV Cameraman \& Studio Course

VETERANS: Check here for Training under NEW G.I. Bill



WITH AN EDUCATIONAL INSTITUTION
Courses in ARTS AND SCIENCES: Philosophy; Education: Letters; Public Health; Medical Jurisprudence: Psschology; Sociology: 1hysics; Chemistry; Geology; Pol. Science; Theology; Law; Business and Commerce: Accounting; Mathematics; Statistics; Agriculture. ENGINEERING: Electrical, Civil, Mechanical, Drafting, Architecural. Nteam. Diesel, Aeronautical. Radio, Structural, Mining, Indus-
irlal, Petroleum, Refrigeration, Chemical. Send for free catalog. McKinley-Roosevelt Incorporated, 4610-A3, Sheridan Rd., Chicago 40. Illinois


## ILLUSTRATED COMIC BOOKLEIS

THE KIND MEN LIKE! THE GIRLS LIKE IT TOO!! (VEST POCKET SIZE) They are loaded with rare cartoons. Full of Fun and Humor. 20 DIFFERENT booklets sent for \$1 in plain wrapper. No C.O.D. P.O.Box 89-K., Bklyn.29,N.Y.

## Broken or Loose FALSE PLATE?



Fix it Yourself EASILY in a Few Minutes
Your plates may become broken or loose just when you need them most. With FIX-IT-KIT you can repair your own broken plates. Also tightens loose fitting sional material. Complete instructions. Satisfaction guaranteed or your money refunded. Order Now at a Make Plates like New new low price only $\mathbf{\$ 2 . 9}$ postpaid - or sent C.O.D DENT-FIX DENTAL PRODUCTS, Dept. PS- 12 P.O. Box 674

Kansas City 8. Missouri

## Zuchenticart

## MINIATURE MODELS



# HOW TO FIX ANY PRROF AIMCCR 

 QUICKLY--EASILY-RIGHT!

W Hether you're a beginner
AUTOMATIC now you can "breeze through"
any "fix-it" job from simple carburetor adjustment to complete overhaul Just look up job in index of MOTOR'S Brand-New 1953 Auto Repair Manual. Follow simple step-by-step directions, clear pictures. Presto-the job is done!
No guesswork! MOTOR'S MANUAL takes you from "scratch" - shows WHERE to start, WHAT tools to use Covers EVERY job on EVERY car built from 1935 thru 1953!

## Everything You Need to Know "Boiled Down" from 189 Official Shop Manuals

NEW, REVISED, ENLARGED, 1953
dition contains the "meat", from over Edition contains the "meat" from over
189 OFFICIAL shop manuals - simplified for YOU, 37,000 essential repair specifications on 872 car models. Over 850 big pages. More than 2500 ' 'this-is-how'; pletures. 227,000 service and repair facts. Leads beginners every step procedures for experts. Instructions and pictures so clear you CAN'T go wrong. Used by U. S. Army and Navy.

## Try Book FREE 7 Days

SEND NO MONEY! Pay postman nothing. Make Manual show less you agree this is the greatest time and work saver you've ever seen-return book in ${ }^{7}$ days and pay nothing. Mall coupon Book Dept.,
250 Desk

Same FREE Offer On MOTOR's
Truck and Tractor Manual
Covers EVERY Job on
EVERY popular make
gasoline truck, tractor
made from 1939 thru
1953. FREE 7-Day
Trial. Check proper box
in coupon.
MOTOR'S
AUTO
REPAIR
MANUAL

Covers 872 Models All These Makes

Buick La Salle Cadillac Lincoln Chevrolet Mercury Chrysier Nash Crosley Nash De Soto Rambler Dodge Oldsmobile Ford Packard Frazer Plymouth Henry d Pontiac Hudson Studebake Kudson Terraplaner Lafayette Willys

## MAIL COUPON NOW FOR 7-DAY FREE TRIAL

MOTOR BOOK DEPT.
MOTOR BOOK DEPT.
Desk 212, 250 W. 55th St., New York 19, N. Y.
Desk 212, 250 W. 55th St., New York 19, N. Y.
Rush to me at once (check box opposite book you want):
Rush to me at once (check box opposite book you want):
MOTOR's Nev AUTO REPAIR MANUAL. If O.K., I will remit
MOTOR's Nev AUTO REPAIR MANUAL. If O.K., I will remit
$\square$
$\square$
(p)
(p)
pharn the book postpaid in 7 days month after that. Otherwise I will
pharn the book postpaid in 7 days month after that. Otherwise I will
with order,)
with order,)
$\square$
$\square$
MOTOR'S New TRUCK $\&$ TRACTOR REPAIR MANUAL If
MOTOR'S New TRUCK $\&$ TRACTOR REPAIR MANUAL If
$\square$ O.K., I will remit $\$ 2$ in 7 days, and $\$ 2$ monthly for 3 months,
$\square$ O.K., I will remit $\$ 2$ in 7 days, and $\$ 2$ monthly for 3 months,
turn book postpald in 7 days. (Foreign price, remit $\$ 10$ cash
turn book postpald in 7 days. (Foreign price, remit $\$ 10$ cash
with order.)
with order.)


Address ........................................................................................
Address ........................................................................................
City.
City.
Check box and save 35 c delivery charge by enclosing wir.
Check box and save 35 c delivery charge by enclosing wir.
Check box and save 35 c delivery charge by enclosing WITH
coupon entire payment of $\$ 5.95$ for Auto Repair Manual (or $\$ 8$
Check box and save 35 c delivery charge by enclosing WITH
coupon entire payment of $\$ 5.95$ for Auto Repair Manual (or $\$ 8$
1 for
1 for

## GivetheWorl

 the MIGHTY MIDGET SW-54 The whole world of radio from 540 kcs . to 30 mcs . in 4 bands - is yours to enjoy with this sleek, lowpriced beauty! Hear foreign stations, including Radio Moscow, ships, amateurs, aircraft, police! Receives voice or code. All this plus the standard broadcast band - your favorite programs with new power and clarity. 59.95
## the WORLD MASTER

AC-88 A truly professional communication receiver in every way. the World Master includes circuit refinements and features usually found only in receivers costing substantially more! It's the ideal choice for shortwave listeners, novices and experienced amateurs! Covers 540 kcs . to 40 mcs . in 4 bands. 129.95


## National

 and SHORTWAVE RECEIVERS Makers of U. S. Navy Receivers MALDEN, MASS.

2 wheel, 2 HP GEORGE Garden

Tractor, Briggs or Clinton Engine

| SEND TODAY |
| :---: |
| Write for free |
| copy of illustrat- |
| ed Georgegarden |
| tool folder. See |
| how a George |
| garden tractor |
| can do every out- |
| door chore. |
| George Garden Tool Dir. |
| Box PS- 12 |
| Sullivan, Illinois | Your George garden tractor is a multi-purpose, year-round work saver. In price, it compares with a power mower. In use, the George garden tractor is incomparable. Complete range of attachments for tilling gardens... mowing lawns . . . cutting weeds ... removing snow. A George tractor is ideal for every purse and purpose.

## MAKE D YOUR <br> BUSINESS

## ON THE SIDE OF THE LAW!

Help fight crime! . . . Earn steady good pay as a Finger Print Expert or Investigator. I.A.S. trains you-by easy, low-cost home study lessons. Learn this exciting work in spare time. Write for full details now!

## OVER 800 POLICE BUREAUS...

Employ I.A.S.-trained men . . . proof of what I.A.S. can do. Write today (state age) for details. No obligation. No salesmen will call.
INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave., Dept. 1369 Chicago 40, Illinois

 AUTOMATIC BOOSTER COOLER
Fuel Economizer \& Decarbonizer. Burns water, saves gas, increases cooling. Filters cooling system, cleans carbon and gives more speed d power. Fits any car or truck. No mechanic needed to instafl.
A. B. C. RADIATOR CO. 401 S. central ave Balto., 2, Md.
Build your own JET ENGINE!


Order these plans today 1. JET PROPELLED BICYCLEE. Assemble
 2. HOW TO MAKE EXPERIMENTAL JET ENGGNES. Seven sheets drawings with in
formation and instuetions $\$ .95 \mathrm{~g}$. SEND NO MONEY. Order both at onice $\$ 3.75$ C.O.D. in USA plus c.o.d. postage. Send chece or Money Order and we pay post.
age, Get other information too Rush oder J. HOUSTON MAUPIN, Dept. 66, Tipp City, Ohio



## $\left.\begin{array}{l}\text { SEE HOW } \\ \text { EASY IT IS } \\ \text { Step by Step! }\end{array}\right)$

Be an Artist! Draw \& Paint for Money (and fun!)
Prepare at home to become a well-paid professional artist -or a well-trained hobbyist. Our 39th year-thousands of successful graduates. Write for Talent Test and illustrated booklet, "Art for Pleasure \& Profit." Both FREE. No salesmen will call.
Studio 1312K, WASHINGTON SCHOOL OF WASHINGTON 5. D.C.

New! 2 in 1 Combination! Pocket-Size
50 POWER MICROSCOPE
 Useful Telescope and Microscope combined in one amaz-
ing, precision instrument, Imported! No larger than a ing, precision instrument. Imported! No larger than a
fountain pen. Telescope is 10 Power. Microscope magni-
fies 50 Times. Sharp focus at any range. Handy for sports, fooking at rare objects, just plain snooping. Wonderful Xmas gift. Send check or M.O. Satisfaction $\begin{aligned} & \text { Guaranteed! } \\ & \text { Order Stock }\end{aligned}=30,059 \cdot \mathrm{~N}$.
.$\$ 4.50$ ppd. GET FREE CATALOG $\pm \mathbf{N}$-World's largest variety of Optical items, Bargains galore . Welescones, Hurplus Spectroscopes. Prisms, Lenses. Reticles, Mirrors and Sozens of other hard-to-get Optical items. Ask for
dozen SCIENTIFIC CORP., Barrington, N. J.

## 2 OR 4 WHEAL DRIVE FOR JEEPS IN SECONDS


gives AMAZING NEW WARN HUB gives your t-wheel dirive Willys 2wneel pep,
nower. speed. atra mileare. pascenter performance-as well as t-wheel power and traction! thange from 2 heel to twheel or i, ack in seconds by turning lingertip control on habs. Warn hubs reduce wear on front axle as-
sembly and front tircs. eliminate shimmy, increase gas mileage up to 6 miles per gal. Unconditional Money Back guarantee. $\$ 65.00$ pair prepaid. ALicO AV '11, 1BLE: Warn Standard Hub for Willys \$20.00 pr.u Dodge \$2,.00 pr. and Warn Antomatic Hub for Willys RIVERTON Box 6064-B3 WRN MFG. CO. Seattle 88, Wash.

## GTOPS FOGGY WINDSHIEITIS F.5 NTEW Chemical Mill <br> Amazing Discovery! Autoists wild over new FOG-STOP Windshield chemically-treated Mitt-at once glass sparkles chemically-treated Mitt-at once glass sparkles crystal clear. Blurry mist, frost, sleet, snow disappear like magic. Stops fogging. Sells like wild! SAMPLES FOR AGENTS $\begin{gathered}\text { Sample offer sent im- } \\ \text { median } \\ \text { to }\end{gathered}$ send name at once. Hurry. Postcard will do. SEND NO MONEY-just vour name. KRISTEE CO.. Dept. 7i5. AKRON, 8, OHIO


 - Major in Power or Electronics - Earn B. S. Degree in $\mathbf{3 6}$ months Over $50 \%$ of the nation's industrial leaders began their careers with engineering training. Today, the demand for young, trained Electrical Engineers and Technicians is constantly expanding. Eight separate programs give you a wide range of career opportunities.

## Plan Your Career From these <br> Courses in Electrical Technology <br> ENGINEERING COURSES <br> Electrical Engineering - Bachelor of Science Degree <br> Save a valuable year through optional year 'round study. <br> Electronics major ................................................ 36 months Power major ................ <br> Electro Technician ............................................. 12 months Electronics Technician ......................................... 12 months Radio Technician ....................................................................... 12 months Radio and Television Technician ...................... 18 months SERVICE COURSES <br> Electrical Service ................................................. 6 months Radio and Television Service ............................. 12 months

## Terms open January,

 March, June, October Approved for veterans. Prior Military, Practical or Academic training evaluated for advanced credit. Faculty of specialists. 50,000 former students. Annual enrollment fom 48 states and 23 overseas countries. 50th year. Non-profit.MECHANICAL TECHNOLOGY COURSES - Also available, Service Technician courses 6 to 18 months - Heating, Refrigeration, Welding, Air Conditioning and Mechanical - Mechanical Engineering with a major in Design, Metal Fabrication or Plant Engineering.
Also, general 3 -month preparatory course.

Residence courses only. Send Coupon for facts.

## * Nivi定 MILMAUKEE SCHOOL OF ENGINEERING

MILWAUKEE SCHOOL OF ENGINEERING Dept. PS-1253, 1025 N. Milwaukee Milwaukee 1, Wisconsin
Send: "Your Career" Booklet


1 cm interested in
name of course
Vame $\qquad$
Address
City
$\qquad$

If veteran, indicate date of discharge

## WHEREVER YOU GO

## take along the <br> Johnson Reed <br> USE IT ON ANY ROD OF YOUR CHOICE FOR TROUBLE FREE SPINNING CASTING OR FLY FISHING <br> For you men who know mechanical <br> 

 perfection when you see it. From the moment you make your first cast - you're in for a treat. Beginner or expert, you'll find the NEW Johnson 80 the one, all purpose reel. "Nylatron" Drag for smooth action . . . "Change-Easy" Spools for quick line changes . . . true spinning action eliminates line twist.

FREE . . write for folder on Johnson Reels, Model 80, 60, 40a, 20 -all price ranges. DENISON-JOHNSON SALES CORP., MANKATO 5, MINN.

tells how ambitious men and women since 1890 have been preparing at home in spare time for the practice of law by studying the famous Blackstone bar-training course. All needed instruction material is furnished including big 16-volume law library. Law diploma awarded. Moderate
tuition; easy monthly terms. Write for FREE book today
BLACKSTONE SCHOOL OF LAW
225 N. Michigan Ave., Dept. 129 Chicago 1, lilinois


## Oीज KEEPS COLD OUT SAVES FUEL

It's the perfect weatnerstripping. Cordlike and pliable, Mortite goes on in a jiffy, without tools or tacks. Anyone-even Juniorcan press it in place around windows, doors, transoms, baseboards. Comes off easily in spring. Hundreds of other plugger-upper uses the year around. 3 packages- 29 c contains enough for 1 window; 98 c for 4. $\$ 1.25$ for 5 or 6 windows. Higher west of Rockies and Canada. Get Mortite at stores or write for circular.
J. W. MORTELL CO.

534 Burch St.. Kankakee, III.

Ball-Bearing
SPEED WHEELS
JUVENILE WHEELS ino bearing;


(Semi-pneumatic tire, ball bearing) $\begin{aligned} & 8 \times 1.25 \\ & 8 \times 1.75\end{aligned} \ldots \$ 1.85 \quad 10 \times 1.25 \ldots \$ 2.20$ $8 \times 2 \ldots 2.2010 \times 2.00 \cdots 2.65$ INDUSTRIAL WHEEL
ug Base, Semi-Pneumatic tire

| $6 \times 2$ SW | \$3.45 | $10 \times 2.00$ | \$6.10 |
| :---: | :---: | :---: | :---: |
| $6 \times 2.00$ | 4.00 | $10 \times 2.75$ | 5.15 |
| $8 \times 2.00$ | 5.20 | $12 \times 2.00$ | 6.90 |
| $8 \times 2.50$ | 5.40 | $12 \times 3.00$ | 9.20 |

Smooth Base, Pneumatic tire and tube $8 \times 3.00 . \$ 11.00 \quad 12 \times 4.00 . \$ 12.10$ $\begin{array}{rrrr}10 \times 2.75 & 6.80 & 4.00 \times 8 & 13.10 \\ 10 \times 3.50 & 10.55 & 14 \times 4.50 & 13.40\end{array}$ $10 \times 3.50,10.5514 \times 4.50,13.40$ Avaitable Now - CASTERS
rite for circulars on all wheels Write ior circulars on all wheels.
Prices F.O.B. our plant. JIM BROWN TOY COMPANY 1095 HOME AVENUE PS-1053 AKRON 10, OHIO

| MAKE | 17 | OURSELF! |
| :---: | :---: | :---: |
| $\qquad$ |  |  |


|  |
| :---: |
|  |  |
|  |  |
|  |  |



MILLIONS USED YEARLY! up to 20,000 eggs yearly. Nation-wide markets waiting for all you can ship. Men \&
Women get ready now for next spawn Small pond starts you. New book tells how! Send for my, illustrated FREE folder
P- ALBERT BROEL- 11
P. O. Box 506 New Orleans 12, La.

## MEW FALSE PLATE

FROM YOUR
OLD ONE IN 18 HOURS

## as low as $\$ 1495$

Send us your old broken, cracked or loose plates and we'II transform them into new lightweight wonder plastic plates. NO TMPRESSIONS needed with our revolutionary method. We use your own old plates. We remake them completely in only 18 hours. Missing teeth carefully matched and replaced. We GUARANTEE TO SATISEY YOU OR REFUND YOUR MONEY.
SEND NO MONEY-Send us your name today and we'll RUSE COMPLETE DETAILS. Begin to enjoy life right now. Clip this Ad: save it and send for free facts.
CHICAGO DENTAL PLATE LABORATORY - Dept.PS-12)
30 N. Dearborn St. . Suite 807 . Chicago 2. III.


In
 Ille Now YOU can get in on the unlimited opportunities and big pay open to skilled draftsmen. You take no risk! Cleveland Engineering Institute will train you quickly to fill industrys growing, desperate need. You will be privately tutored by a licensed professional engineer. C.E.I. guarantees to train you until you qualify. Thousands have succeeded with a C.E.I. diploma. So can YOU: Two courses to choose from: Mechanical or Aeronautical. Get full information at once! No obligation. No salesman will call. Just write your name and addresson a 2c postcard and mail it today!
 book

## TELEPHONES

## Desk Stand style

Slightly used and in excellent condition. Many Valuable Uses-

Inter-house phones Loud Speakers Microphones
Educational purposes Toys, etc.


Postpaid in U.S.A.

Come complete, ready to use
Wiring Diagrams Furnished
Please add 75c each shipping and handling costs.
MICROPHONE
Dept. X-504
1760 W. Lunt Ave., Chicago 26, III.


HE-MAN VOICE!
STRENGTHEN your voice this tested scienprove the POWER of your speaking and singing voice. in the privacy of your own room! Self-training lessons, mostly silent. No FREE BODK Write TODAY for Eugene *How to Develop a Successful Vreat booke, It's absolutely FREE! You must state your age Booklet mailed postpaid in plain wrapper, No sales. man will call. Send your name and age RI 210 s. Cilnton St. Studio MX-1 Chicago 6, III.


LEARN LOCKSMITHING
Learn this fascinating, profitable trade from experts in your spare time at homel Age or physical handicap no disadvantage. Year tical. illustrated lessons. You can make money even while learning! All materials and special tools supplied without extra charge

LOCKSMITHING INSTITUTE, Dent. PS-48
15 PARK AVENUE
RUTHERFORD, N.
Lic. by N.J. State Board of Education

## KIDNEYS MUST REMOVE EXCESS WASTE

Nagging backache, loss of pep and energy, headaches and dizziness may be due to slowdown of kidney function. Doctors say good kidney function is very important to good health. When some everyday condition, such as stress and strain, causes this important function to slow down, many folks suffer nagging backache-feel miserable. Minor bladder irritations due to cold or wrong diet may cause getting up nights or frequent passages.

Don't neglect your kidneys if these conditions bother you. Try Doan's Pills-a mild diuretic. Used successfully by millions for over 50 years. It's amazing how many times Doan's give happy relief from these discomforts-help the 15 miles of kidney tubes andfilters flushout waste. GetDoan's Pills today!

## mins Auto Meghances WANT TO KNOW <br> 1664

This Big Practical Book gives full information with working diagrams covering the principles, construction, igni- tion, service and repair of modern cars, trucks and buses.
Diesel Engines, Hydramatic \& Fluid Drives Fully Explained. A complete Guide of 1800 pages, with over 1500 illustrations show. ing inside views of working parts, with instructions for service jobs.

IT PAYS TO KNOW
How to flt plstons-How to locate engine knocks. How to fit connect-bearings-Howtoservicemain bear--How to recondition valves-How to cime valves-How to adjust fan beltsHow to adjust carburetors and chokes. How to rebulld a clutch-Ilow to service automatic transmis-sions-How to service brakes-How to adjust steering gear-How to cope with ignition troubles-How to service distributors-How to time igni-tion-How to "tune up" an engine.


COMPLETE - PAY \$1 A MO. TO GET THIS ASSISTANCE FOR YOURSELF SIMPLYFILL IN AND MAIL COUPON TODAY.


Step up your own skill with the facts and figures of your trade. Audels Mechanics Guides contain Practical Inside Trade Information in a dorsed. Check the bot Send No Money. Nothing to pay postman.


[^3]Prepared for You by Famous Staff of Popular Science Automotive Experts!
This completely up-to-date manual was written and edited by some of the nation's leading automotive authorities. So practical is the valuable advice crowding the pages of this book that it's like having a dozen skilled mechanics at your constant beck and call!
They edited this book just for YOU, the non-pro. fessional. so that you can keep your car in better shape for a longer time in the critical car-shortage. labor-shortage days now upon us! They've poured their hard-earned years of knowledge and experience into this exciting book to help you beat car-trouble at home and on the road!
Now you'll find it easy to put new life, longer life into your car-
whether you own a Model T vintage " jalopy " or a "hot-off-the-assem.
bly-line" job. You get 2 wealth of easy-to-follow text and step-by-step
pictures that save you big money! SAVE $\$ 14$ to $\$ 30$ by repairing
dented fenders; SAVE up to $\$ 200$ by reupholstering your car for cost
of materials alone; SAVE $\$ 50$ to $\$ 75$ by doing your own professional-
looking paint job; SAVE up to $\$ 125$ locating, preventing, correcting
ring troubles! Learn everything you must know about your car and its
parts-valves, brakes, mufflers, lights, tires, rings, fuel, batteries, and
ever so much more!
Book will more chan pay for isself on your very first job!

## Avoid Disappointment! Mail Coupon NOW!

## POPULAR SCIENCE PUBLISHING CO., DEPT. 1253

 353 Fourth Avenue, New York 10, New YorkYes, without obligation, please send me big new auto book, "HOW TO TAKE CARE OF YOUR CAR." When book arrives, I'll pay postman only $\$ 2.49$ plus a few cents postage. If not more than delighted, I'll return it within 7 days and receive prompt refund.
SAVE MORE! Send full remittance now and we'll stand all packing, shipping and insurance costs. Same refund guarantee!

## NAME.

ADDRESS
CITY..................................ZONE.......STATE.
Check here to see DeLuxe Edition, bound in lifetime Buckram, title stamped in gold. Only 50c extra. Same refund terms!

## SUCCESS • BIG PAY in truiation MASTER A\&E MECHANICS urgently needed

Maximum training in minimum time! Thorough practical instruction backed by more than 25 years of aviation technical experience. Training authorized under G.I. Bill.

Write today! Illustrated Catalog Registrar, Dept. 91, Miami 30, Florida

TRAIN IN MIAMI .- AIR CAPITAL OF THE WORLD

| MAKE <br> MONEY Selling <br> ESHELMAN <br> Power Mowers <br> Riding Tractors <br> \& Rotary Tillers |  |
| :---: | :---: |

## $\$ 750$ BUILDS 4 ROOMS \& BATHI!

 WHY PAY RENT? For soove Hundrod Fitty为 Dollars and 30 days of your spare time, you can build ourself this Beautiful Home. $9 \times 11$. Back bedroom 10x12. Kitehen $9 \times 11$, Bath $\overline{5 x 8}$, Hall $3 \times 4$. Wind outsteel casement windows. Concrete block:stuecoed. Step-by-step illustrated in: stuccoed. Step-by-step illustrated in-
structions, blueprintand material itst. stuctions, pmueprint and material Mst. antee. Economy Home, Box 645 .
Dept. D . Columbus 16 . Ohio

## DON'T BE CAUGHT WITH A DEAD BATTERY

Amazing "New Life" battery rejuvenator stops build-up of plate sulfates . . . keeps battery automatically charged. Use lights, heater, radio, as much as you like, Get faster starting! Greater power! RECHARGING IS UNNECESSARY! Only one treatment needed! Money back guarantee. Rush $\$ 1.00$ to:

- Il188 Castieton Rd., Cleveland 21, 0 HiO

| MODER TRAMSPAREMT 001 <br> Genuine Dupont NEW FALSE P | $\begin{aligned} & \text { Tastic } \\ & \text { ATE } \end{aligned}$ |
| :---: | :---: |
|  <br> From Your Old, Loose Plate NO IMPRESSION NEEDED New, revolutionary Duplication System actually transforms your oid loose, cracked, chipped plate into a new, natural-pink Dupont Plastic Plate with same teeth or new, natural matchet |  |
| SEND NO MONEY - just your name and address for FREE details. Save at our low price! Highest prices pald for Dental Gold. ALL-STATE DENTAL LABORATORIES, 22 w . Madison, Dept. 371 , Chicago 2. | 30-DAY MONEY. BACK TRIAL |

## Wheels <br> Wheels <br> (0)

7" Disc Wheel 3/'" Tire 3 "

7" Disc Wheel $11 / \mathbf{s}^{\prime \prime}$ Tire $1 / 2^{\prime \prime}$ sleeve. 8"' Disc wheel $^{\prime \prime} 11 / 8^{\prime \prime}$ Tire $1 / 2^{\prime \prime}$ ball bearing


 $12^{\prime \prime}$ Disc Wheel 1.75 semi-pneum. Tire $1 / 2^{\prime \prime}$ B.B....... $\$ 3.50$ ea. Above wheel prices includes hub cap. Plus Postage. C.O.D.'s accented. AXLES-Sizes $5 / 16$ in., $3 / 8$ in., $1 / 2$ in.-Cut to size-End hole drilled. UNITED WHEEL STAMPING CO.
12131 S. PEORIA STREET PSI2 CHICAGO 43, ILLINOIS

## thousands now play

## who never thought they could!



WOULDN'T TAKE \$1000 FOR COURSE
"The lessons are so simple that anyone can understand them. I have learned to play more than a month. I wouldn't take a thousand dollars for my sand dollars for my Kansas City, Mo.

PLAYS AT DANCES
'The Piano course I'm taking is the 3rd course with your school. Previously I took Saxophone and Clarinet. Since then 1 ve played ${ }^{\text {a }}$ E. lot of dance jobs." Iowa.


## PLAYS ON RADIO

'I can't keep from telling you that I have a good position playing from KTHS, Hot Springs, Ark., every morning."* J.S., Okla.

## You, too, can play any instrument by this EASY A-B-C METHOD

YOU think it's difficult to learn music? That's what thou$Y_{\text {sands of others have thought! Just like you, they longed }}$ to play some instrument. But they denied themselves the pleasure-because they thought it took months and years of tedious study to learn.

And then they made an amazing discovery! They learned about a wonderful way to learn music at home-without a private teacher-without tedious study-and in a surprisingly short time. They wrote to the U. S. School of Music about this remarkable short cut method. A free LessonSample actually showed them how easy it was to learn.

The result? Over 900,000 people have studied music at home this simple, A-B-C way. They have found the key to good times, popularity and profit.
And that's what you can do right now. Simply mail the coupon. Get the proof that you, too, can learn to play your favorite instrument -quickly, easily, in spare time at home. Just read the fascinating illustrated booklet-examine the print and picture sample. Tear out the coupon now, before you turn the page. Instruments supplied when needed, cash or credit. U. S. SCHOOL OF MUSIC, Studio CI512 Port Washington, N. Y. 55th Successful year. (Established 1898.) *Actual names on request. Pictures by professional models.

## FREE! Book and Lesson-Sample

U. S. SCHOOL OF MUSIC,

Studio C1512, Port Washington, N. Y.
Send me Free Book and free Lesson-Sample. No salesman is to call upon me. I'm interested in playing (name instrument) $\square I$ do $\square \dot{I}$ do NOT-have an instrument now.
■ $\qquad$
$\square$
(please print)
Address .



## MAIL NOW FOR FREE BOOK! -

I UTILITIES ENGINEERING INSTITUTE, Dept.DM-28
$\mathbf{2 5 2 1}$ Sheffield Ave., Chicago 14, ill.
O. K.! Rush, without obligation, FREE Book on DIESEL
| NAME
ADDRESS
CITY $\qquad$ ZONE $\qquad$ STATE
$\square$ Check here for information if under 17.

## MIRACLE POWER

## in Gas and Oil Every 1,000 Miles Stops Dry Starting Damage

## IJNLIMITED OPPORTUNTTIESIN ENGINEERING DEGREE

IN 27 MONTHS
sauay cing.neering in this world-famed school. Established 1884. Demand for our graduates exceeds supply. Approved for Korean-Vets.
Bachelor of Science Degree in Mechanical, Civil, Electrical, Chemical, Aeronautical, Radio (Television) Engineering Business Administration and Accounting. Also-36 weeks certificate courses in Surveying and Drafting.
Personalized Instruction. Accelerated courses. Non-essentials eliminated. For ambitious, earnest students. Earn your degree in the shortest possible time. Preparatory courses. Placement service.
Extensive Campus. Well equipped, new and modernized -uildings: up-to-date labs. Low cost. New terms start quar-
:erly. Enter January, March, June, September.

Mail Coupon Today
TRI-STATE COLLEGE
5123 College Avenue, Angola, Indiana
Please send me free catatog and special information. I am particularly interested in courses as checked: $\square$ mechanical Civil Electical Short Diploma Courses
Name.
Address

## कीटEFAFy you <br> NEW LOW PRICE!



SEWING MACHINE 1 Year
guarante

Buy direct from manufacturer and save! Kit comes fully wired, installed a jiffy. Fits all machines! You PARTS

- Motor \& Bracket
- Multi-speed foot con-
- Crord set $\&$ block
- Card set \& block
- Steel pulley \& belt FREE . . reg. $\$ 2.95$ chrome SEWLITE given with every kit.

IO DAY FREE TRIAL-ORDER NOW: Send no money, pay COD or send money order and we'l pay postage. Please state whether wheel on your machine toward you or away from you. Shipping wt. 6 lbs. SENIOR SEWING MACHINE CO.

Brooklyn 6, N. Y.

## ALPHABET PATTERNS



MULTI-PURPOSE Alphabet Patternsnumerous craft uses. 14 distinctive al-phabets-numerals-monograms. Over 500 individual patterns, $1 / 2^{\prime \prime}$ to $4^{\prime \prime}$ high. Only $\$ 1.00$ Postpaid.
WALKER STUDIO, Dept. AS, 4343 Lindell, St. Louis 8, Mo.


If you suffer from the miseries of itching, bleeding or protruding piles, you may have a generous supply of Page's Palliative Pile Preparations absolutely free for the asking. They have relieved pile suffering in hundreds and thousands of cases for more than 50 years.
FREE Trial supply to quickly prove all this, will be sent absolutely free and with no obligation to buy now or later. Send name and address for free trial TODAY : E. R. PAGE CO. Dept. 45A1, Marshall, Mich.



## FRET 100 FOREIGN STAMPS <br> All genuine, unpicked, unsorted - just as re- ceived from Europe. Asia, Africa, Near East, Far ceived from Europe. Asia, Africa, Near East, Far East - from everywhere! Plus a beautiful souve- nir of World's Rarest Stamp and our valuable ''Stamp Collector's Guide". Other valuable offers also included for your FREE inspection! <br> Send 10c for postage and handling to 12

DRAINS Cellars, Laundry Tubs; CIRCULATES Oil; IRRIGATES Gardens
Original "Type P" Pump has 2400 GPH capacity. 360 GPH 75' high, or 1500 GPH from $25^{\prime}$ well. Use any $1 / 8$ to $1 / 2$ HP motor. DOES NOT CLOG. Only $\$ 6.95$ postpaid if cash with or(West of Mississippi, add 50c.) MONEY BACK GUARANTEE:
Also Gear pumps in all sizes.
 ABAWCO PUMPS, BELLE MEAD 3, N included

with 4 courses-low factory prices 50 lb , set.... $\$ 8.48$ | 150 lb. set.... $\$ 20.48$ 100 lb. set.... 13.98 200 lb. set.... 25.98 Write fer Order by Mall; $50 \%$ with order, bal, C.O.D. DAN LURIE BARBELL CO. 1701-S-12 Pitkin Ave., Dept. 370-M, Brookiyn, N. Y.


Tandy Rivets quickly and permanently fasten Leather, Cloth, Plastic, etc. Ideal for odd jobs you never thought you could do. Send for FREE Card of 8 Rivets and 64 -page Catalog. Enclose 10c for shipping. NATIONWIDE - A TANDY STORE NEAR YOU Fandy p.o. BOX 791-HG, Ft. Worth, Tex.

# This year...be sure you get the famous MILE-0-METER! 

Let your family know that
you want the famous Mile. you want the famous Mile-
O-Meter this Christmas! Thousands of men did just that last year. and were "surprised" with the valuable and useful gift they wanted most! You'll join them in saving money every mile you drive it's what you need to get more miles per gallon, avoid highway breakdowns, and insure top engine performance. Simple to install on the dash of any car-no holes to drill-
 all directions and fittings included.
The chrome and black Mile-O-Meter actually pays for itself over and over again . . . tell your family today!
 FRENCH SPANISH GERMAN RUSSIAN JAPANESE ITALIAN .NORWEGIAN
any of 29 languages available
A Linguaphone Language Set is a lasting gift-an invaluable asset in business, travel. school, armed services and social lite. With LINGUAPHONE you LISTEN and LEARN another language the same easy, natural way you learned your own-AT HOME you hear native men and women make everyday conversationyou Understand-YOU SPEAK! It's like living in another country. Over a million home-study students of all ages. There's nothing like "The Gift of Language." Write TODAY for FREE Book. Passport to a New Wordd of Opportunity. Linguaphone Institute, 147-12 Mezz., Rockefeller Plaza, New York 20 .



## INTERNATIONAL BINOCULAR COMPANY, Dept. 7-N-90

 352 FOURTH AVENUE, NEW YORK 10, N. Y.
## SHORTHAND in

Famous Speedwriting Shorthand. 120 wpm. No symbols; no machines; use ABC's. Easiest to learn; write and transcribe. Low cost. 200,000 taught by mail. For business and Civil Service. Typing available. 31st year.


## Write for FREE booklet to: <br> Speedwniting

## this

 fits ALL popularfarm \& industrial
gasoline engines fits ALL popular
farm \& industrial
gasoline engines fits ALL popular
farm \& industrial
gasoline engines
$\square$ GOVERNOR


## . $\sqrt[3]{3}$ LONG RANGE

## Universal Governor - Instant variable speed selection and accuONLY

 rate engine control at any speed setting within 1200 to 2600 RPM. Higher and lower ranges obtainable by simple change of pulley. Also "constant speed" operation.
## $\$$ <br> 5150

- Accurate, dependable speed control for engines operating corn shellers, drag lines, hoists. arc welders, trucks and tractors with power take-offs, etc.

Write for Complete Information
Pulley extra
Send Check or
Money Order. State Make Model of engine.
DEALERSHIPS
AVAILABLE
"World's Most
Experienced Governor Manufacturer"

THE P/ERCE GOVERNOR CO., Inc. 1654 Ohio Avenue, Box 1000 Anderson, Indiana, U. S. A.

$\underset{\substack{\text { Why be a lonely, unpopular wall-fower? } \\ \text { LEARN }}}{\text { Li }}$ Why be all the smart dances from the most modern to the old favorites-at home, in private without teacher, music or partner. So simple even a child can learn quickly. Tap dance ing, Waltz, Collegiate, Samba, Rhumba, Jitterbug and many Also, delightful old square dances with illustrations for $\$ 1.00$. Get each Separate or both for $\$ 1,98$. If you order both take your choice of FREE-DREAM BOOK or LOVE LETTERS. C.O.D, orders 25c extra and Postage. paid or C.O.D. plus shipping charges. State size, large or said or
ROLLDEX, P. O. Box 516, Dept. D-85, Safety Harbor, Fla.



## HE-MAN PHYSIQUE

Thousands now enioy results from this dynamic new system. Common Sense shows you the way to a powerful, more attractive body. . in an amazingly short time. Write for FREE illustrated brochure.
JOHNSON HEALTH STUDIOS, Dept. M-I 22 E. Van Buren St., Chicago 5, III.

with the AMAZING NEW - PROVEN RELIABLE and SAFE SELECT-A-CHARGE - WATTAGE REGULATOR WITH SAFE E-Z ADJUSTABLE CHARGE BOOSTER SWITCH * A new secret electrical circuit formula, Stops Burning and Sticking of contacts. These regulators give years of trouble free service. Stop the horror of driving with a half dead battery. - Increase or double your battery charge and life. - Hot Hi-Volt spark for smooth sure-fire ignition - Get more charge from your small generator safely. - Get big battery performance from a low cost batteny - Brighter lights - Safer driving - E Z Starting DEALERS WANTED - Big Profits Write how you can have a demonstrator freel SCIENTIFIC ELECTRIC CO. - BOX 2162-B - CLEVELAND 8, OHIO

## LEARN MEAT CUTTING <br> AT NATIONAL Pay After Graduation



The steady dependable trade of Meat Cutting taught easily in 8 short weeks. You LEARN BY DOING under actual meat market conditions in big modern school at Toledo.
For beginners or men with experience. Get a Profitable store of your own. Remember, PEOPLE MUST EAT! Big pay jobs. Free employment help. Thousands of successful graduates.
Buying, cutting, percentage, pricing, advertising, selling, etc. A complete retail meat education. National School established over 25 years. Get National training NOW. Pay your tuition in easy weekly payments
after you graduate. Get all the facts. Send coupon for FREE 52 page school catalog-TODAY. G.I. Approved.

```
National School of Meat Cutting, Inc.
Dept. \(51-\mathrm{Y}\), Toledo 4, Ohio
Send me your FREE school catalog on National Training
Toledo in Meat Cutting, Meat Merchandising and Self Service
Meats. No obligation. No saiesman will call.
Name. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Age. . . . . . . |
Address . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
City . . . . . . . . . . . . . . . . . . . State.
    Approved for training Korean Veterans
```

Some from 3 ft . to 4 ft . Easy to make GIANT CIRCUS ANIMALS-in structions included. $31 / 2 \mathrm{ft}$. Giraffe, a yard full of $12^{\prime \prime}$ kittens. Make a big SANTA CLAUS, a set of REINDEER, Seal, Kangaroo. FREE with $\$ 4.00$ orcer a balloon squawker. FREE with $\$ 6.00$ order 50 plastic toys. "A Complete Rodeo." Add 10 c for postage.

## 52 PARTY BALLOONS $\$ 700$ <br> In assorted colors \& sizes.

50 PLASTIC TOYS $5{ }^{00}$



$\bullet$ Goes wherever your car goes - Folds compactly © Keeps rain, dust, salt air, sun away © Protects your car's finish © Durabiy constructed of vinyl plastic that is long wearing and
tough enylon threads for extra security © Springtite elasticized bottom, holds securely in all kinds of weather. Fits all makes and models - Machinery, equipment, furniture, stock piles, etc Direct from manufacturer Enclose check or money order for $\$ 6.95$ or $\$ 8.95$ plus $\mathbf{3 5 c}$ postage, or sent C.0.D. 10-Day Money Back Guarantee.

MARDO SALES CORP., Dept. G-607, 480 Lexington Ave., New York 17, N. Y.

## BECOME AN EXPERT IN <br> 

Traffic men earn $\$ 4,000$ to $\$ 10,000$ and up. Thousands of firms need oxperts on rates, tariffs, regulations. We train you thoroly in spare suthorities. Placement counsel and help. Write for free, 48-page book 'Traffic Management - the Fast Growing Profession.
LASALLE Extension University, 417 So. Dearborn St. A Correspondence Institution Dept. 1283T Chicago 5, III.


## TRAINED MEN NEEDED BIG PAY-GOOD FUTURE $\square$ TELEVISION DIESEL ELECTRONICS AUTO

WHY WORK FOR LOW PAY or risk being out of a job??? Usually the properly trained man has a steady job ... through good times or bad. Even back during DEPRESSION there was a big demand for Bailey Trained men.
In only $51 / 2$ to 6 months we can train YOU to enter one of the big pay fields!
No previous experience or special education necessary. With our method of training you do not spend years pouring over books, figures, charts and graphs. You learn by rebuilding, repairing, testing and operating the most modern equipment, under the guidance of experienced, courteous and friendly instructors. This method of training gives you the experience and confidence required to step right into the big pay jobs without spending years as a mechanic's helper.
It's EASIER and COSTS LESS than you may think to get this residence shop training. . . we help you find part-time jobs while in school-full-time jobs after graduation. Check subject above in which you are interested and mail for complete information.

## BAILEY Technical SCHOOLS

## 1624 S. Grand <br> Veteran Approved

NAME St. Louis 4, Mo

STREET
TOWN $\qquad$

SAVE MOMEY • SAVE FUEL • BE WARMER STORM WINDOWS of genuine DuPont cellulose acetate

- CLEAR AS GLASS

No cloudy vinyl plastic effect-but as transparent as the windows if covers.

## - INSTALL IN



## MINUTES . . . FROM INSIDE

Scissors and Scotch tape are all you need. No climbing ladders for outside installation! No marring of window sills with tacks. Simply tape on . . . as easy as mending a page

- PERMITS AIRING OF ROOMS
 Just lift off tape when open window is desired . . . Replace when window is closed.


## $100 \%$ AIRTIGHT - Used by the U.S. Gov't. Fit

 any window. Roll size $3^{\prime \prime} \times 288^{\prime \prime}$. Sheets easily taped together to cover wider windows. Completely waterproof. . . Instructions furnished. They'll pay for themselves many times over in fuel savings alone. Fill in and mail the coupon TODAY.
## SEND NO <br> MONEY!

Pay Postman YOUR MONEY BACK IN FULL IF RETURN-

ED IN 10 DAYS
T. C. TOR;
Levittown, Pa., Dept. D S-123

GENTLEMEN: Please ship immediately ( rolls (ea. roll 36 " $x$ $288^{\prime \prime}$ ) - at $\$ 6$. per. roll of TOR Plastic Storm Windows . . .ea. roli enough for five average size storm windows - with instructions.
( ) will pay postman $\$$
plus few cents postal collection fee. ( ) Am enclosing payment herewith (saving collection cost)
Name
Address
City

Proted your home aqaindt pover interuptions with an ...

## ONAN Emerperay ELECTRIC PLANT

Provides dependable standby electricity for heating system, pumps, freezer, lights. appliances. Keeps home safe livable. Automatic start and stop. Find out how little it costs! zundis fot Folden!

A SIZE FOR EVERY NEED 1,000 to 50,000 watts. Compact, quiet-running, easy to install. Gasoline engine powered.

## D. W. ONAN \& SONS, INC.

6758 University Ave. S. E.
Minneapolis 14, Minnesota


STOP
RADIO \& TV NOISES INSTANTLY! NEWELECTRONIC
Bell-Tronic line filter eliminates noisy Interference Simply plug radio or TV cord into filter and filter into wall socket Enjoy Bell Clear reception. Send \$1 ppd. No C.O.D. Try 5 days. Money back guarantee.

TUBE WHOLESALERS CO.
Box 364, Dept. PS-2, Rockville Centre, N. Y.


MAKE UP TO \$5 AN HOUR WITH



## 8 FEET OF CARS!

 End-to-end these cars, No Con CARS $\$$ trucks, trolleys, plane Fifty true 3-dimensional colorful plastic scale models. Order Now!YOUNG PRODUCTS, Dept. 50772605 Elmhurst. Detroit 6 , Mich

## $\$ 2600$ MORE A YEAR

in your spare time laundering venetian blinds. Start at home. Expand to full time. Others making over \$1000 a month! Small investment for new portable machine. Send for Free booklet today. No salesman will call.

VENETIAN BLIND LAUNDRY EQUIPMENT CO., INC. 442 N. SENECA DEPT. 12-T WICHITA, KANSAS

## MAME MONEY IN YOUR OWN DIAStíS

Want to earn extra money-make your own Christmas gifts of professional-looking accessories? Perhaps you've never realized it before, but any hobbyist can do it who has use of the average home shop equipment. And now you can buy raw materials direct tubing. A whole new wondrous world of enjoyment awaits you Immediate dellvery. Write now for price list.
PHIPPS \& BIRD, INC., P. O. Box 2V, Richmond 5, Va.



Save on everything in TV and RADIO

Everything for Experimenters, Builders, Amateurs, Servicemen, Engineers and Soundmen Send for allied's big 268 page value-packed buying guide to everything in TV and Radio! Largest selections of custom TV chassis, TV accessories, FM and AM radios, High-Fidelity Sound, Amateur supplies, P.A. Systems, recorders, test instruments, builders' kits, industrial electronic suppliesplus the world's largest stocks of electronic parts, tubes, tools and books. Get everything-get more for your money - send today for your free 1954 allied Catalog.

NEW HOME OF ALLIED RADIO


| SEND FOR |
| :---: |
| FREE CATALOG |

ultra modern facilities TO SERVE YOU BEST

## ALLIED RADIO

ALLIED RADIO CORP., Dept. 7-M-3
100 N. Wesfern Ave., Chicago 80, Illinois
$\square$ Rush FREE 1954 ALLIED 268-Page Catalog
Name-
Address
City

## PAY LESS on repairs GET MORE from yourtiv set

You can easily identify trouble, and often fix it yourself; you can increase the clarity of your set with the help of

## Mandl's TV Servicing

A HAND CHART shows you where the trouble is when you have "snow," streaks, bad focus, double image or any other flaws in picture or sound. Just run down the trouble column, then turn to the text pages giving detciled, illustrated servicing directions for your particular trouble.

## SAVE NEEDLESS EXPENSE

You'll find that you can save many service costs; learn simple, easy-to-make adjustments to improve your set. Thousands of servicemen use this famous book because it is so easy to follow, so thorough and complete.


## See it on FREE trial

[^4]
## NEW Crosman for Christmas <br> At dealers everywhere

Rifled barrel, . 22 cal., highpowered air pistol for in-door-outdoor target shooting. WRITE FOR CATALOG

CROSMAN ARMS CO., Dept. 46, Fairport, N. Y.


The business of applying Colorcrete is a community enterprise, with special appeal to men of limited capital. Equipment is compact, simple to operate, practically wear-proof. Work is easy, interesting and rich in profit potentials. Broad opportunities for development. We supply all equipment and full instructions.
No experience or special ability needed. Write or wire today for the Opportunity Book. COLORCRETE
INDUSTRIES, INC. 572 Ottawa Ave. Holland, Mich.


50 POPULAR SCIENCE


EYE GLASSES by MAIL As low as s19.
WRITE for FREE CATALOG with 14 IENS SAMPLE CARD
Thousands of
Customers
Est. 1939


QUALITY READING-MAGNIFYING OR BIFOCAL. GLASSES FOR FAR AND NEAR ADVANCE SPECTACLE COMPANY. Inc. 537 S. Dearborn St., Dept. SP-12 Chicago 5, Illinois

## RUPTURED?

## Get Relief This Proven Way

No leg-straps or cutting belts. Automatic adjustable pad follows every body movement with instant increased support in case of strain. Cannot slip. Light., Wear in bath. Send for FREE book, "Advice To Ruptured" and liberal 60-day trial offer. [Our 83rd Successful Year 1
CLUTHE SONS, Dept. 34, Bloomfield, New Jersey


## FULL COLOR - LIFE SIZE

 (5 FOOT TALL) MARIIYN monroe PIN-UPTHE BEST GIFT-GAG EVER-Big as life-twice as natural - lovely Marilyn Monroe, beautifully reproduced 5 feet tail from a full color Kodachrome. The only LIFE SIZE pift-up print. Pin it on the wall or closet door. A perfect opener for the man with a den, bar or playroom. An eye62 inches high. $211 /$ inches wide. Only $\$ 2.00$ ppd. Send cash. che $k$ or M.O. Money back if not fully satisfied. PIN-UPS, Dept. SC12-3, Box 86 , Boston, Mass.

complete
\$29.75
Dept. PS-12, 7007 Haas Ave., Los Angeles 47, Callf.

## TREASURE -- $\$ \mathbf{1 0 , 0 0 0}$ <br> New locator detects metals, valuable min erals and buried treasure. Moneyback guarantee of superiority. <br> Also geiger counters. Govt. reward of $\$ 10,000$ for uranium discovery. Write for FREE information. <br> THE GOLDAR COMpany <br> 1544 W. GLENOAKS BLVD. GLENDALE 1 . CALIF

## \$2.95 EACH OR 2 FOR \$5.00!

II
Genuine Telephone Company Upright telephone complete with cord in Tested and Guaranteed condition. For intercommunication or extension. Complete line of telephones and parts, inter-communication systems, switchboards, handsets, magneto and dial telephones, etc. Write for free list. C.O.D. orders accepted. All shipments F.O.B.
TELEPHONE ENGINEERING CO.
DEPT. A-A




Capt. Lewis L. Millett usa


Lt. Col. R. R. Myers usmc


Pfc. H. A. Cafferata, Jr. usmer


T/Sit. R. S. Kevnemore Usmc


Lt. Thomas Hedner, Jr. USN


M/Sgt. Harold E. Wilson USMCR

In all. 104 men have won the Medal of Honor in Korea. The men here stand as representatives of them-and of all the service men and women to whose devotion we in America owe our security this Christmas of 19.53 .


## Peace... their Christmas Wish for us!

These are some of the bravest men on earth. Yet these young holders of the Medal of Honor were never fighters for the love of fighting. They are men of war with a dream of peace.
They want a world in which small wide eyes can gaze in rapture at a tinselled tree. Where a happy Christmas is a child's inalienable right-because fear and force have at last given way to peace and law and goodwill. They have fought ably for peace, with courage "above and beyond the call of duty." Can we, at home, do something for it, too?
Yes. Beginning now, each of us who earns can put some part of his earnings into United States Defense Bonds. For by these Bonds we make our own families secure. first of all. Then. out of the security of our families, we build the strength of Americato stay at peace in a world where peace still is only for the strong.
You can invest in Defense Bonds best through the Payroll Savings Plan where you work or the Bond-A-Month Plan where you bank. Won't you begin-today?


## U-BUILD-IT tunter for <br> SPORT OR HOME FROM \$399

A size for every need from $14^{\circ}$ up. High strength steel prefabricated chassis and frame work. Factory made parts. No experience necessary. Kit of tools with electric drill furnished. Send $25 ¢$ for sample plan and literature.
MIDWEST METAL PRODUCTS, P. O. Box 272
Elkhart, Indiana

U.S. citizens have equal rights with oil companies seeking oil on public land. Without leaving home you can file for U.S. oil leases in oil states like California. Wyoming. Colorado, New Mexico, Utah, Montana. Some have profited as high as $\$ 250,000$ for $\$ 250 ; \$ 11,000$ monthly for $\$ 200$ by filing, letting others develop. Send for free booklet.

## CALIFORNIA LEASE CO.

7075-PS Hollywood Blvd.
Los Angeles 28, Calif.


## - 4 NIGHTS AT HOME!

LaSalle's famous Law Library - used as reference in many Law libraries and Law officeshas enabled thousands to master Law surprisingly fast, in spare hours at home, for business and professional advancement.
These 14 remarkable volumes, compiled by leading professors and lawyers, cover the whole basic field of Law in condensed, orderly, simplified manner.

You advance rapidly with this great library, plus special lectures furnished. We guide you step-by-step with personalized Problem Method of instruction . . . you learn by doing-handling legal problems-not by memorizing rules.
Send for two FREE 48-page booklets, "Law Training for Leadership," and "Evidence," answering questions about Law and its value to you, and telling how LaSalle Law graduates are winning rapid advancement in business and public life. Mail coupon below. No obligation.

## LA SALLE EXTENSION UNIVERSITY A Correspondence Institution

417 S. Dearborn St. Dept. 1283L Chicago 5, III.
Send me your two FREE booklets described above, without obligation.

Sirel
Citv. Zone \& State


RICHIEDISTRIBUTING, INC. 11916 Madison Ave., Dept. B12 Cleveland 7, Ohio

The perfect, lasting gift for any motorist!


Swivel mounted on the windshield molding, this engine analyzer and driving gauge tells how to get more miles per gallon-top engine performance, as you drive! Motor Minder gives a constant, accurate check on valves, carburetor, spark plugs, piston rings, timing, etc. Installation is simple and quick! Dial is illuminated for night driving.

Get it at your dealer's. If he cannot supply you, send us his name and address with your check or money order for $\$ 10.95$. Motor Minder will be sent prepaid!

Pays for itself Only \$ (1) $\$ 5$ In Gay Holiday in a hurry! Gift Wrap !

## 

Instrument Div., Dept. P-123, 1840 Diversey Pky., Chicago 14, III.


Start a NEW BUSINESS!
or Add to your present Repair Business
SHARPEN DULL PIPE WRENCHES
PIPE TAPS \& DIES "GUM" CIRCULAR SAWS Write for Information
J. C. MOORE INDUSTRIES Box 5 276, Fredonia. Pa.

## (TAMT51.MR DEGREE IN 27 MONTHS

## Big Demand for Graduates

AERONAUTICAL, CHEMICAL, CIVIL, ELECTRICAL, MECHANICAL and RADIO ENGINEERING (inc. TV and Electronics). Hundreds of young men are earning B.S. ENGINEERING DEGREES annua ly in this recognized institution-year around op part of their college expenses in this large industrial center

Low tuition. Competent instruction. Thorough, intense, pracLical program. Modern, well-equipped laboratories including new physics laboratory and modern wind tunnel. Individualized
instruction emphasized.

Students from approver for G.I.'s. Engineering preparatory courses, ber, March, June, Septemb 21 foreign countries. Enter Decemand full information. Enroll now.

## INDIANA TECHNICAL COLLEGE

6123 E. Washington Boulevard
Fort Wayne 2, Indiana
Please send me free information on B. S. Engineering degree in $\mathbf{2 7}$ months as checked.

$$
\square \text { Aeronautical, } \square \text { Chemical, } \square \text { Civil, }
$$

$\square$ Electrical, $\square$ Mechanical, $\square$ Radio-Television.
Name.
Address


TOP QUALITY AT ROCK-BOTTOM PRICES! Stamped steel wheels at savings up to $20 \mathrm{C}_{\mathrm{C}}$-rust-resistant and built for rugged to $20 \%$-rust-resistant and buice. Semi-pneumatic tires, heavy red service. Semi-pneumatic tires, heavy red
enameled finish; ball bearings for $11 / 2^{\prime \prime}$ axle diam. (O.E.M. inquiries invited.)


Order Now.-- Send cash, check, or m.o., pay
ROTARY WHEEL CO.
Dept. S-12, 710 E. 12th St., Kansas City, Mo.


## PISTOL Sketchbook

Accuráte, Authentic Hand Drawings of guns in some of thes of guns and accessories available 300 detailed sketches of guns and accessories available tion of over 400 pistols from 15 th to 20 th Century. All main proof marks. Visual dictionary of pistol terminology and their historical evolution. This collector's own sketchbook of Pistols now avail- $\$ 2.50$
able to you for the VERY FIRST TIME. I. LISTER, Suite 400-B, 1015 Chestnut St., Phila. 7, Pa.
 RELIEF...OR YOUR MONEY BACK Write now for free booklet and pictures of rupture care. You can be helped... work steady, with low cost, easy to wear Web Truss, thousands satisfied
Dept. PS-12, Hagerstown, Maryland
 back guarantee. We pay postage. Get yours now. As A Microscope
CRITERION CO. 331 CHURCH ST.
DEPT. PSB 16 HARTFORD 3, CONN

## MEN-WOMENRAISE

Successful Home Grower Show you how
Louis Schirmer, successful home grower, shows you step-by-step how he and Mrs. Schirmer started with a few plants at home, developed a big-profit business, and grew an Orchid collection now worth a fortune. Learn how Orchids multiply - how one plant may become many, each as valuable as the first. No big investment. No overhead. Takes few minutes a week. Bigprofit orders come from individuals, florists, hotels, clubs, etc. Popular year-round gift. Millions sold by Mail-Order. Schirmer shows you how!

## PLANTS AND INSTRUCTIONS <br> Send for NO-RISK Examination!

secrets of the experts Directionssecrets of the experts... in simple

Georgeous Orchids like this in your own home!
how" drawings, gorgeous full-color pictures of Orchids. Also real blooming-size Orchid plants from the Schirmer's own Gardens. Everything you need to start is yours to examinine at home, without risk. Free-full details. Learn how you may become an Orchid Grower. Send no money! Write today. Airmail is quickest.
HOME GROWERS COAST TO COAST Benefit from Schirmers' Help!
"A uonderful course, uritten so anyone can understand it" -J. G., Mich. "I can sell all the Orchids I can produce" -M. H., Idaho
"Am very proud of my course and plants. . Our florist says be will buy my Orchids"
-R. P., Arkansas
MAПL COUPON NOWZ SEND NO MONEY...
TROPICAL FLOWERLAND, Dept. 2C 4622 Wilshire Blvd., Los Angeles 5, Colif.

## ELECTRIC SHEAR SHARPENER



Over 90,000 Sold-It Must Be Good
Genuine Carborundum wheel ideal for shop or
home use. Send remit. home use. Send remit. tance with order and shiponce, prepaid to your door. complete with electrical goods catalogue.

## POWERFUL PALM-SIZE RADIO

HEARING AID BATTERY POWERED
A mighty miniature of ELECTRONIC VALUE. GUARANTEED PERFORMANCE. Enjoy private listening pleasure at home, office, camp. Detroit Scoutmaster writes, "Wired kit easily. It's sensational .; really pulls them in". POWERFUL LOW DRAIN, HIGH GAIN SENSITIVE CIRCUIT receives standard broadcast signals up to 1100 miles.


> F6.75 instructions
> Assembled $\$ 8.95$

ALNICO MAGNET EAR SET, \$1.45. Midget batteries, | $\$ 1.50$ per set. POSTPAID. $\$ 1.00$ deposit on COD orders. All parts FULLY GUARANTEED.
PRECISION ELECTRONICS, DEPT. J placerville, calif.


## Quit being a BAG of BONES

 Weakling like I Was $\rightarrow$
## IN © MINUTES OF

YOU Can DO ALL I did!
I gained 25 Terrific Lbs. of HANDSOME POWER-PACKED MUSCLES all over!
I Improved My HE-MAN Looks 1000\%
I Won NEW STRENGTH-POPULARITY NO! I don't care how skinny of flabby you are. I'll make you OVER by the SAME method I turned myself from a wreck to the strongest of the strong. DEVELOP YOUR 520 MUSCLES.
YES! You'll see INCHES of From head to heels you'll gain SIZE, POWER, SPEED. How You CaM Wir a $15^{\prime \prime}$ TALL SHVE年 1 ivet did robay


 neme
noones
eITr


DECEMBER 1953
 IMPERIAL SALES CO.
114 East 47 th Street, Dept. MK-17, New York 17, N.Y.

## The SPEEDY STITCHER

Sews quick and strong, making new or repairing boots. shoes. coats, gloves, belts, saddles, golf bags, Ski, Football, Baseball. Skating, Hunting, Fishing, Camping togs, grain
hags, burlap, etc.


handizes Each stitcher comes ready to use with a reel of needles, assorted handle. A handy tool for carried in on hunting, fishing or camping or IYMAN BRADFORD $\$ 1.00$ LYMAN BRADFORD CO. Box No. 350 KINGSTON, MASS.

## NEW PANITPEN

PAINT STRIPING TOOL Works like a Fountain Pen Stripes with Paint instead of Ink! This amazing new "PAINT PEN" is a Paint striping on furniture, bikes, model planes, autos, signs, toys, linoleum, wall board etc. straight, curved, circular or evenly spaced par allel lines the same way a professional painter with. Simply fill Tubular Glass Paint Fountain with any color paint and wheel tip feeds paint for easy cleaning. Tool complete with tip for cumplete tools with 1-64, 1-32, 3-64. Other $1-4$ in tiplete KIT with 7 tips, 85.00 . Also lect. Here's the handiest tool in your

## DEALERS

PAINT STRIPING TOOL of 1 doz. Fast, profitable trated circnler for illus trated circular, discounts
 CURVEDOR PARALLEL LINES
Home Craftsmen
Just the tool you've been waiting for New Paint Striping Tool gives pro-
fessional', results every time, yet Only simple and easy to use as a fountain Oniy simple and easy to use as a fountain
0 pen. Adabtable guide keeps lines
00 straightas an arrow. Justas easy to
make curves or free hand designs. Adds new beauty and finished look to WENDELL MFF. CO Dept. 212 4234 LINCOLN AVENUE, CNICAGO IB, ILL


INSURED TIRE SERVICE POPULAR BRANDS
Fi F $\begin{aligned} & \text { INSURANCE POLICY given } \\ & \text { with each used tire sold. } \\ & \text { we guarantee the amount of }\end{aligned}$ We guarantee the amount of service you pay for.
Tube Given Free with Each Used
Passenger Tire Unon Request
$\qquad$
Ded
io o
orders orders for
Two or
More used More
tires You CANT LOSE!!


 | $600 \times 16$ | $\$ 4.55$ | $670 \times 15$ | $\$ 5.25$ | $700 \times 16$ | $\$ 5.55$ | $760 \times 16$ | $\$ 6.35$ |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| $650 \times 15$ | 4.95 | $670 \times 16$ | 5.35 | $710 \times 15$ | 5.45 | $820 \times 15$ | 6.45 |
| $650 \times 16$ | 5.45 | $700 \times 15$ | 5.40 | $760 \times 15$ | 5.95 | $550 \times 17$ | $\mathbf{4 . 7 5}$ |

Supreme Qualify. Nething Finer - 30 Months Insured Service $450 \times 20 \quad 5.95|450 \times 21 \quad 6.25| 700 \times 15$ (6) $10.45 \mid 750 \times 16(8) 15.95$ \begin{tabular}{ll|ll|ll|l}
$600 \times 16$ \& 5.65 \& $650 \times 15$ \& 5.75 \& $600 \times 20$ \& 10.95 \& $900 \times 20$ <br>
$650 \times 16$ \& 5.85 \& $670 \times 15$ \& 5.95 \& $650 \times 20$ \& 11.75 \& $1000 \times 20$

 

$700 \times 16$ \& 7.75 \& $700 \times 15$ \& 5.95 \& $650 \times 20$ \& 11.75 \& $1000 \times 20$ \& 20.45 <br>
$750 \times 16$ \& 12.50 \& $710 \times 15$ \& 6.55 \& $700 \times 20$ \& 12.50 \& $1100 \times 20$ \& 26.75 <br>
$752 \times 6(8)$ \& 11.95 \& $1000 \times 27$ \& 19

 

$750 \times 16$ \& 12.50 \& $710 \times 15$ \& 6.50 \& $32 \times 6(8)$ \& 11.95 \& $1000 \times 22$ \& 19.50 <br>
$\mathbf{7 5 0}$ <br>
$525 \times 17$ \& 5.75 \& $760 \times 15$ \& 6.95 \& $32 \times 6(10)$ \& 12.75 \& $1100 \times 22$ \& 24.75 <br>
$640 \times 18$ \& 5.45 \& $820 \times 15$ \& 7.50 \& $750 \times 20$ \& 14.50 \& $1200 \times 20$ \& 23.50 <br>
$640 \times 15$ \& 5.75 \& $475 \times 19$ \& 5.75 \& $825 \times 20$ \& 21.50 \& $100 \times 24$ \& 22.75
\end{tabular} 1 1 1 $1 \begin{aligned} & \text { Speedy shipments on Mail Orders. F.O.B. Chicago. } \\ & \text { Insurance Policy sent with each order. Deduct } 10 \%\end{aligned}$

TIRE SALES on orders for 2 or more used tires. Send CHECK or 449 W. 37th Street, Dept. SS-14, Chicago 9, III.

## Free Catalog or 3000 Novelties

Send for amaxing catalog of novelties, live animals cientific supplies, hobbies, funmakers, planes a boats get timesavers, cameras, optical unusual seeds, gad movies, lucky jewelry, religious novelties, disguises, musical instruments, stamps, coins, puzzies, fortune cellers, radios, auto \& bike accessories, telescopes, magnifiers, compasses, banks, smokers gadgets, artists suppies, printing sets, en sports, books, games, plants, etc. send coin or stamp for postage JOHNSON SMITH \& CO., Dept. 696

Detroit 7, Michigan


BURSTEIN-APPLEBEE CO., 1012 MsGEE ST., KANSAS CITY, MO.

## THE KEY TO POWER

Life is law and never luck!
Create the future you desire by learning to control your subconscious mind. Free booklet. Write to KEY TO POWER
Dept. PS, 7321 Beverly Blvd.
Los Angeles 36, Calif

## Free Book on Arthritis <br> And Rheumatism

## HOW TO AVOID CRIPPLING DEFORMITIES

Explains why drugs and medicines give only temporary relief and ail to remove the causes; tells all about a specialized non-surgical. non-medical treatment which has proven successful for the past 33 sears. Write for this 44-page FREE BOOK today.
Ball Clinic
Dept. 36
Excelsior Springs, Mo.


CUT BUILDING COSTS $2 / 3$ Make Your Own Concrete BLOCKS and BRICKS

## To Use or Sell

New superior moulds make absolutely square, true, easy-to-lay blocks which will pass any building code. Produc tion is fast . easy. One durable $\$ 30$ machine will make four 5"x8"xi2 for itself in one day! Sell blocks for big proflt . $\because$ or save $2 / 3$ building cos for yourself. POST CARD BRINGS FREE FOLDER.

ECONOMY MFG. CO.
DEPT. S STONE MOUNTAIN, EA.

New Low Cost Electric Water Heater Gives You


Complete-Ready to \$19.95 Plug In-Only
 of shown), then PLUG IN 110 volt outlet. Uses 1250 watts. Plenty hot water. Temp. adjustable from 100 to 180 degrees. Only $\$ 19.95$ C.O.D. plus shipping or send check or money order for $\$ 19.95$ now Money back in ten days if not delighted. Full one year guarantee!
COLLOID EQUIPMENT Co. Inc.
Dept. PS. 12, 19 Murray Street NEW YORK 7. N. Y.

1954 CATALOG-Send 25c 41 models for '54! See World's finest line before you buy. Rated ance by the experts., 54 catalog plus booklet ${ }^{4}$ Boat selection. Operation, Maintenance" $\$ 1.00$

## Custom-Craft THE ORIGINAL "PACKAGED" водया

Over 100 Modern plans and full size patterns. Racing classes, cruisers, inboards, AND FULL-SIZE: outboards, soil boats. By famous designers. Patterns Design Catalog plus boat building hand. book send $\$ 1.00$.

## CUSTOM-CRAFT (DEPT. B) BUFFALO 7, N. Y.

|  |  |
| :---: | :---: |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |



The Modern PLASTIC for lasting Home Repairs

PERMANENTLY mends cracks or holes in wood, tile, stone or plaster. Sticks and stays putDoes not chip, shrink or fall out. Easy to use. Economical. Mold it, chisel it, polish or paint it. If unobtainable from vour lumber, paint or hardware dealer, the big $4-\mathrm{lb}$. can will be sent you postpaid (in U.S.) for only \$1.25. Full money-back guarantee, order now.

DONALD DURHAM CO. 313 School St., Des Moines, Lowa

"Here I am at work making good money as a draftsman. I'm glad I sent the coupon to Chicago Tech for that Free Trial Lesson and found out how easy it is to learn Drafting in spare time at home. Today I feel secure in my job) because the draftsman's work comes first on any new project. And, in addition, draftsmen can't be replaced with machines. What's more, I feel I'm slated for promotion and more pay, because I see so many draftsmen advancing to high-pay jobs."

## LEARN IN SPARE TIME-AT HOME!

## (or at the College in Chicago)

A few hours of pleasant home study every week-that's all. All the tools you need; drawing outfit included. With Chicago Tech's help, you train yourself step by step. This tested method-developed over 49 years of C.T.C. progress -prepares men quickly for good positions in industry.


FREE INFORMATION - SEND COUPON To prove to you how easy it is to learn Drafting at home by the Chicago Tech method, we will send you this FREE TRIAL LESSON. No charge for this lesson, now or later. Fill out and mail coupon, or send post card today.

## CHICAGO TECHNICAL COLLEGE

S-221 Tech Bldg., 2000 So. Michigan Ave.,
Chicago 16, Illinois
Mail me FREE Lesson with information about big opportunities in DRAFTING.

Name . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Age
Address . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
City . . . . . . . . . . . . . . . . . . . . . Zone . . . . State . . . . . . . . . .




- the ONLY tOOL YOU NEED IS A SCREWDRIVER
- These awnings are pretreated, ready for paint. It's easy! Just do the top - the sides are assembled. Designed and engineered by Herbert's with experience and machinery to sell you a better awning.
- AVAILABLE COMPLETELY ASSEMBLED WITH BAKED ENAMELED FINISH.

WRITE FOR FREE MEASURING CHART AND LITERATURE

## Make Your Own!

## ASSEMBLE AMERICA'S

Most Beautiful ALL-ALUMINUM DOOR CANOPIES AND WINDOW AWNINGS


DIRECT FROM FACTORY Save 50\%


## 40 ACRE GOVERNMENT OIL LEASES-\$100

You do no drilling, pay no taxes. may realize a king-size profit without ever leaving home. Free map and booklet. Write to

AMERICAN OIL SCOUTS, Dept. PS
7321 Beverly Blvd.
Los Angeles 36, Calif.

[^5]
## a IDEAL LAWHMOWER SHARPENER

BOOST YOUR INCOME


You can earn extra cash with the Model 300 Ideal Lawnmower Sharpener. Used and recom mended by leading manufacturers and service shops, the Ideal has everything you need, nothing else to buy. Grinds reel and bed knife, also reconditions. Get started now in this highly profitable business. Write for catalog today.
The FATE-ROOT HEATH Co. Dept. PS-12, Plymouth, Ohio

Do you work all day with COLD FEET?


## NOW,

at last, a new, modern; low priced electric foot warmer that will keep you healthy, happy and comfortable


Check stand cashiers, secretaries, assembly line workers, housewives, office workers, theatre cashiers, machine operators, telephone operators, and many others throughout the country are now singing the praises of the Electro Mat. There is no further need to work all day with cold feet. Many colds, causing absenteeism and irritability, can be directly traced to cold feet. Safe and Economical Size $14^{\prime \prime} \times 21^{\prime \prime}$ light-weight portable
Consumes less power than a 75 watt light bulb. Mail your check or money order PETERSON RUBBER MAT CO. 5508 N. Halifax Arcadia, California Please send me Electio Mots ot So.95 each IMPORTANT SAVING.
It - or more ordered, price is oniy 35.93 eeth. C.O.D. Enclese \$1 00 dopesit with orden. $\square$ propaid



IT'S FUN TO DO MAGIC $\}$ Be popular! Amaze-mystify-entertain! For
30 years Douglas has satisfied customers over the world. Now, you can enjoy then fascinating hobby. Oniy 10e brings our Catalog 500 Tricks, containing brand new tricks
for pocket, parior, stage. Join in the fanfor pocket, parior, stage. Join in the fun-
send 10 c today!
Douglas Magicland, Dept. P, Dallas, Texas
 ...IN YOUR HOME ...SPARE ROOM, BASEMENT, GARAGE... ANYWHERE!

EARN BIG MONEY - SPARE TIME

New "Chance of Lifetime" opportunity! Start your own spare or full time business once you know the revealing breeding secrets. It's fascinating! It's Fun! Breed EXOTIC and graceful "Angel Fish", BEAUTIFUL "Gourami" that are 12 DIFFERENT COLORS, "Fightung Fish" THAT FIGHT UNTIL DEATH; "Danio" that are STRIPED LIKE A ZEBRA; TRANSPARENT FISH - hundreds of expensive varieties. Some fish lay 300 to 600 eggs at one time. (Some very rare fish have sold for over $\$ 75$ a pair.) Get into PARTNERSHIP WITH NATURE and let nature multiply your profits for you. NO EXPENSIVE EQUIPMENT - NO EXPERIENCE NECESSARY WE SUPPLY EVERYTHING YOU NEED. HELP FIIL hUGE DEMAND from stores, offices, theaters, hotels, etc. New plan lets rour mailman BRIMG YOU ORDERS. Investigate TODAY.
FREE!
Colorful "How To Do It" success BOOK-
CET, REPRINTS, bre AIL DETAILS. Rush coupon today!

## RUSH this Coupon TODAY!

## Tropical Fish Breeders of

America, Dept. C12
1010 S. Los Angeles St., Los Angeles 15, Calitornia

Dear Sir:
Please rush me all Free Details.
Name
Address
City
State
Your Age

## start a big profft business with a small investment EARN UP TO s200 a DAY

Manufacturing Exciting New RAINBOW ROCK
Concrete Slump Brick in your back yard Earn big building boom profits with Rainbow Rock, the colorful new building brick that's taking the country by storm. Sell all you can make to contractors, builders, building supply houses. RAINBOW ROCK CUTS LABOR COSTS BY 1/3! Amazing low cost machine makes modern slump brick 24" Iong (3 times the length of ordinary brick) in a variety of widths and pastel colors . up to 1500 bricks a day! NEEDS NO SPECIAL SKILL. Operates indoors or out. Full instruc. tions and valuable mixing formulae supplied. YOU CAN START EARNING BIG MONEY NOW. PAY AS YOU PROFIT! A limited number of machines available on easy payment terms. NOW is the time to start. Write today for free literature and full information. GENERAL ENGINES CO., INC. Dept. SR-123-307 Hunter Street Groucester, N.J. - Gloucester 6-1337

## ع <br> BUILD <br> your own SMITH your own SMIITH AIR COMPRESSOR

Operates spray guns, rock drills, tampers, paving breakers, sandblasting . . Uses only 1 gallon of gas an hour! Save Money-build your own Smith Air Compressor! Famous the world over! Cap. $60 \mathrm{cu} . \mathrm{ft}$.; pressure up to 100 lbs , per sq. inch. Just order the Smith Compressor Head and Accessories with complete instructions for assembling. All you need is a Ford Motor and shop facilities. Head equipped with high -peed compressor valves; automatic unloading and idling.

Write for complete information!
GORDON SMITH \& COMPANY, Inc. 405 college Street - Bowling Green, Ky.

|  |  |
| :---: | :---: |
| For Fine PRECISI0N Work 999 uses |  |
| IMPORTED WARDING FILES <br> set of 6 with wood handles. 6" long <br> PRICE only ${ }^{\$ 195}$ <br> Postpaid LIND SALES 1521 S. La Cien | IMPORTED NEEDLE FILES <br> FOR HOBBYISTS. JEWELERS. WATCHMAKERS. DR'S. \& DENTAL WORKERS <br> Set of 12 different shapes 7 long <br> price <br> Postpoid nega Blvd., P S Los Angeles 35, Calif. |


 With Guaranteed JETMATIC Venetian Blind Laundry No risk, because you start your own business short time, when your profits exceed your job salary, you will make it your FULL-TIME business, as hundreds of others have done. fices, factories, for this low-cost service jes, factories, for this low-cost service
JETMATIC, made by world's largest manufacturer of perfect Venetian blind laundries, guarantees perfect results without taking blinds apart, without hand rubbing. WRITE TODAY for comptete detalls and experiences
of hundreds of men of all ages who are mak.
STEEL PIER SENSATION Luxurious RAINBOW ROCK fireplace wall in living room of the City N of the Century in Atlantic City, N. J.s Steel Pier .... acclaimed by over 300,000 Summer, 1953 visi seen! Endorsed by orchitect, William F. B. Koelle.


Makes beautiful, decorative fences, garden walls, garages, outside walls, room separators, etc.

Classified Ads only 80c per word per insertion, payable in advance. Minimum ad 10 words. To be included in February issue, copy should be in our office by December 22.
No cancellations accepted after December 15.


GIFT Discount Buying 162 Page Catalog \$1.00. Hone. 1500 Harvey Road. Wilmington. Delaware.

FLYING Flea Spin \& stallproof airplane latest construction plans and instruction booklet $\$ 6.95$. Free Details! Vemaline Co., Box 222. Hawthorne, New Jersey.
YOUTHS famous Ocean City Fishing Kit. Gift boxed \$4.00. Bee Co., South Charleston 3. West Virginia.

THRILLING new Salon-style Home Hair Dryer. Only $\$ 13.95$ ! Fully guaranteed! Details free. Consterdine Enterprises, 912 Virginia SE, Grand Rapids 6. Michigan.

STAMPS Wholesale: $\$ 3.00$ Box, Limit 1. Brown's Coins \& Stamps, 529 Southwest 29th. Oklahom
NATIONALLY advertised household appliances, watches. Up to $60 \%$ discount. Catalog $\$ 1.00$. Reagan \& Son, Box 731 , Binghamton. New York.

WHOLESALE catalog. 450 items. Jewelry. Appliances. cameras, households send 50c. Marsh. Box 5, Baldwin, N. Y'

FOOLPROOF Guaranteed AC Electric Shaver. Soothing action whisks away men's beards, women's surplus hairs. $\$ 3.95$ Postpaid, with case. Two Siliconite Auto-Tool-Gun cloths- $\$ 1.25$. Carlson's, 2523 Acqueduct. New York 68. N. Y.

BUY for Cash and save. Aluminumeare Jewelry Gifts Appliances Nationally advertised brands guaranteed. Write for free catalogue. Butcermilk Falls Exchange,
P. O. Box 7C. Falls. Penna. P. O. Box TC, Fals, Penna.

EVERYBODY'S Tying Flies! Christmas Kit contains good tools, illustrated instructions, authentic materials for 100 varied killers. Guaranteed to delight. Rush $\$ 6.00$. Willmarth Tackle, Bayport 3, N. Y.

NEW student Model 120 Bass Italian Piano Accordions Complete case and straps, at wholesale prices only $\$ 159.00$ Accordion Dist. 1736 West 63rd Street, Chicago. Illinois.

ALBINO hamsters. Free information. Circle S Hamstery. P.O. Box 183. Claymont. Delaware.
NO workshop complete without Easyplater. Also Electrochemistry sets. hobby 293C. Red Lion, Pa.

SURPRISE Package. Really worthwhile. 25 c . Hilltop Specialty Shop. Blackwood, New Jersey.
LEGS-Aching? Circulation Poor. Legs Relaxor gives quick relief $\$ 7.95$. Write information, Legs Relaxor, 142 Brooks St., New Orleans. La.
GIVE stamps to collector friends this Christmas. Quality assortments at $\$ 2.00$. $\$ 5.00$, $\$ 10.00$ Guaranteed. Maximchuk, Flin Flon. Manitoba. Canada.

COMPLETE new library of 18 comic books. $\$ 1.00$ postpaid. Sperry's, 1021 Oak, Elmira. New York.
BEST Quality Pearwood Recorder. Wonderful gift for young or old. "C' Soprano with instructions- $\$ 6.50$ prepaid. Arthur Hersh. Box 24, Lakewood, New Jersey.
SENSATIONAL invisible Crystal Radio. Inside Headphone. Complete. ready to operate $\$ 3.00$. prep.
ington $18 . \mathrm{D}$. C .

DIFFERENT, Beautiful. Redwood wreath greeting, postpaid December. $\$ 2.50$ C.O.D. \$2.00 cash. Empire Services. Santa Rosa,
California.

AMATEUR Weatherman's Almanac. Shows how to study and forecast weather. Descriptions of instruments. Blank recording forms. Lists record storms. $\begin{aligned} & \$ 1.00 \\ & \text { Weatherwise. }\end{aligned} . \begin{aligned} & \text { Franklin Institute. }\end{aligned}$ PhilaWeatherwise, Franklin Institute. Philadelphia 3. Penna.

HOW To Live without money. (book). Write: H. Bishop, 405 Second St., Neenah, Wisconsin.
100 ENVELOPES or Letterheads $\$ 1.00$. Printing. 21 Barclay Ave.. Portsmouth. Va.

SPORTSMEN-Mail $\$ 1.00$ for special Holiday offer - Fur-Fish-Game nine months $\$ 1.00$ (save 80c) or one year $\$ 1.25$ Fur-Fish-Game contains true. vivid stories on hunting. fishing. camping. travel. America's largest trappers monthly. Sample 3c. Clip advertisement. send at once with name. address. remittance to Fur-Fish-Game, 171 East Long St.. Columbus
15. Ohio.
'BRAND 17"' America's most versatile $4 \times 5$ camera various interchangeable reducing backs other accessories available. Brand Camera Co., 907 So. Victory. Burbank. Calif.
HATE Shaving? Incredible scientific discovery makes every shave a miracle. For guaranteed pleasurable lifetime treat send of Functional Research. Box 4866 . Washof Functional
ington 8. D. C.
HOME Bar Tips How to mix Zombies. Cocktails. Wines. When to stir. When to shake. Correct glassware. Book handsomely bound. Illustrated. handy size. Ideal gift. $\$ 1.00$ postpaid. Advance Sales Co. Box 24. Toronto. Ohio.
NEW Ideas and Items 25 c Brings Samples to Retail for $\$ 1.00$. Specialties. Box 475A. Park Ridge. Ill.
SONGWRITING Complete Course writing. selling songs. $\$ 3.00$. Northland, Box 1690-E. Milwaukee 1. Wisc.

INS IALL yourself. Save dollars. Automatic Thermostat for all hand fired furnaces. plugs into regular outlet, protects furnace, saves fuel, regulates room temperatures. Free literature. Linn Products, 516 Kercher. Miamisburg. Ohio.

ENGINE Pre-Heater. G-E. keeps idle motor warm. easy to start. even zero Weanderful autoist gift chevrolet Model regularly $\$ 9.95$. special $\$ 4.45$. Orther Mode regularly $\$ 9.95$. Special $\$ 4.45$. Other cars (except Packard. Nash 600. Studebaker 6) only $\$ 3.95$. Add 50 c for postage. Wisniew
ski. Milwaukee 7 Wisconsin. LOVELY $\$ 5.00$ "Teens Bracelets" for
$\$ 1.00$. Jewell. Box 774 . New Bern. N. C. \$1.00. Jewell. Box 774. New Bern. N. C.
CaRISTMAS Special-500 Regular Envelopes Printed with name and address only $\$ 2.95$. Free Samples. James Ferrario Printing. 728 South Webster Avenue Scrantor 5. Pa.
XMAS special free ball pen. 100 double edge razor blades $\$ 1.00$. Payne, 5426 5th edge razor blades $\$ 1.00$. Payne,
Avenue. Los Angeles 43. Calif.

SHIP Models Ltd. Kits. Fittings. Plans. Stuart-Turner Steam Engine Castings 1953 Catalog 25c. Box 751. Brookline 47 Mass.
A "Suitcase" full of Cartoon Fun. Your children can learn cartoon drawing in a jiffy. Complete set $\$ 1.00$. Additional Funny Face cards 50c. Selumart. Box 29. New York 72. N. Y.
PRINTED stationery $\$ 1.25$ per box. Aneralla. 1423 Edwards. New York 61, N.Y. NATIONALLY advertised Stamp Albums. U.S. Price List. Packets, Supplies-Lists free! Cole. $43-\mathrm{G}$ Rinewalt. Buffalo 21. N. Y
GOLD! Personalize signatures on Christmas Cards and snapshots with brilliant gold meallic ink. $\$ 1.00$ bottle. Metalux, "MICKEY Rooney One Man Band". Seven In One Comedy entertainment novelty. deal gift all ages. \$3.95 postpaid.
Virillo. Box 507 . North Hollywood. Calif.
\$1.-IN envelope brings 20 Wh . Mountain minerals mounted in giftbox. Analysis included. Ramblin' Ranch. Campton. N. H. UNUSUAL Christmas gifts. photographic enlargements beautifully mounted. $3-5 \times 7$ or $2-8 \times 10-\$ 1.00$. Klein. 980 Simpson St.,
New York 59 . Naratins
BARGAINS Wonderful books; courses on drawing, painting. cartooning. lettering. Free Catalog. Art Book Shop. Arnold 5. Missouri

VACRACK solves tank vacuum cleaner storage problems. Vacrack Products. Box 2435. Cleveland 12. Ohio.

FREE! 60 Wholesale Catalogs Free! Sherry's. Box 11-S. Miami 37. Florida.
SIDEWALK Engineer? Give him "'How to Operate Excavation Equipment." 144 pages. illustrated. absorbing. authentic. Cloth $\$ 2.50$. paper $\$ 1.50$. C.O.D. extra. North Castle Books. Greenwich 1. Conn.
100 FHOTOSTAMPS- $\$ 1.25$. Buy Wholesale: catalog. 50c. (refunded). Inquiries invited. Johnson. 1129 State. Harrisburg 33. Pennsylvania.

INKLESS Fingerprint Outfit Postpaid $\$ 1.00$. Identprint. Box 137. West Haven Conn
CARVALET. Perfect Traveler's gift. Hangs Clothes neatly across rear seat $\$ 1.00$
pcstpaid. 1578 Brooks. Fresno. California pcstpaid. 1578 Brooks. Fresno. California. BEAUTIFUL Swiss Musicboxes at $\$ 5$. Schär. Allschwilerstr. 123. Basel, Switzerland.

QUBIC. discover the great 3-D plastic game. Guaranteed for exciting fun or return for refund. Postpaid $\$ 2.50$. Qubic 54 B Warner St.. Springfield 8. Mass.

HERE'S a new toaster. Features. automatic operation, shade control, air cooled system. butter cup. plastic cover year guarantee. only $\$ 22.95$ ppd. R.

## 1 AUTOMOBILES \&

HI-Mileage-Speed equipment from the world's largest supplier. Dual manifolds finned heads. electric doors. lowering sets chrome panels. thousands of items for all cars. 1954 catalog 25 c (illustrate 1 literature free). Wh lesale to garages. Newhouse Automotive Industries. Los Angeles 22 .
COLOR Slides- 35 mm . Sports. Classic. Custom cars. 3 for $\$ 1.00$. List. sample, 50 c Autoslides. Box 24. Eastwood Station, Syracuse 6. New York.

OLDE Tyme European Autos. Actual $5 \times 7$ photographs of European olde tymers with technical data. $\$ 3.00$ dozen. Actual $5 \times 7$ photographs of American olde tymers $\$ 3.00$ dozen. Both sets $\$ 5.00$. Ozark Enterprizes. P. O. Box 102. Rolla. Mo.

FIBERGLAS automobile bodies. Build your owit. Gem-O'-Lite's own 'How', book $-\$ 2.50$. Information. materials Catalog6868A. North Hollywood, California

ALL-Car Auto Club offers automobile literature-old. new and foreign; dealer books; service manuals; glossy photo graphs; free motor magazines. Write to day; get on Free mailing list. Auto Maniacs. Inc.. Stockbridge. Michigan.
CROSLEY owners. Merry Christmas from the Crosley Car Owner's Club. 210 Greenway. Charlotte, North Carolina. Write for details.

PHOTOGRAPHS. World's Finest Automobiles. List. Sample. 25c. Box 1028 Minneapolis. Minnesota.
A Better Car For You! New 256-page book "How to Take Care of Your Car" by famed Popular Science experts shows you easy ways to beat high cost of car care repair. Over 750 pictures, hundreds of easy instructions on fixing, servicing. saving on gas, more! Guaranteed! Only $\$ 2.49$. Popular Science, Dept. ${ }^{1253 C}$. Yvenue. New York 10. New York. Fourth
 Trading Service, Box 1188, Akron 9. Ohio.

## 2 AUTO SUPPLIES \&

NEW and used guaranteed parts for civilian and Army cars and trucks. Largest stock in America. Mail orders. Pioneer Auto \& Truck Parts Company, 788 W. 13th Avenue. Denver. Colorado.

BRUSH Plating Outfits connect to a battery. No tanks or shop required. Free particulars. Gunmetal Co.. Ave. K. Decatur. Illinois.
SECOND Edition. It's New! It's Different! Cet world's largest Auto Accessory \& Parts Catalog aird save money. 132 pages Over 50.000 items. Including Hollywood Accessories Hi-Speed Equipment. Rebuilt Engines, all parts and accessories for all cars and trucks. We have that Hard-ToGet part! Jam packed with bargains. able). J. C. Whitney, $1919-\mathrm{KB}$ Archer, able). J. C. Whitney, 1919-KB Archer
SAVE-California Custom Accessories headquarters. Buy direct from original designers. Electric push button door-trunk conversions. Bull Noses, Custom Grilles. Speed-Dress-Up Equipment. 40 page catalog. hundreds of photos. Send 25 c to Eastern Auto, 3319B South Grand. Los Angeles 7. Calif.
GM71 Discarded injector parts wanted. Hogen. 7120 Carnegie, Cleveland, Ohio.
"MODEL T" Ford Parts-engine and chassis. Parts for other makes old models, too. Special parts made to order. (We also buy surplus items). B. S. Wisniewski Inc., Milwaukee 7. Wisconsin.
""WATER Injection," Free descriptive illustrated information. Neher Industries, LaVerne 6. California.

BRAKE Checker. Be safe. Safety check your brakes before the police do. Simple, easy, and clean to use. No experience required. $\$ 1.00$. Block Tester Company, Box
1238, Brawley. California. CARBURETOR Flanges for vacuum controlled valve oilers, water injectors. vacuum gauges, etc. Send $\$ 1$, make and
model car. Flanges, $253-\mathrm{E}$ Angeleno, Burbank. Calif.
BUY Wholesale nationally advertised auto supplies, thousands other products at big discount. Free "Wholesale Plan."
American Buyers', $629-\mathrm{E}$ Linden, Buffalo American
$16, \mathrm{~N} . \mathrm{Y}$.
LEAVE 'em Behind With Du-L-Spark. Dual Point Adapter Plates, Ford \$1.50, Chev. \$2.00. Free Catalog. Hove, 1503 Hinn.
nepin Avenue, Minneapolis 3, Minn

CAR Insurance only $\$ 1.00 ;$ guaranteed lubrication if equipped with Pro-Caps one postpaid. A. Creed, 123PS Warner Bldg., postpaid. A. Creed,
Washington 4. D. C.
BARGAIN Offer! Surplus stock of Gale Hall's original Gasoline Economy and Motor Condition gauges, designed for permanent dashboard mounting. Brand new, original cartons! Directions and connections included. Original price $\$ 7.50$, now only $\$ 3.98$ plus 40 c postage! Deluxe all$\$$ chrome model, originally $\$ 12.95$, now only \$5.98 plus 40c postage! Order now! N. E.
Surplus Sales, Dept. PS-12, 67 High Surplus Sales, Dept. PS
Street, Newburyport, Mass.
INCREASE! Gasoline mileage Three to Five more miles per gallon, Guaranteed Gasoline Vaporizer, also Increases Power.
Easier
starting. $\$ 3.50$. Turb-O-Vane. Stockton. Calif.
LACHAPELLE'S Treatment. (Patented.) Puts babbitt wearings in the motor for $\$ 3.00$ or postpaid. Ferns Products, $8120-\mathrm{D}$ $\$ 3.00$ or postpaid. Ferns Products, In Canada, Master, Box 3, Station C. Hamilton, Ontario. Data on request.
SILVER Alloy Ignition Points. Best contacts known. Smooth speed power. Custom made. Write Scientific Electric, Box 2162 PK , Cleveland 8, Ohio.
ELECTROPLATE autoparts, novelties, mirrors Easy, inexpensive home processes. Free booklet. Tyco Metals, Box
13231-FC. Houston 19. Texas.

FORD, Chevrolet, Plymouth, Genuine Tungsten Super Points $\$ 1.00$ Super ConGuaranteed Hove Points Unconditionain neapolis 3. Minn.

ATTENTION Motorists-You can save time and money by Polishing and Waxing your car in one Easy Operation with Easy Glitter car wax, $1 / 2 \mathrm{ib}$. can $\$ 2.00$ postpaid. Kasten Chevrolet Co., Altenburg, Missouri. GET More Power and pick-up with La Kleen Spark Plugs. easier starting, more miles per gallon. Great for two cycle engines $10-14-18 \mathrm{~mm}$. sizes. Price two dollars each. Address EverKleen. 212 E . Castle St. Syracuse 5 New York. or Charles Thomas. Route \#3, Rome. New York.
PROFESSIONAL Automotive Gaugessurplus stock of Famous Gale Hall instruments, brand new, original cartons! Compression gauges, originally $\$ 10.75$, only $\$ 2.98$ plus 40 C postage! Precision engine analysis vacuum gauges, originally $\$ 12.50$, now only $\$ 4.58$ plus 40 c postage! Catalog of other bargains sent rree with first or-
der! N. E. Surplus Sales, Dept. PSA-12 67 High Street. Newburyport. Mass.
CAR burning oil? Losing compression? Try Clifford's Compression Seal. \$2 Post paid. Clifford's, 1329 Seventh, Aurora, Ill.
SAVE your automobile battery. Samac. containing Cerium will revitalize any mechanically sound battery. Guaranteed to extend life. Standard package $\$ 2.00$ postvision. Canion Industries, Inc., P. O. Box 181, Kensington, Maryland.

MOTORIST Save Gasoline Vacumating overrich mixtures. For Free particulars how you install on your car for introducing, write Vacumatic, Dept. 2052, Wauwatosa, Wisconsin. Salesmen Wanted.
CONVERTIBLE Tops-A good X-mas Present-Custom Made Black-Tan, \$27.95: Florida Top Shop, 7325 S Old St. Augustine Rd., Jacksonville, Florida.

WIPING Cloths $21 / 2$ lbs. for $\$ 1.00$. Fahrman, 343 Hamilton, Allentown. Pa.
SMALL German built toggle switches, 3 position, ebony handle. Hole mounting. Superb quality. 2 for $\$ 1.95$. Competition Chemicals, Box 141, Iowa Falls, Iowa.
CHEVROLET Owners: Stop tappet noise with Kaye Tappet Silencers. Quality product. Easy to install. Complete set $\$ 5.95$. Kaye Products, 2067C So. Layton Blvd. Milwaukee, Wisconsin.
KUICK whitewall tire cleaner, fast, economical. money back guarantee, 14 oz . can \$1.25, postpaid. Kuick Chemicals, Manufacturing Chemists, 1762 Main Street, Buffalo 8, New York.
BUY Wholesale! Join The Discount Club. Lifetime membership $\$ 1.00$, Free in formation. Box 622A. Burbank, California.
NEW, life for worn out batteries termed "dead." 50c package. Power-X, P.O. Box 55. Staten Island 10 , New York.

SAVE your life with amazing new "Tor-sion-Flex" Sway-Bilizers! Stops sway, skid, slide. Postal brings free illustrated literature, gift offer. Sway-Bilizer, 5434-B Higgins Road, Chicago 30.
"BIG Discounts"-Speed, Power Custom Equipment! Catalog 25c (Information Free). Almquist Engineering. Milford 6Z, Pennsylvania.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as $\$ 8.00$. you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The February issue closes on December 22nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising". O. K. Kelly, Classified Adv. Mgr., Dept. 1253, Popular Science Monthiy, 353 Fourth Ave., New York 10, N. Y.
3 AUTO TRALLERS
BUILD your own trailer! Plans for all kinds. Illustrated catalog 10 c . Jim Dandy. 125-S. Wausau. Wisconsin.
AVAILABLE in Kits. Slip-on Coach for all Pickups. Traller Kits. Trailer blueprints. Catalog 10 c. Comstock Trailers,
$585-\mathrm{SK}$, Parsons. Kansas.

## MOTORCYCLES, BICYCLES <br> AND SUPPLIES

RECONDITIONED motorcycles and motors. Chromium accessories. Complete stock Indian parts. Expert rebuilding Fast service. Indian Motorcycle Sales. Kansas City 27. Mo.
CZEK motorcycle $\$ 25$; Midget motorcycle $\$ 20$; Doodlebug motorscooter $\$ 30$; Whizzer bike motor $\$ 10$; two cylinder May tag engine \$4. Four airplane tires $\$ 3$. Mailorder only. Send 25 c for catalogue Number 56 , just out, listing these and hundreds of other bargains in new and used midget cars, motorscooters, homeclass mail). Midget Motors Directory. Athens, Ohio.

MOTORBIKES, power mowers, engines. sprayers. Free Catalog. Lenco, Box 436, Danville, Illinois.
NEW Wasp 4 Cycle Bicycle Engine Kits. Ready to install on bike. Cauffiel Motor Industries. Temperance, Michigan.

5

## AVIATION

PROPELLERS, plans, for snow sleighs. airboats. Literature. Gano Propeller, Box 3284 B . Ft. Worth. Texas.
PROPELLERS-Pusher propellers for sleds and boats. CallAir, Afton, Wyoming.
PROPELLERS, Plans, Supplies, for snow sleighs, air boats. Immediate deliv ery. Catalog 25 c . Banks-Maxwell, Box 3301G, Ft. Worth, Texas.
6 BATTEERIES,

## GENERATORS, ETC.

EDISON Nickel odorless storage batteries, 12 to 600 ampere hour. Any voltage. Long guarantee. Literature, Hawley Smith Co., Croton Falls 2, New York

## 7 ELECTRICAL SUPPLIES <br> EQUIPMENT

ELECTRIC Pencil: Engraves all Metals, \$1.50. Beyer Mfg., 10511-C Springfield, Chicago 43.
LAMPS- 25 c brings bargain catalog showing all parts for ropairing, building vases, oil lamps, etc. Gyro Lamps, 5402B Clark, Chicago 40.

REVERSING Switch. Free trial, free literature, no money with order, no COD maximum motor ${ }^{3 / 4} \mathrm{HP}$. After ten days send $\$ 2.98$ or return switch. Best Tools Inc., Dept. S3. Box 92, Berwyn, Illinois.

FREE Catalog. Surplus and other merchandise. Hydraulics, Generators, Welders, Motors, Boat Kits, Winches, Tools, Pumps, 1500 items. Dunbar Mfg., 10318-C Aurora, Seattle, Washington.

LAMP Supplies-Wholesale-any amounts. All parts for repairing and building lamps. Catalogue 15c. Brown Specialties Co. No. 501-Wellston Sta., St. Louis 12.

FREE Surplus Catalog. You need it, we have it. Everything in Hydraulics, Pumps, Winches, Welders and supplies. Mechanical books. Prices you can afford. LeJay 23, Minneapolis, Minnesota.

## 8 WELDING, SOLDERING

WELDERS - electric - various models, $\$ 28.50$ to $\$ 235.00$ direct from manufacturer. Free literature. Champion Welder Mfg. 193PS Centre St., New York 13, N. Y.

WELDERS make ornamental iron railings, illustrated manual $\$ 1.00$. Joseph O'Connor, Milan, Ohio.
'BUILD-Ur-Own" a.c. welder and a.c. power plant with a good used engine and low cost Hobart generator. Welds any-
where and supplies 5 KW stand-by power Where and supplies 5 KW stand-by power
for any emergency. Write Hobartweld, for any emergency. W
Box P-1233, Troy, Ohio.
A.C. Welders. Four Sizes. Lowest Prices. Free Literature. Holgerson's Serv., Canton, Kan.

WELDERS "Instant Start" 100v. \$29.50. Morris, 1070 In er Drive, Schenectady, New York.

## MACHINERY, TOOI

SUPPLIES, ETC.
TOOLCHESTS wood complete \$64.-Fos-
ter's, 244 West 106 Street, New York 25.

# POPULAR SCIENCE OPPORTUNITIES 

MOTOR driven rotary Hone sharpens all Keen Edge tools. A must for all shops. Immediate delivery. Moore Industries. Fredonia. Pennsylvania.
allen One Ton Power Bench Type Punch Press. $\$ 125.00$. Circular. Allen. Dept. PSB. Clinton. Missouri.

LEVEL any kind of construction. grading without a transit. Simple one-man precision instrument. Costs only $\$ 12.95$. Write for Free Booklet. Levelall. 85N Park St.. Rockland. Mass.

BUILD Your own machine tools. Milling machine castings only $\$ 49.50$. $10^{\prime \prime}$ shaper $\$ 97.50$. Twenty others at low prices. Cata-
logue 10c. Lewis Machine Tool Co. Los Nietos. California.
TOOL post turns thousands of different size concave, convex radii $0^{\prime \prime}$ to $4^{\prime \prime}$ no speSial. Louis 12, Mo.
POWER tools. equipment wholesale prices. Free bulletin. Homecrafters Cooperative. Grand Rapids 6. Michigan.

## 10 ENGINES, MOTORS, ETC.

WINDING Data. listing 225 motors single and three phase $\$ 1.00$. Motor Data. Box 7631. Kansas City 28. Mo.

ALTERNATING Current Generators 750 Watt $\$ 38.50 .5000 \$ 185$. Motors $1 /$ horse $\$ 15$. $3 / 4 \$ 22$. $1 \$ 35$. Butler. 1885 Milwaukee.
Chicago 47 .
REBUILT Gasoline Engines. $\$ 17.00$ to $\$ 37.00$. Cauffiel Motor Industries. Temperance. Michigan.

## 11 BOATS, OUTBOARD MOTORS

BUILD marine engines with Federal Conversion Kits. Federal Marine Motors Conversion Kits. Federal Marine Motors,
9011 Cottage Grove Ave.. Chicago 19. Ill.
NEW. used rebuilt marine motors. Marine conversions. fittings. Free Catalog. Stokes Marine Supply. Dept. 23. Coldwater. Mich.
OUTBOARD Motor Parts-New-Used for all makes. Send stamp for price quotation, listing parts needed. Outboard Motor Mart. Inc.. 229D State Street. Boston, Massachusetts.

FULL size, cut-to-shape Boat Patterns. Blueprints. $71 / 2-38$ feet. New 1954 illustrated "Build A Boat" catalog of 50 naval architect-designed Cruisers, Runabouts,
Sloops. Skiffs. Outboard Boats. Sailing, Racing. Houseboats. 25 c Marine Hardware Catalog. $\$ 1.00$. "How to Build Boats" book Catalog. $\$ 1.00$. "How to Build Boats" book.
$\$ 1,75$. Polywog Houseboat Plans, $\$ 12$. Cleveland Boat Blueprint Co. Plans, \$12. Cleveland Boat Blueprint Co., Dept
9400 Steinway. Cleveland 4, Ohio.
BUY Wholesale nationally advertised outboards. thousands other products at big discount. Free "Wholesale Plan." American Buyers', 628-E Linden. Buffalo 16. N. Y.

MARINE Conversions-Willys to Cadillac. Catalogue and conversion hints free. Barr Marine Products, 2709B Castor Avenue. Philadelphia 34. Pa.
BOAT Kit, complete. only $\$ 59.00$. Semi-Vee. 12' light enough for cartop. Fre-assembled frames. pre-cut parts. brass screws. Hustrated instructions. Write for Dept. C-17. Defiance. Ohio.

CRACKER Box Boat Plans $\$ 7.50$ set. Marine hardware at discounts. Literature free. Glen Marine. Box 568. Compton, Calif. BRITISH Anzani Super Outboards. 3/4 to 15 horsepower. literature free. Damac Corporation. Roslyn 12, New York.

MARINE conversions for Ford and Jeep engines. Catalog 10c. Lehman Manufacengines. Catalog 10c. Lehman Manufac-
"BELLY Tanks" $\$ 9.95$. Free picture. Buckman Co.. 89A Merced, California.

FIBERGLAS permanent boat coating. Gem-O'-Lite's own "How" book- $\$ 2.50$. Complete catalog-10c. Airmailed-35c. wood. California.
BOAT Kits. Sail. Power. Oak ConstrucMon. Hardware. Catalog 15 c . Boatbuilders FIBERGLAS-Lifetime boat covering. Patch kit covers 11 sq. feet $\$ 5.00$ postpaid. Free information. Northwest Fibr-Glass Co.. 1531 North Morgan. Minneapolis 11 .
Minnesota.

## 12 BODY-BUHDING COURSES, JIU JITSU \& ATHLETIC <br> EQUIPMENT

HANDBALANCING self-taught. Complete illustrated instruction. Money-back guarantee. $\$ 2.00$ postpaid. W. Power. 923 W. Vine. Kalamazoo. Michigan.

BREATHING exercises develops chest. good looks. good health. "Breath of Life" booklet. gives seven detailed exercises $\$ 2.00$. Ray. Box 873 . Columbus 4. Ohio. SKINNY? Fastest weight gaining system. \$1.00. Luzzi. 29 Hall Avenue. Tuckahee 7. New York.

## FIELD GLASSES,

WAR Surplus Bargains. Binoculars. Telescopes. Sextants. Millions of Lenses. Prisms. Reticles. Eyepieces. Objectives. etc. Mail 10c for Big "Catalog CNN" Send $\$ 1.00$ for Stock CN-10-piece Lens Kit and Big Instruction Booklet. Edmund Scientific Corp. Barrington. New Jersey.
GIANT 100X to 400 X telescopes easily made. Complete kits from $\$ 2.00$ up. Free money saving price list. Suffolk Science money saving price list. Sufft
Service. Riverhead New York.

FREE Catalogue! Thousands war surplus optical bargains Lenses Prisms Telescopes. Binozulars. etc. Send $\$ 1.00$ for G. Jaegers. 691 West Merrick Road. LynG. Jaegers, 691 West Merrick Road. Lynbrook. New York
SAVE Money-Get interesting facts. Free 52 page three color catalog. 80 dif-
ferent models. United Binoculars. 9043 S . ferent models. United Binoculars, 9043 S .
Western A-7616. Chicago 20 .
AMAZING prices. binoculars, telescopes. microscopes. Free trial. Folder. "Binocular Selecting" optical catalog free. Prentiss Importers. Mercury Bldg., West Los AnImporters. Mercury
SPECIALISTS. Used. new microscopes. Prepared slides. Supplies. Telescopes. Free illustrated catalog. Nassau Optical. 9 W Greenwich. Roosevelt. New York.
REFLECTOR Telescope Kits from $\mathbf{8 6 . 2 5}$ All parts designed and built at our Hoboken factory. Mirror Cells. Diagonals. Focusing Mounts. Tri-Pods. Tubing. Oculars Fully Guaranteed. Send for Free Illus trated Catalog. Our only Sales Showroom, Esco Products. 134 West 32nd St., Rm. 204-B. New York 1.
BINOCULARS-Telescopes. Microscopes. Terrific values $\$ 3.98$ up. Request FreeMoney saving catalog. Criterion, HartMoney Saving catalog
ford. Conn. Dept. S16.

BINOCULAR specialists, all makes repaired. Authorized Zeiss. Hensoldt dealer Tele-Optics. 5514 Lawrence. Chicago 30, Illinois.
AMAZING High Power Telescope Kit Including Tubing. Fittings, 5 ground. polished Lenses, Instructions $\$ 2.95$ postpaid Brings objecis 21 times closer! Hobbycraft.
7111 Princeton. Chicago 21 .
REFLECTING Telescopes, completely assembled. 60X. \$29.75. Guaranteed Observatory clearness. Free information.
TELESCOPE Kits-Accessories. Mirrors aluminized, ground to order. Free catalog Garth Yptica
GIANT 100 power day and night telescope. Completely assembled. Steel and brass tubing construction. Hardwood trinod. Same size and quality lenses as $\$ 15.00$ telescopes. Only $\$ 7.95$ fob factory. Carl Jamer. Manorville 5. N. Y.
GIANT Astronomical telescope complete with 6 ft . tripod. 45 X . 75X. 100 X eyepieces. Sun Frojector lens. $\$ 15.00$. Money back guarantee. Suffolk Science Service.
Riverhead 3. New York.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mallbox. For as little as $\$ 8.00$. you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The February issue closes on December 22 nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising'" O. K. Kelly, Classified Adv Mgr., Dept. 1253. Popular Science Monthly, 353 Fourth Ave.. New York 10. N. Y.

BINOCULARS. Lowest prices. $8 \times 30$. $\$ 32.00$ guaranteed. Telescopes. microscopes. Free catalog: All sizes. Joe's Binocular Sales. 4827 Second Blvd.. Detroit 1. Mich.

STAR-Atlases. astronomical books. Write for list. Herbert A. Luft. 42-10 82nd Street. Elmhurst 73. New York.

## 15 sporting coods, gicNs

## TRAPPING

120 PROFUSELY illustrated pages. antique pistols. swords. daggers. armor etc. 50c. Robert Abels. PS860 Lexington Ave.. New York 21.
FREE Catalog: Flies. Lures. Mustad Hooks, Fly Tying. Lures Spinner. Rod Making Materials. Nylon Coils. Supreme Mfg. Company. Amarillo. Texas.
BUY Wholesale nationally advertised sporting goods. thousands other products at big discount. Free "Wholesale Plan." American
IMPORTED. Stilettos. Daggers. Springers. Throwing knives, Hunting knives. etc. Free Catalog. J. D. Clinton, 94 Church Street. Mt. Clemens 3. Michigan.
5.000 BARGAINS iirearms binoculars. war relics. catalog 50c. Smith Museum. War relics. catalog

CAST Iron Sinker Molds-for making your own sinkers. Free illustrated booklet. Reading Instrument Co.. Box 78. Reading Pennsylvania.

SAVE 50\% on finest Bows. Arrows. Complete Bowhunting outfits, etc. Free catalog and "How To Select Archery Equipment"
booklet. Malibu Archery. 3156-BD West Eighth. Los Angeles 5. Calif.

MOLDS for Fisherman's Sinkers. Jigs. Squids. Casting and Spinning Lures. Gwee, GUNS!!! Guns!!! Guns!!! Mausers. Lugers. Kentuckies. New-used Hunting Bargains. Antique Arms-Illustrated Catalog 50c. Ed Agramonte. Yonkers 2A. N. Y. STOP Back lash. Enjoy fishing. Free details. Write Deagle. 238-D Jackson street. Twin Falls. Idaho.
JAP rifles altering American shells $\$ 6.00$. catalog 5c. TP Shop. West Branch 10. Michigan.

POWERFUL Blowgun. Complete with darts. $\$ 1.98$. Ray's. 6631 Ashbury. Affton. Missouri.
OVER 500 guns. modern. obsolete. List 10 c coin. Ed Howe. 26 Main. Coopers Mills. Maine.
FISHERMEN. Make your own custom Bamboo Rods. Choice tonkin cane kits. Bamboo Rods. Casting, Spinning. fly rods. Send for free complete list. Paul H. Young Co.. 8065 Grand River. Detroit 4. Michigan.

## 16 CAMPING EQUIPMENT <br> \& TENTS

CAMPING equipment. Sleeping bags. Tents. Low Prices. Free 80 page catalogue. Mor-San Sales. 10-21-G 50 th Avenue, Long Island City $\begin{aligned} & \text { 10- New York. }\end{aligned}$

## 17 DOGS, BIRDS, HAMSTERS,

MAKE Big Money! Raise Chinchilla Rabbits. Cash Markets Supplied. Write Today! Rockhill Ranch. Sellersville 16. Pa.
RAISE Mink: Free booklet. pen plans, inside "secrets." feed. care. Mink are money makers. Investigate today Utaw RAISE Highly-Profitable Angora and New Zealand rabbits. Particulars free. White's Rabbitry. Jackson. Michigan.

HAMSTERS-Golden; young. $\$ 3.00$ pair; fully developed. $\$ 4.00$ pair. Request prices on rare albinos. Adtrondack Hamstery, Frospect 9. New York.

CHINCHILLAS for profit. Best prices.
HAMSTERS - Cages and Equipment
Write for Information. Circle S Hamstery.
P. O. Box 183. Claymont. Delaware.

HAMSTERS-Golden and Albino. Fine Christmas gifts. Free information. Anderson's Hamstery. 35 Oneida. Pontiac. Michigan. Dept. 20.

GUINEA Pigs. Home business. Booklet free. Taylors. B426B. Hapeville. Georgia. RAISE Fishworms-Highly profitable! Illustrated booklet explains raising, feeding, marketing shipping 25c. Ozark Worm Farm-V. Willow Springs. Missouri. NATURALIST'S Catalog 10c. Lizard 75c. Hamsters $\$ 4.75$ trio. 200 Mealworms $\$ 1.20$. Quivira Specialties. Topeka 10. Kansas.
HAMSTERS Golden and Panda. literature Free. Charles E. Bowser. Smokerun, Penna. Dept. P. SALE Tame Red Striped Squirrels.
Dewes H. Balch. Castleton. Vermont. CHINCHILLAS (no rabbit) easily raised. Profitable. Big future. Terms. Cliff's Chinchillas. Ithaca, Michigan.
CHINCHILLAS Rented. Off spring bought. R. Rau. Route 2. Jeannette 4. Pennsylvania.

RAISE talking parakeets. choice breeders. Adie. 481 Ferndale Avenue. Youngstown. Ohio
LIVE Baby Alligators $\$ 3.50$ each postpaid with instructions. Length $10 "$ to $14^{\prime \prime}$. Trading Co.. P.O. Box 817. Dept. A. Miami Beach 39. Florida.
19

## FARMS. OTHER

FARM-Ranch Opportunities. Favorable conditions. Washington. Minnesota. Montana. Idaho. Oregon. North Dakota. Lit-
erature. farm descriptions. Specify which state. J. W. Haw. 120 Northern Pacific Ry.. St. Paul 1. Minn.

CALIFORNIA Ranch Lands. 50c to $\$ 5$ acre minimum bid. Farm-ranch-hunt-fish-retire. 10 c brings illustrated land
catalog. outline maps. Tax Land Sales, catalog. outline maps. Tax Land Sales,
Bc: 2350BX. Hollywood 28. Calif. BC: 2350BX. Hollywood 28. Calif.
FLORIDA-New development adjoining Ocala National Forest in Lake County, at $\$ 10$ monthly. Folder iree. Winfree Vernor. DeLand. Florida.

STROUT'S Farm Catalog. Farms, Homes. Businesses. 33 States. Coast-toCoast. 3298 bargains described. Mailed free. World's largest: 53 years Service. Strout Realty, 255-ZB 4th Ave., New York 10. N. Y.

FLORIDA Beautiful Retirement Homesites, near Gulf Coast. $\$ 250$ at $\$ 10$ Monthly. Finest Fishing. Hunting. Government Game Preserve nearby. Free Literature. ville, North Carolina.

FLORIDA. Central. Lake-Front subdivision near Tavares lots $10 \%$ down, $\$ 25.00$ month. Write John D. Rapalje. Box 792A. Tavares. Florida.
FLORIDA'S choicest lakefront lots. Excellent fishing-hunting. Eustis-Deland highway. $\$ 10$ monthly, without interest. Free literature. Roepke's. Eustis. Florida.
SELLING village homes like rent. Request list. Perry. Brier Hill 29. Pa.
FLORIDA-Homesites. business sites and acreage in Potterfields Garden Acres. High dry land about 40 miles from Tampa and St. Petersburg close to wonderful Hunting and Fishing. Tracts as low as $\$ 595.00$ for three acres. only $\$ 10.00$ down, $\$ 10.00$ month-Information write G. B. Potterfield. Owner. Dept. V. Charleston, West Virginia.

## 20 TREES, SHRUBS,

FRUIT Trees! Stark Bro's sensational new "Dwarfs." Also standard size exclusive patented, trade-marked varieties produce abundant. larger. better apples. peaches. pears. All fruit faster growing, quicker bearing. Also beautiful ornamental trees and shrubs. Get giant new Color-
photo Catalog Free. Stark Bro's., Dept. photo Catalog Free. Stark
30064 . Louisiana. Missouri.
DECEMBER offer 150 fresh double petunia seed mixed or separate colors $\$ 1.00$. Natson's. Blooming Prairie. Minnesota.

## 21 POULTRY \& SUPPLIES

RAISE pheasants on $\$ 100$ week plan. Little capital and space can make you independent. Free details. Great Central System, Columbus 6, Kansas.

POULTRY Farmers-Broiler GrowersTurkey Raisers read the new American Poultry Journal for latest ideas and greater profits. 12 months. 50 c . Special offer. years. $\$ 1.00$. American Poultry Journal. 182 North Wabash. Chicago.

RAISE Turkeys the new way. Write for free information explaining how to make up to $\$ 3.000$ in your own backyard. Ad57, Columbus Turkey Institute. Dept 57, Columbus. Kansas.

## 22 PROFITABLE OCCLPATIONS

HOW to Make Money With Home Workshop" describes amazing methods used by hundreds of successful craftsmen. Tells what to make. How to sell workshop output spare time. Write at once for details. Craftsman. i15B12 Worth St.. NYC.

DETECTIVES Earn Big Money. Excellent opportunity. Detective Particular free. Write, Wagoner. P-125 W. 86th. N. Y. 24.

WANT A Diesel Job? New Opportunities to increase income. Higher Pay. More Money. We can help you Qualify. Tools. Shop method home training. Write today! Diesel. Tractor. Heavy Equipment Division. Interstate Training Service. Dept.
B2-N. Portland 13. Oregon.

S10.800 PROFITS! Your Own Mailorder Business! No Risk! "Success Plan" Free!
Treasury. 709 Webster, New Rochelle P-18. New York.

FOREIGN Employment Construction Work. If interested in foreign projects with high pay. write Foreign Service Bureau. (Dept. P.S.). Metuchen, New Jersey.

ADDRESS advertising postcards. Must have good handwriting. Lindo, Watertown, Mass.

EVERY Home Can Use 6 Hot Air Register Filters. No Soot On Walls. Costs $\$ .60$ Sells $\$ 1.00$. Send $\$ 1.00$ For Sample. Modern Metal Products. Warren. Ohio.
BUY Wholesale thousands nationally advertised products, at big discount. Free "Wholesale Plan." American Buyers 623-S Linden. Buffalo. New York
FREE! "301 Profitable Small Businesses!" Amazing shoescring plans! Work Home! Start Sparetime! Deumant Surveys. Kenmore 23-T, New York.
$\$ 40.00$ WEEKLY. Make growing mushrooms. Domirion Patent 331.583. Free Spawn with Order. North American. 169 Y Yonge. Toronto. Canada
LUCRATIVE profession. Repair china antiques invisibly. Complete course $\$ 5.00$. Gussack. 12310 Magnolia Blvd., N. Hollywood. Calif.
MUSHROOMS grown boxes. barrels. Manureless process 50 c . Spawn $\$ 1.00$. Gordens. 553 William. Winnipeg, Manitoba. GROW Mushrooms. Cellar, shed. and outdoors. Spare. full time. year round. We pay $\$ 3.50 \mathrm{Lb}$. We paid Babbitt $\$ 4.165$ in few weeks. Free Book. Washington Mushroom Ind.. Dept. 101, 2954 Admiral Way. Seattle. Wash.
WELDING Pays \$\$\$. Learn easily at best equipped school in country. Nonprofit School with low cost training. G.I. Box P-1232. Troy. Ohio.

BUY Wholesale thousands nationally advertised products. Save money! Make money! Fostcard brings details. Kemah Texas. Hol
HOME Mail Order Beginners. Sources, methods. instructions. Details. plus op portunity offers. 10c. Carnahan Bros., 5582-B Nelson, Cypress, Calif.

DRAFTING, learn at home in spare time. It's easy with C.E.I. individual tutor method. Write for Free success book. Cleveland Engineering Institute, 6301 Euclid. Cleveland 3. Ohio.
BIG Kit. Make lovely gifts from beautiful colored shells. Pins. earrings. talley cards. Earn extra money. $\$ 3.25$ complete Catalog 10c. Duryea Shell Studio, Bay
Pines. Florida. Pines. Florida.
MAKE money raising Chinchillas. The coming fur! Easy to raise in basement or backyard. Feed $\$ 4$ year. Registered breeders for sale. Free literature. Felker. R-3. Box 630. Golden, Colorado.

HURRY! Cash in on coming income tax boom. Learn how to prepare tax returns. Experience unnecessary. Write Union Institute. Lakewood 1-F. New Jersey.
SELL Advice! Amazingly profitable business. Prospex. Box 6404A. Jacksonville 5. Florida.

SET rhinestones in plated backs. Easy. Over $100^{\prime}$ profit. Catalog 20c. Bergen Arts. 128 S Main Street. Hackensack. N. J
FREE Book " 505 Odd, Successful Businesses., Work home! Expect "Odd'! Pa-cific-37C. Oceanside. Calif.
"EVERYBODY Likes Candy." Learn to make professionally (Our 43rd year.) SELL Stamps-I guarantee profits. Return envelope Fairbrook. 133-21 Blossom. Flushing 55. New York
$\$ 500.000$ BY mail from home. Free Folder. Publicity. Kalamazoo 65EA. Mich. DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as $\$ 8.00$. you can adverlise your product or service in the classified Monthly Monthly. The February issue closes on December 22nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising," O. K. Kelly. Classified Adv. Mgr. Dept 1253. Popular Science Monthly. 353 Fourth Ave.. New York 10. N. Y.

## 23 BOOKS \& MAGAZINES

BIG Catalogue: 1500 bargains. send 10c. Books. 3100 Ocean Parkway. Brooklyn 35 SPARETIME Profits Taking Subscriptions. All Magazines. Wholesale Catalog Free. Cassell Agency. Westfield 1. N J
TERRIFIC new self-help book Cyclegram teaches science of life cycles in minutes. promotes success in love. business health. 64 pages retails $\$ 1$. Wholesale introductory special 2 for $\$ 1$. Cyclegram. Box 301. South Pasadena, Calif.

ATHEIST books. Catalogue free. Truth Seeker Co. 38 Park Row, New York 8.
BOOKHUNTERS! All Subjects. Send Wants! Jaher Book Service, $620-\mathrm{K}$ East 178 Street. New York 57.
NATIONAL Geographic Magazines 18881952. Any issue. Periodical Service. Box 465-PS. Wilmington, Delaware.

BOOKHUNTERS! Scarce, unusual. miscellaneous books supplied. Atlantic Book Service, 2 Lawrence, Charlestown 29. Mass.

GERMANY export import industrial directory 65,000 addresses. English index $\$ 9.00$ postpaid. Burke Associates. Manchester 3. Mass.

CREW-cut mask baldness. It really works. Details free. W. Henderson, Box 361, Maywood, Illinois.
BOOKHUNTERS! All subjects! Send wants! Plymouth. Box $365-\mathrm{G}$. Far Rockaway. New York.
24

## HYPNOTISM

FREE Illustrated Hypnotism. Selfhypnosis. Catalogue. Write: Hypnotist. 1324 Wosis. Catalogue. Write: Hypnotist,

MCGILL'S illustrated self-hypnosis course. $\$ 2.50$. Guarantee. Catalogues featuring internationally famous Hypnotism Center publications. 10c. Lloyd Collins. Appalachia Virginia.
"HYPNOTIZE the First Day" instantaneous hypnotic sleep, or your money back.
$\$ 2.00$. Lewis. 4009 Lake Park. Chicago 15.

AMAZING record! Hypnotizes; transfers control to you. Instructions. $\$ 2.95$ ppd Information Box 405. Hermosa Beach. Calif.

HYPNOTISM. Sample lesson Free. Write Baltimore School of Hypnotism. Dept. $312-\mathrm{A} .4214$ Belmar Avenue. Baltímore 6 Maryland.

MECHANICAL Hypnotist, new invention causes trances immediately. Instructions.
secrets included. \$2.00. Click. G.P.O. Box 1312. New York 1.

25

## MAGIC TRICKS,

90 PAGE Novelty-Magic catalog with Novelty. 25 c . Allen. Dept. PST, Clinton, Missouri.

## POPULAR SCIENCE OPPORTUNITIES

MAGICIANS, Gamblers books. supplies 28 exposed. Free Catalogue. Book, Box 671 , St. Louis 1. Mo.
500 TRICKS. Douglas famous 120 -page Catalog. oniy 10c. Fastest service to magicians for 30 years. Send 10c today, Douglas Magicland. Dept. 2, Dallas. Texas.
FREE Catalog. Best Magic. Practical Jokes. Top Hat Magic. Evanston 22. I11.
ENTERTAIN With Magic-Hobby or Profession. Write-Marsh's. 237 W. 11 th. Profession. Write
Columbus 1, Ohio.

2500 TRICK Catalogue (512-pages) pocket. parlor. stage. World's Finest Magic. Catalogue $\$ 2.00$ (dollar trick included free). Kanter's, S-1311 Walnut. Philadelphia 7.
WOODEN Nickels. Catalog, trick. 25c. Fun'n Magic. 423-S North St. Marys. San Antonio. Texas
MAMMOTH Amusement catalog. magic. jokes. Houdini Sensational Escapes, Spiritualism. 224 pages wonders. also Mystery Book Shows you How-all prepaid send one dollar. Magician Heaney Co., Oshkosh. Wisconsin.
BE a Magician. Large professional magic catalog of latest tricks. 35c. Ire land. F-109 North Dearborn. Chicago.
VENTRILOQUISM - Easy instructions. 25c. Dummies. Magic. Catalog free. Leaderbrand. Cal Allen. Texas.
"JUMBO" Catalogue!! - Tricks!! Magic!! - Funmakers!! 10c. Rick's. Box S-260. Chicago 90.
DOLLARS in the mail for you! Put your ad here and watch orders fill your mailad here and watch orders fill your mailbox. For as little as $\$ 8.00$. you can adverise your product or service in the classified Monthly. The February issue closes on DeMonthly. The February issue closes on Deand free copy of booklet "How To Make and free copy of booklet "How To Make Money Out Of Classified Advertising. O. K. Kelly. Classified Adv. Mgr. Dept. Ave.. New York 10 . N. Y.

## 26 COIN COLIECTING:

GET Profit and Pleasure in collecting old coins. Send 10 c for 56 -page illustrated coin catalog. You'll be delighted with it. Building. Fort Worth. Texas. Largest rare coin establishment in U. S. Established 53 years.

FREE! Foreign coin. banknote and Coin Collectors' Illustrated Catalog to approval service applicants. Send 3c postage. Tatham Coin Co.. Springfield-50. Mass.
OLD Money Wanted. Will pay $\$ 100.00$ for 1894 Dime. S. Mint. $\$ 50.00$ for 1913 Liberty Head Nickel (not Buffalo). Big premiums paid for all rare coins. Send 4 c premiums paid for all rare coins. Send 4 c profit to you. Numismatic Co.. Dept. 30. prort Worth. Texas.
WANTED-1894-S Dime Pay $\$ 500.00$. Certain 1913 nickel $\$ 1.000 .00$. 1901-S quar: ter $\$ 20.00$ to $\$ 150.00$. Hundreds of others. Know their true value. Complete illustrated catalogue 25c. Worthycoin Corporation. (D-301). Boston 8. Mass.
$\$ 1.000 .00$ JAPANESE Invasion Note $\$ 1.00$. 100pp Illustrated Coin Catalogue 25 c. Shultz. Salt Lake City 10. Utah.

LIBERTY Nickels 10 Different $\$ 1.00 .15$ Different $\$ 2.00$. Rhodeco. 105 Windsor, Reading. Pa .

WHAT Are your coins worth? Amazing Fell's new 1953 United States coin book. Everything on every single coin mintedWorth, value. how to sell. speculating. investment: other valuable facts. Clothbound. 150 illustrations. Send no money Pay postman only $\$ 1.50$ (plus postage) or $\$ 1.50$ postpaid (refundable). Order now! Fell Publishers. 386-U312 4th Ave., New York City 16.

FIFTY indian head cents $\$ 2.00$. Sayers, 1000 East Unaka. Johnson City. Tennessee. 103 DIFFERENT Foreign Bills- $\$ 1.00$. Free List. Dwight Musser, Dunbar. W. Va.
WORLD's Greatest Magazine for coin collectors and wooden nickel 10c. Lawrence Brothers, Anamosa, Iowa.

200 DIFFERENT, including Roosevelt triangle. $\overline{5}$ to approval applicants. S. Avalon Stamp Co. Springfield. Mass.

FREE-Complete set of Famous Americans. Flags. Parks and Presidentials to approval buyers. Send 3 c for 15 of the above stamps plus full particulars. Triboro Stamp Company 145 Nassau Street Dept. 212. New York 28. N. Y.
POLAR Bear Triangle: Giant George Washington. Six Colored Ecuador. Arctic Triangle, first American commemorative Corsica. Devils Island. others. Everything ree with approvals. Capital Stamps. Litthe Rock 10. Ark.
FREE! Powerful Magnifying Glass ior 5 c Post. Bargain lists and approvals. town. New York.

FREE Stamp Collection:-100 different stamps from Europe. Africa. Asia. Scandinavia. Balkans. etc., 3c to approval applicants. Tatham Stamp Co.. Springfield 50 Massachusetts.

FREE, Valuable mystery gift. Aprovals Raymax. $37-\pi$ Maiden Lane New York City.

65 ALL Different U.S. Stamps. Includes 50 yr . olds. commemoratives. airmails and $\$ 5.00$ Stamp. Only 10 c . Approvals. Willett Co.. Box $511-\mathrm{M}$. Port Chester. New York.

ALBUM! Capacity over 1.000 stamps! Only 10c!! Stampmart. Hartford 1. Conn.

AMAZING Offer! 200 United States stamps-including commemoratives. airmails. high denominations to s1.00-only 10c to Approval Applicants!! Illustrated Bargain Lists free. Mystic Stamp Co. Dept. 55. Camden. New York.
312 MIXED U. S. only 10 c to "Gold Nugget'" approval applicants! Nothing like them. Kessel's. Folsom. California.
SPECIAL!! Nudes collection: approvals -5 c . Atlas. 2830-P Eisenhower. Racine Wisconsin.
327 DIFFERENT Stamps 25c! Including early Canada. Newfoundland. British Colonies. Vatican. Red Russia. Hitler Heads. Indian States. Animals. Airmails. French Colonies. Rarities. Unusuals. Every Stamp different. Rare bargain with approvals. Money back guarantee. Niagara Stamp Co. Niagara-on-the-Lake 62 Canada.

EXCHANGE Your Duplicate Stamps. Send 100-200 different foreign and dime Receive all different. Patterson.
'WOW! 203 All Different Germany 15 c " Zeppelins. Semi-Postals. Airmalls. High Values. Big bargain lists and approvals included. Jamestown Stamp. Jamestown 509. N. Y.

3000 DIFFERENT Worldwide $\$ 4.75 ; 5000$ $\$ 9.50$. Buywise. Box 115 T . Hollis 23. N. Y AUSTRALIA. 47 all different. 10 c . An$\frac{\text { derson. Box } 52 \text {. Seaside Heights. N. J. }}{\text { COLOSSAL Stamp Zoo 10c. Jungle }}$ Beasts. Wildlife. Domestic animals-Fif teen different. including Rhinoceros. Elephant. Snake Tiger. Zabu. Kangaroo.
Koalabear. Emu. Kookabura. Bull. Horse Koalabear. Emu. Kookabura. Bull. Horse -Extraordinary accompanying approvals. Niagara Stamp Company. Niagara-on-the Lake 52. Canada.

FREE Sets; colorful surprise 10c. Approvals. trades-Bristol Stamps. Collinsville. Conn.
12 PACKETS from 12 different countries \$1.00. Mammoth Packet List Free. Econo\$1.00. Mammoth Packet List Free. Ec
51 DIFFERENT from 51 countries. 10 cents. Schmidilin. Dep't. 8. Russiaville. Indiana.
INDONESIA Famous American Bicolors. Box 1246-V Church Street Station. New York City 8.
225 STAMPS For Only 10c! This mammoth value includes Airmails. Pictorials; moth value includes Airmails. Pictorials; stamps from strange Countries cataloguing up to 25 c each! Also approvals. Mystic 100 DIFFERENT U.S. 50c. Approvals. Utechts. 1143 A North Keeler. Chicago 51 .
1.000 STAMPS for you to look at-big, attractive approval books of beautirul stamps. Pick and choose to suit yourself, at 1 c to 5 c each! Let us show you the economical way to a large. worthwhile collection. Wolverine Stamp Service. Dept. D-3. Fruitport, Michigan
ROOSEVELT Greece Pope Triangle. Greenland. Israel. 51 others. 5 c . Approvals. Longhorn. Box 3068 P . Lubbock. Texas.

LION Triangle Mosquito, 104 others, all different. 5 c . with approvals. Mercury. different. 5 c . with approvals. Merc
Scarboro Junction. Ontario. Canada.

222 ALL different 10c to approval applicants. Jayne. Gravesend Sta. Brooklyn 23. New York

FREE: Mint British Colonies from Tonga. Seychelles. Brunei, Transjordan, Sarawak. Solomon Islands, Caymans. Gilbert Enlice-Free with approvals. Viking, GORGEOUS Orchid Diamond plus EnorGous 5 -colored Flag. Will Rogers airmail, mous 5-colored Flag. Will Rogers airmail, Corsica and 25 others all 3c to approval borsica and 25 others all 3c to approval buyers.
$15 . \mathrm{D} . \mathrm{C}$
DEALERS Wholesale catalog. Postage 3c. Franksco. 5031 Queensbury. Baltimore. Maryland.

MIDGET Triangle-Giant Diamond. Rhino, Greenland. 28 others. 3c Approvals. Vidal. 3396 Alta Vista. Cincinnati i1. O. COLONIAL Collection Free-Magnicarocious collection. British. French. American and other Colonies. Flowers. Animals. Commemoratives. Triangles., Pictorials. High Values all free "plus". Philatopic Magazine. Send 5 c for postage. Empire Stamp Company. Dept. PR. Toronto, Canada.

500 WORLDWIDE stamps 50 c to approval applicants. Faith. 13391/2 Westminster, Alhambra. Calif
U.S. Complete Sets unused Farley Parks $\$ 1.75$ Flags 90c Presidential Coils 60 c Parks $\$ 1.60$ Illustrated U.S. list. Standard 108 DIFFERENT stamps including triangles. diamonds. rarities. pictorials. commemoratives. and topicals only 10c. With approvals. Cassidy. Hampton 600, New Brunswick.

TRIANGLES. Airmails, Bicolors. USA stamp centenary. Columbus. Trieste. Garibaldi. fortresses. large historical pictorials. 3 c to Approval Buyers. Fortune Stamp Company. PSM3, Washington 10 . D. C.

FREE! Monaco nude set. These popular stamps offered new approval applicants. Moumblow. Box 278 M . East Northport, N.Y.

ITALY. 100 Different 10c with ApprovYork 1.
OLD scarce U. S. seconds on approval. Slightly defective. bargain prices. Hearn$\frac{\text { feld. Clintonhill Station. Newark } 8 \text {. N J. }}{50 \text { DIFFERENT Juventute stamps } \$ 1.00}$ Ernst Schmid. Hauptpostfach 255, Zurich, Switzerland
BEAUTIFUL New Zealand 1943 Elizabeth and Margaret Rose triangles only 10c to approval applicants. George Richie. 1539 Sixth. Alameda. Calif.

FREE 119 Foreign Stamps including Africa. Australia. Pakistan. China. India, Russia and Scandinavia. Send 10 c for postage and handling, With approvals. 82. Canada.

UNITED States- 58 different including 8 airmails. 15 commemoratives. 10c. Approvals. Sunsets. Box 47 . South Gate. Calif. GIANT approvals thousands different 1 Farragut. Chicago 31, Ininois.

UNITED States- 40 different 10c; 40 different Commemoratives 25 c . No approvals. Seidenberg. Appleton 944. Wisconsin. 60.000 DIFFERENT, on approval! World-
Wide. Cole. 43-G Rinewalt. Buffalo 21. N.Y. 50 BRITISH Empire-All DifferentPlus Illustrated Book "How To Recognize Rare Stamps." Only 10c with approvals! Kenmore. Miford G-9. New Hampshire.

FREE. Scott's International Album other premiums. Details with approvals IRaymax. 35-X Maiden Lane. New York City.
PHANTOM Plane Airmails-genuine flown copies from French West Africa (C12-14) handsome, mammoth stamps. with high catalog value-plus packet stamps from 50 different countries-all for 25 c ! Interesting approvals. Modern Stamp Co.. Dept. B-3. Ferrysburg. Michigan.

FREE Congo Flower Set, Approvals. Eagleco, 6916 Roosevelt Boulevard. Philadelphia 49. Pa
SENSATIONAL Twenty-five different colorful pictorial complete sets plus desirable bonus packet everything only 20c. Bargainful Approvals accompany. Dresel Box 270-S. New York 25. New York.
299 DIFFERENT Worldwide Stamps 25c. plus Hitler Heads. British Colonies and attractive stamps on foreign cover. Everything complete 25 c to adults requesting thing complete 25 c to adults requesting approvals. Canada Stamp Co. 1907 Main
St.. Dept. 119. Niagara Falls. New Iork.
ALBUM 100 Diff. stamps. 3 premiums -20 c . Smithco. Box 6618 . Northeast. Kansas City 23. Missouri.

FREE Sample-Interesting, informative Illustrated! National Stamp News. Anderson, South Carolina.

PENNY Approvals by country. M. H Hoerning. 102. Farmington, Ark.

27 HITLER Stamps from five Nazi dominated countries. Historically valuable collection only 5 c . to approval applicants. Gulfstream PSM. Hillsdale. New Jersey.

AUSTRIA-packets. sets, singles. Lists 10c. Henry Faville. Box 2005. Madison 5. Wisconsin.
FREE 4 Germany pictorial sets. Approvals. Pleasure Stamps, 1865 A 52nd, Brooklyn 4. N. Y
FREE! Scott's International Albums Parts 1. 2. or 3. To regular customers foreign approvals. Hal Buck. 935 Waterloo Road. Stockton. California.

CANADA- 100 Different. 25 c with approvals. Crown Stamps. Box 331, Toronto, Canada.
50 DIFFERENT Argentine. 10c. Approvals. Reuter. 611-D W. 40th Pl.. Los als. Reuter
Angeles 37.
WOW! 7972 Different Worldwide Stamps From 36 Stamp Companies With Approv als $\$ 8.00$. Names 1000 Stamp Collectors $\$ 5.00$. King. 32 Alexander. Kamloops. B.C. Canada.
FREE U.S. mixture and bargain list. Rothberg. X 123 PS . Braintree 84 . Mass. 50.000 STAMP Grabags 25c each. Anderson. 630a Bingaman. Reading. Pa.
333 STAMPS 10c! Amazing value. Approvals. Star. Box 478 A . Alice. Texas.
NEW Zealand triangles. Queen Elizabeth. 10 c with approvals. Seminole stamps, Box 1138-S. Coral Gables 34, Fla.

OPPORTUNITY! Gorgeous lot with Triangles, Giants. Midgets. Flags. Airmails and Railroad Stamps. Also. Guiana, Brunei. Mongolia. Sarawak. Etc. EveryEving only 10 c to approval applicants Evden. Valley Stream 25. New York
1000 FINE Mixed U.S. Stamps 25 c . Wright. 201 Mealey Hagerstown 2. Md. LOCOMOTIVE - Airplane - many Pictorials. Free with approvals. Wirth, Melrose Park. Norwich. Conn.
STAMPS Galore! Foreign mail clippings 25 c ounce. $\$ 3.50$ pound. Uhl. Lantana. Florida.
FREE Foreign Stamps. Approvals. Durham Stamps. Box 567. Burbank. Calif.
SENSATIONAL U.S. Confederate States catalogue free. Stone, 45-S Bromfield. catalogue
Breston 8, Mass.
ZOUNDS! Exciting "Strange Countries" Packet-Free with approvals! Saxon. Vista. California.
WONDERFUL Offer Seven complete mint sets only 10c with approvals. Reich
(S26). 1033 Lawrence. Chicago 40.
WANT better stamps? Try our quality United States. Foreign approvals. No. Andover Stamp. Noith Andover. Mass.

BARGAINS galore low priced approvals. Chur, Box 245, Buffalo 12, New York.

500 WORLDWIDE Mixture. Big Variety 25 c . Mo.2jar. Fairmount. Cincinnati 14. Ohio. U.S. 500 Mixed $25 \mathrm{c}, 1000-40 \mathrm{c}$. 50 Different 10c. 50 Different Commemoratives 25 c . Sibley. Mendon. Mass.
100 DIFFERENT British Empire 10c with approvals. Sadler. 9013 Central. Kansas City 14. Mo.
w/2\# U.S. Mixture. Old-New. 50c. Lists. Weatherby. Medina. Ohio.
EXCITING. unusual stamp packet! Only 10c with approvals! Plymouth, Box $365-\mathrm{H}$. Far Rockaway. New York.
DIFFERENT? U.S. to your order. No approvals. Free lists. Wm. Kuehl, 3125 East K. Tacoma 4. Washington
TWO mint U.S. plate blocks only 25 c with approvals. William Wern. 333 No. Michigan. Chicago 1, Illinois.
$\star+5$ TRIANGLES 2c with approvals. Choice Stampco. P.O. Box 424, Miami 3. Florida.

100 DIFFERENT with worldwide approvals 10 c . Jacobsen. 4395-B Broadway. New York 33
"MONACO Nudes" (5). 10c with approvals. Royal Stamp Company. Tamaqua 2. Penna.

MAGNIFICENT; Nineteenth Century U. S. Plus Civil and Spanish War Revenues. 20 Different 10c To Approval Applicants. AAA Stamp Company, Arcade Building. St. Louis 1. Missouri.
BAHAWALPUR Silver Jubilee mint set free to applicants of U.S. or British Colonial approvals. Alan A. Taylor. Skyland, N.C.
START your own Stamp Business. Send for Free circular. Donald Shepard. Box 1147. Chicago.

FREE. 250 stamp hinges and 20 different Canada with approvals. Jaydee, 218 West Dickinson. Grand Rapids 7. Michigan.

UNBEATABLE! 30 complete sets. $\$ 1.00$. Approvals. Pinkerton, Box $81-\mathrm{M}$. Bethlehem. Penna.

100 DIFFERENT Spain 25c. Penny approvals included. Reed. Box 980 . Chicago 90 Illinois.
50 DIFF. Finland 10c with apprevalsCarroll's. W-310C Sprague. Spokane. Wash.
COMMEMORATIVES-U.S.-Your choice 20 Mint or 75 Used. All different. $\$ 1.00$. G. M. Granstrom. 612 Orange, El Centro. Calif.
FREE! Unique illustrated bargain catalog of Mixtures. Packets. Accessories. Many pages, values galore for any colTowerco. 1630 West Melrose. Chicago 13. 500 STAMPS. all different. 50 c . Eddie Stoka. 10511 Peoria. Chicago 43. Illinois. DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as $\$ 8.00$. you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The February issue closes cn December 22nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classifled Advertising". O. K. Kelly. Classified Adv Mgr. Dept. 1253. Popular Science Monthly. 353 Fourth Ave., New York 10. N. Y.

## 29 ANTIQUES, RELICS \&

OLD Guns. Prices. Free catalog. Pioneer Press. Harriman. Tennessee.
PROCRASTINATING?-Am selling several hundred Historical Firearms. ${ }^{30} \mathbf{3 0 . 0 0 0}$ Prehistoric Relics. Collectors Cartridges. Coins.-Revolutionary, Confederate. Civil War Flintlocks, Muskatoons, Revolvers. Blunderbusses. Winchesters, Carbines. Frontiers.-400 Bayonets. Swords. Bullet Molds. Ramrods. Gun Parts.-Powderhorns. Blo-horns, Bo-wood, Deer-steerbuffalo horns.-Arrowheads, Tomahawks. Hammerstones. Spearheads. - Dauguerrotypes. Violin Wood, Agates, Minerals. Fossils. Gold Dollars.-Catalog profusely illustrated. 35c. Heike. (Dadeville). Wenona. Illinois.

ARROWHEADS, location given. four $\$ 1.00(24-\$ 5.00)$ Bird Points. two $\$ 1.00$ Tilton Relics. Book-Relic Catalog 10c. Tilton Relics, Topeka 10. Kansas.

4 FINE Indian Arrowheads $\$ 1.00$. Good Grooved Tomahawk $\$ 2.00$. Lear's. Glenwood, Arkansas.
BEAUTIFUL Black Obsidian Arrowhead \$1.00. List. Moise Penning. Klamath 3. California.
ANTIQUE Firearms. pistols, percussion flintlocks. list 25 c . Westbrook. 738 Royal Street. New Orleans. La.

## 30 MINERALS \& PRECIOLS <br> TONES

INDUSTRIAL mineral prospecting pays big when you 'Hit''! Free instructions. Stratex Instruments. 1861G Hillhurst. Los Angeles 27.
GEMSTONES. Mineral specimens. Every variety. Lowest prices. Postcard brings free booklet. Plummer's. 4720 Point Loma Ave.. San Diego 7. Calif
GEMOLOGY Books! Catalog 10c. Atlantic Books. 2 Lawrence. Charlestown 29 , Massachusetts.

SAPPHIRE-tourmaline - topaz - garnet - peridot. 5 uncut gem specimens. $\$ 1.00$. O'Briens. 1116 B Wilcox. Hollywood 38. Calif.

COLLECTORS. Two Dollars brings twelve beautiful genuine specimens from gemland Brazil. $\$ 5.00$ brings perfectly cut en carat Brazil topaze. Airmail bills or check. Jean Bach. 413 Praia Icarai. Niteroi. Brazil.
CRETACEOUS Fossils (Exogyra arietina) 2 for 25 c . 10 for $\$ 1.00$. Hawkins, Route 4, Georgetown. Texas.
COLLECTION Colorado Gems, identifed. \$1.00. Bader's, 839 East LasAnimas. Colorado Springs. Colorado.
COMPLETE chemical analysis of minerals and ores, $\$ 3.00$. Garger's, 2172 $1 / 2$ erals and ores, $\$ 3.00$. Garge
WYO. Jade or Sweetwater Agate 25 c . specimens-jewelry-setting. etc.-free list -Hays. 417 West 17 th. Casper. Wyoming.

## 31 HOBBIES, COLLECTIONS

INVENTING can be an interesting and prontable hobby. Write for complete parinculars. Institute of American Inventors inglon 60-E, $631-E$ St.. N. W.. Wash-
4 HOCEL Baggage labels 25c. Copleston, 1555 Odell, New York 62, New York.
CLEARANCE Sale! Army Patches 3c up; Catalogue 10c; 32 different emblems $\$ 1.00$. Hobbyguild. 550 Fifth Ave., New York City.
MILITARY Miniatures Catalog 25c. Bob Bard. Box 1463. Baltimore 3. Maryland. WANTED-Cigarette, tobacco cards. Write Charles Bray. East Bangor. Penna. EXCITING Hobby; collect Authentic Military Patches. Insignias. Campaign Ribbons. Nayy Rates. etc. 57 assorted $\$ 1.00$. Free gift. Pritt, Dept. S-12, 12 West 27 th. N. Y. C

MILITARY Miniatures: U.S. Marines. American Revolution. Civil War. Custer's Cavalry. Illustrated Catalog 25c. Bussler Quincy 69. Mass.
NAZI. Soviet. Campaign ribbons. big packet. Lists $\$ 1.00$. Medcrafts. 1923 34th St. SW. Calgary 3. Canada.
UNUSED matchbook covers- 100 different \$1.00-36 page Catalog 25c.-Charles Edelman. 1311P East 84. Cleveland 3, O.

## PLOTO FINISHING,

35 MM- 36 Exp. Develop \& Jumbo Print each \$1! Guaranteed Quality-Free Mailer. Flash Photo. Box 36P. Parksville Sta., Brooklyn 4, N. Y.
TWO Prints each good negative. 8-exp. $35 \mathrm{c} ; 12-\mathrm{exp}, 50 \mathrm{c} ; 16-\mathrm{exp}$. 65c; Reprints 4c,
Mayfair Photo Service. Box $617-\mathrm{A}$. Toledo, Ohio.

PHOTOGRAPHY For Pleasure or profit. Learn at home. Practical basic training. Long established school. Free bookiet. American School of Photography, 835 Di-
versey Parkway. Dept. 1746. Chicago 14.
OVERSIZE Prints no extra charge. 8exposure roll, 30 c .12 -exposure. 45 c . 16-exposure. 55c. Reprints oversize 4c. Finest 297. Watertown, Wisconsin. Service. Box

PHOTOS copies-20 Wallet-Size deluxe prints $\$ 1.00$. Original picture returned. Send any size photo or negative. (No C.O.D.'s Please) Federal Wallet-Size Photo Co.. Dept. P.S., P. O. Box 2448. Kansas City 6. Mo
KODACOLOR Prints by Eastman for Christmas. Special Handling. Send Kodacolor negatives. Send $2 \times 2$ color transparencies and 25 c for making each Kodacolor negative. Prints: $31 / 2 \times 5-37 \mathrm{c}$; $5 \times 7-\$ 1.75$; $8 \times 10-\$ 4.00$. Order by December 10th. Free catalogue and maller. Fascolor Service Company. Box 86, Rochester 1. New York.

TOP Quality Fast Service. 8 Exposure Roll Jumbo Finish Super Pak Album Only $35 \mathrm{c}-16$ contacts 40 c . Free Mailers. Complete Photo Finishing Service. Satisfac1410. New York 1, New York. GPO Box

SENSATIONALLY New- 16 oversize contact prints or 8 plastic bound superpak album jumbo prints with your frst roll
25c. Album Studios, Weatherford. Okla.
ENLARGEMENTS! Eight $5 \times 7$ 's or five 8x10's. \$1.00. Wilart Enlargers. Box 967, 8x10's. $\$ 1.00$. Wilart
Little Rock. Arkansas.
$\underset{\text { ROLL developed and } 4 \times 6 \text { or } 3^{1 / 4 \times 41 / 2}}{ }$ oversize glossy velox prints 8 exposures 40 c . 12 exposure 60 c . 16 exposure 80 c . Hagner Photo Service. 1318 West Columbia Avenue. Philadelphia 22, Pa.
FREE Mailers, contact prints 4c. Jumbos 5 c . 25 Photo Xmas Cards $\$ 1.95$. $100-$ $\$ 6.75$. Western Photo, Dept. PS123. Box 69. San Francisco 1, Call.

CHRISTMAS Cards from your favorite negative, 18 for $\$ 1$, including envelopes. 60 cards $\$ 3$. Send 15 c for postage and pack-
ing. L. A. Eastman Studio, Bode. Iowa.

## 33 MOTION PICTURES, SLIDES,

SOUND EQUIPMENT
GUARANTEED Fresh 8 mm roll. magazine; 16 mm roll, magazine movie film. Color, b\&w. Free catalog. Eso-H, 47 th Holly, Kansas City 2, Missouri.
MOVIE Camera Film: 8 mm roll $\$ 1.50$, $16 \mathrm{~mm} 100^{\prime} \$ 3.00$. Free processing. Better $\frac{8-16 \mathrm{MM} \text {. Silent-sound films. Complete }}{\text {. }}$ rental library. All latest subjects. Free catalogue. (sample film 10c) Garden Film, 317 West 50 th. New York 19 .
FREE Giant catalog of 8 mm \& 16 mm films for home movie enthusiasts. Films for every occasion. Lee Stann, Dept. PS12, WILD Life Films. Exciting, dramatic action in the natural habitat of animals of forest and plain. 8 mm or 16 mm in beautiful color or B. \& W. Also $2^{\prime \prime} \times 2^{\prime \prime}$ color slides. Write for free illust, literature. No. Hollywood, Calif.
TAPE Recorders, Tapes. Accessories. Unusual Values. Dressner, 624 East 20th Street, New York City 9.
5,000 NEW-Used $8-16 \mathrm{~mm}$. Silent-Sound Films. International, 2120 Strauss, Brooklyn 12, New York.
TITLES and Christmas Carols on 35 mm color slides. Free illustrated list. Slide Titles, 1440 Broadway, New York 18, N. Y.
RENT 16MM sound films 50c reel. Large selection; free catalog. U. C. Film Serv-
ice, 128 Chestnut St., Roselle Park, N. J.
BARGAINS 16 mm sound films also for exchange. Bedner, 5300 So. Talman, Chicago.
EARN up to $\$ 15.00$ dally with your movie projector! Details free. Metcalf, 10806 Glenroy, Chicago.
NEW Movie Bargains! 50 ' 8 mm . Prevue film, $59 \mathrm{c} .300^{\prime} 16 \mathrm{~mm}$. silent rilm (value $\$ 9.75$ ), $\$ 1.98$-our title choice. Blackhawk ${ }^{8 m m}$. films-Children's Films. Railroads, \$2.98; Bible stories $300^{\prime}, \$ 7.98$. New, used 16 mm sound, silent bargains, too! Six used $100^{\prime} 16 \mathrm{~mm}$. reverse-image Panoram musicals, $\$ 3.49$. Good used 16 mm . sound projectors-all leading makes- $\$ 129.95$, Films, 1128 Eastin Bldg., Davenport. Iowa.
8 \& 16 MM Professional National Parks Movies in full color, Reasonable. Ideal California 4644 Geary. San Francisco 18, California.

34 CAMERAS, PHOTO SUPPLIES
BASS Says: Trading cameras a national habit since 1910. Write to Bass the old Horse Trader." A postcard will do. Sim ply say: "Bass. I have and I want How much will you allow me?" Satísfaction guaranteed. Bass Camera Company,
Dept. AG. 179 W . Madison St., Chicago 2.

PHOTOGRAPHY For Pleasure or profit. Learn at home. Practical basic training Long established school. Free booklet American School of Photography, 835 Diversey Parkway. Dept. 172C. Chicago 14, Ill.
BUY wholesale nationally advertised cameras, photo supplies. thousands other products at big discount. Free "Wholesale Buffalo 16, N. Y

WHOLESALE Photographic Supplies. Cameras. Films. Projectors. Enlargers. Write for Free Catalog. Capitol Photo Supplies, 2428 Guadalupe. Austin, Texas.

TAKE Better Pictures! First new Popular Science camera book in 10 years! 256page 'Everybody's Photography Manual" Over 750 illustrations; new facts on films, cameras, developing. home movies, accescarier, more! Only $\$ 2.49$, satisfaction aces sories, more! Only $\$ 2.49$, satisfaction guaranteed. Popular Science, Dept.
Fourth Avenue, New York 10. Y.

## 35 <br> MUSIC, INSTRUMENTS \&

## SONG WRITERS

WANTED! Poems for musical settings. Write Songwriters' Service, Clifton, N. J. POEMS Wanted to be set to music. Free examination. Send poems. McNeil. Maser of Music. 510-
Angeles. California.
POEMS Wanted for musical setting. Send poems. Free Examination. Five Star Music Masters, 646 Beacon Bldg., Boston, Massachusetts.
POEMS Wanted for musical setting. Send poems, Free examination. Crown
Music Company 1472 Broadway New Music Comp.
SONGWRIIERS! Protect your poems and songs! Don't mail anywhere! Write for safe procedure! Song Service, 333 W 56th. Dept. P.S., New York 19. N.Y. SONGWRITERS! Let me help you. Stamp for booklet. Mark Rubens, 146-C West 79 Street, New York 24, N. Y.

SONGPOEMS Wanted. Mail to: Tin Pan Alley, Inc., 1650 Broadway, New York 19. N. Y. GUITAR-Easy as pie. Quick, new simplified course. Individual mimeographed lessons. Arranged by popular Radio artist. ment, 505-Fifth Avenue, New York 17 . SONGWRITERS. Impress publishers With recordings that we make from your "lead sheet." Details Free. Masterpiece
SONGWRITERS! Send poems, songs. Music Service, 243 West 72nd St., PS, New York 23 .

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

INSTANT piano playing! New Method Assures Instant Results! Praised by thousands! No Piano Needed! Study homeplay anywhere!, Write now! \$2 Postpaid. "Instant Piano", Dept. \#100, Paraville Station, Brooklyń 4, New York.
FREE Record of your song-Your words - My melody. Free iniormation. Johnny Mack's Melody Mart, 1094
Street, Dept. K, Los Angeles 37 .
POEMS Wanted for musical setting. Send poem for immediate consideration and Free Rhyming Dictionary. Richard Brothers, 46 Woods Building, Chicago 1. DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. yor as little as $\$ 8.00$, you can adver-
tise your proauct or service in the classined tise your proauct or service Popular Science Monthly. The February issue closes on December 22 nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising' O. K. Kelly. Classified Adv. Mgr., Dept 1253. Popular Science Monthly, 353 Fourth Ave. New York 10, N. Y.

SELF taught courses: Piano. singing. songwriting. and other instruments. Song collections. Music. Teachers' Associates. 26P Potters Lane. Great Neck. New York.
1953 ACCORDIONS - Wholesale. Free catalog. American Accordion Center

36 RADIO, TELEVISION

## SUPPLIES \& EQUIPMENT

MAKE simple, tubeless. batteryless. dis-tance-getting crystal radios. Crystal and illustrated instructions 25 c postpaid. Allen. 427-S. Clinton. Mo

FREE Radio Tester. Tools. Soldering Iron. Build and keep is guaranteed higi quality Radios and Test Equipment-only $\$ 19.95$ complete. No experience required Money-back guarantee. Order direct or send for descriptive literature. Free-valuable Radio and TV Repair Guide on request. Progressive Electronics. 497 Union Ave., Dept. PS-12, Brooklyn i1. N. Y.

LIMITED Quantity surplus double head phones. High quality, Slightly used. $\$ 7.95$ anteed. Allen, Dept. PSH, Clinton, Mo.
SEND \$3 Crystal Radio set complete Box 2929, Odessa. Texas.
RADIO-TV Troubletracer. Fix all Radios and TV Sets. Become serviceman Overnight. No experience needed. Guaranteed. Complete. Send $\$ 2.25$ pius 20 c post age. International Instrument Development $11 . \mathrm{Y}$.,

NEW TV Catalog Free. Loaded with bargains for TV servicemen, technicians. installers. Finest new TV antennas. Mo torless Directronics, Multi-Channel Yagis. UHF Antennas. Converters. Motors. Boost ers. Parts, Instruments, hundreds of qual ity accessories at money-saving prices Get your catalog now! National Electronics, 4112 Delco Bldg.. Cleveland 3. Ohio.
CRYSTAL Radio experimenters. Write Leslie Hulet, R. 4, Lakewood. New Jersey

MAKE simple powerful distance-getting crystal radio. Works anywhere. Illustrated booklet fifteen cents. Money back guaran tee. Francis, Box 5963, Cleveland, Ohio CLEARCO Crystal Radio kit $\$ 1.50$, pre assembled $\$ 1.75$, iree catalogue. Clearco Crystal Co., Box 1857, Milwaukee 1. Wisc.

BUILD two way crystal set. Receives radio signals or music from phonograph Complete plans 50c or radar type fixe crystal and plans $\$ 1.00$. Bean Electronics Box 582, Bellflower, California

TVeto silences annoying television, radio commercials! Operates from your viewing chair. Attach it yourself to any set; it's easy, harmless! Money back guarantee $\$ 2.95$ postpaid. TVeto, Box 444 , Arcadia California.

TALKIE Crystalphone: Nearest thing to a real Walkie Talkie. Talk and receive Radio programs. Instructions 50 c . Talkie Crystalphone, Valley Road, Box 27, Clark T'W'P-Rahway, New Jersey.

CRYSTAL Set experimenters. New book devoted entirely to "Theory, Design and Operation of Crystal Receivers" written by graduate engineer. Amazingly thorougn. covers transistors; easy to understand charts, circuits. Only $\$ 150$ postpasid charts, circuits. Only $\$ 1.50$ postpaid. Don' miss your copy! Kott, 5024 St. Clair.
Detroit 13, Michigan.
AMAZING photoelectric cell transforms light into electrical energy. Unlimited uses. Only $\$ 1.00$. Springfield Enterprises Box $54-\mathrm{N}$. Springfield Gardens. New York.

CRYSTAL radio kit, $\$ 1.50$; Phone. $\$ 1.75$;


SUPER Bargains! Radio-Television tubes and parts. Amplifiers, Phono oscillatols Test Equipment. Free Literature. Southard's TV. Box 464. Farmersville. Calif.

TELEVISION Interference Eliminated with amazing, easily installed, guaranteed, antenna high-pass filter. Unbeliev able. only $\$ 1.00$ postpaid. BMB Co.. Box 8 Hillside Manor Branch. New Hyde Park. New York.

TUBES nationally advertised brands Wholesale
8709 114th Street,
Electronic Tichmond Hill, N. X .

## POPULAR SCIENCE OPPORTUNITIES

MAKE simple, tubeless batteryless. dis-tance-getting crystal radios. Crystal and Allustrated instructions 427 -S. Clinton. Mo. 25 c postpaid. Allen, 427 -S. Clinton. M
REPAIR your own TV. Personalized instructions. Send model number and $\$ 1.00$. LS Engineering. Box 4113. No. Hollywood, California.
STOP radio Television noise immediate1y. Patented filter plug eliminates interlights motors applances. fuorescent tion. No C.O.D.'s, try 7 days. money back guarantee. $\$ 1.00$. Electronic Tube-Mart. 8709 114th Street. Richmond Hill, New York. Dept. PS-1253.
COLOR television! Enjoy multicolor filter screen now. Easily attached. Send $\$ 2$ or your screen size. Satisfaction guaranteed. Zingo Products, Johnstown 9, N. Y.

## 37 BUSINESS OPPORTUNITIES

EXTRA Money-No Selling-operate vendors. Amazing profits. details Free. Silver King. Suite 221. 622 Diversey. Chicago 14. GOOD Paying Business Silvering mirrors. plating autoparts. refiectors, bicycles, bathroom fixtures, etc. by late methods. No tanks or shop required, outfit furnished. Free Booklet.
E. Decatur. Illinois.
OFERATE profitable mail order business. Write Walter Service, 4159-B East 112th. Cleveland 5. Ohio
MAKE money addressing envelopes. Our instructions reveal how. Glen Glenway, 5713 Euclid. Cleveland 3. Ohio.
IMPORT-Export! Opportunity, profitable. world-wide, mail-order business from home, without capital: or travel abroad. Established world Trader ships perience unnecessary Free details. Melperience unnecessars,
linger 69 C , Los Angeles 24.
NEWEST Spare. Full-Time Business. \$ō to $\$ 10$ hour possible. Paint with Suedethe finish with touch And eye-appeal. Beautify auto dashboards, Signs. radios,
toys. figurines. lamps-100. 1 others. Comtoys. figurines. lamps-100. 1 others. Com-
plete. Step-By-Step Instructions sent for plete. Step-By-Step Instructions sent for no-risk examination. Free detais. Coast.
$1004-\mathrm{HJ}$, So. Los Angeles St.. Los Angeles 15.
ENVELOPES addressed accurately, reasonably. Fast Service. We have capable addressers in your city. Glenway System, $5713-\mathrm{x}$ Euclid. Cleveland 3. Ohio.
137 PLANS for starting home business. Details: Elite Co.. 220-A Grand St., N. Y. 13. VENDING Machines-No selling. Operate a route of coin machines and earn Parkway profits. ${ }^{\text {amachine }}$ Corporation. Dept. 73 . Parkway Machine Ensor St.. Baltimore 2. Maryland.
MAKE Money spare or full time casting Metal Toys and Novelties. Big wholesale and chail store demand for Autos. Soldiers. Ashtrays. Banks, etc. keeps manufacturers busy. Production moulds furper hour. No experience or special place necessary. Write for information and illustrations of patterns needed. Metal Cast Products Co., Dept. E. 1696 Boston Road, New York $60, \mathrm{~N} . \mathrm{Y}$.
TROPICAL Fisn supplies. Save! Representative your area will supply. Nmoae, Box 4635. Los Angeles 24. California.
EARN Money Selling Binoculars. Rifles, Cameras. Send for free dealer bulletin. Nidorg \& Co.. $14-\mathrm{E}$ Washington Place.
New York 3. N. Y.

RECAST old batteries into new. Latest achievements. Battery Laboratories. Minneapolis.

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. CG, Inglewood 4. California
BREED Rare Tropical Fish at home. Earn Big Money! Learn Secrets! Help flil huge demand. Amazing Opportunity! Free Los Angeles 15.

RAISE Orchids-at home-big profitsfascinating. Year round any climate. No
Greenhouse. Instructions. Including Bloom-ing-size Orchid Plant. sent for no-risk examination. Free details. Flowerland 4622-F Wilshire. Los A.tgeles 5.

LEARN metalizing baby shoes. gifts, etc. Bronze. gold. silver. Folio Free. Kiktavi. 7217-PS South Broadway. Los Angeles 3

MAKE Perfume", Catalogue Free-"International." 6347 Parnell-PS-12, Chicago 21. Illinois.

FIX typewriters. Free booklet describes our modern. inexpensive home-study course. Factory methods taught. Write Typewriter. Building 4. Tarentum, Penna.
$\$ 25$ WEEKLY working two hours daily at home. Lycke. Box $2471-B$. Cleveland 12. Ohio.

NATURAL Molding Latex. Extra Thick. Free Sample, Flock. Tinsel. Supplies. W Wooley. 115-B Donald, Peoria. Illinois.
MAKE Money At Home às renewal headquarters for all magazines. Big Christmas Sales prufits now. Liberal Commissions. Supplies furnished. Write for Free Catalog. McGregor Magazine Agency, Dept. 510 B . Mount Morris. Illinois.
MAKE Money selling by mail; instructive booklet 25 c . Manhattan House. P. O. Box 51-L. Saint Albans 12, N. Y.
QUICK Money! "Repairing Car Batteries." At Home! Easy. Too! Batteryman, Grand Junction, Colorado.
OPERATE, profitable spare-time "Home Letter Shop,' by mail. Write Continental
Publishers, 1332 So. 61st, Milwaukee 14, Wisconsin
POPCORN and Potato Chip equipment. Long Eakins Company, 5363 High. Spring: Long Eakins
field 99 Ohio
GET Dollars by Mail! Keep every Penny. Terrill. Bogard. Missouri. BOOKKEEPERS-Earn more, money. Operate amazing "No-Ledger", system. Spare or full time. Free bulletin, Write
Frye. Box 432 . Chester, South Carolina.
EARN Money Selling Jewelry \& Home Appliances. Send for Free Wholesale Catalogue. Nidorg \& Co., $14-\mathrm{L}$ Washington Place. New York 3, N. Y.
HOW to Raise Needed Funds. Free details. Enterprise Bureau, Syracuse $2-\mathrm{S}$. New York.
HOW and where to obtain Capital? Free details. Star Service. Wapakoneta. Ohio.
INDUSTRIALISTS - Businessmen. Investigate Florida. Rapidly-growing Florida offers innumerable opportunities for business and large and small industries and a highly favorable tax situation. Write State of Florida. telling type of business you're seeking and specific requirements. You'll be put in touch with communities where opportunities exist and where you'll enjoy Florida's wonderful year-round climate. Free. complete information will be sent you. Write today: State Of Florida. InCaldwell Building. Tallahassee. Florida.
EARN Extra Money weekly mailing circulars for advertisers. Complete in-structions-25c. Siwaslian. 4317-B Gleane
Street. Elmhurst 73. New York.
"INCOME" from local information, No Selling. Write Neherco. Laverne 6. Calif.
EARN Money With Typewriter-Sewing Machine. Details Free. Edwards, 3915-PS, 12 th . Des Moines 13. Iowa.
ADVERTISING book matches-Cash in on big demand-sell Union Label matches. Cuts for all businesses and political par-prices-protection guaranteed on repeat prices-protection guaranteed on Co.,Dept. PX-1253, 7530 Greenwood. Chicago.
SUNNY California Land Bargains as low as $\$ 5.00$ rer acre. Low Down paymentslow monthly payments. Write for free information. Land Department, Suite 105. 1540 N. Highland Ave.. Hollywood 28. Calif.
ADDRESS advertising postcards. Must have good handwriting. Lindo. Watertown, Mass.
LEARN Sewing Machine Repair, electrify. sell. "How" to make big money at home spare time. New zigzag machines, etc.. wholesale. Details free. Taylor Service. Hamilton. Ohio.

START A Buying Service, buy wholesale thousands nationally advertised proddiscounts. Postcard brings details. American Buyers, $627-\mathrm{S}$ Linden. Buffalo, N. Y.

FREE! "301 Profitable Small Businesses!" Amazing shoestring plans! Work Home! Start Sparetime! Deumant Surveys. Kenmore 23-T. New York
BUY Wholesale nationally advertised appliances. watches. ecc. $i 000$ items for Christmas Catalogue 50 c . In itrinational Sales Company. Dept. B. 175 Fifth Ave. New York 10 . N. Y.

THRILLING Profitable Home Business Make fast-seller chenille monkey trees. dolls. flowers. Terrific holiday demand. Information free. Velva. Bohemia 17. N.Y.
MONEY in new greaseless doughnuts Start in kitchen. No smoke. Sell stores. Free recipes. S. Ray Co.. 3605 South 15 Ave.. Minneapolis 7. Minn
BRONZED baby shoe metallizing equip ment. New and used. Big selection of metal and onyx mountings. Free cata logue. Hollywood Bronze Supply. 1624-A E. First Street, Los Angeles 33. Callfornia.

EARN $\$ 50$ weekly in spare time. Lifetime vitamin business. Details free! Emim-Bee vitamin business. Details iree! Emim-Bee.
BOOKKEEPERS, increase earnings op erating sensational bookkeeping service Kern. 4942-B Vineland. No. Hollywood. Calif
WE Love our mailman-He leaves over $\$ 1.000 .00$ monthly in our rural mailbox. My college professor husband drafted a scientific home mailorder method. We bought a Texas ranch, live as we always wanted Now, we sell the "Ranch Mailorder Method." Operates anywhere. Inquire: Eveningshade Ranch. Helotes. Texas

WANTED! Home Producers. by manufacturers in our Clearing House Service. Become a subcontractor. casting plastic products for these companies. Thousand at home. without previous experience. Plastic Service Associates. Dept. 12-PS East Boston 28, Mass.

BE Notary Public. Rate higher. Details Free. Stationers. Helotes. Texas.
FREE details! Home operated mailorder business. Successful "Beginner's" plan Everything supplied. Lynn. $10420-\mathrm{C}$ National. Los Angeles 34. California.
GET A New Start In Life In Collection Business. Free Details. Franklin Credit. Roanoke 7. Virginia.

HOW To Start A Mail Order Business (And Keep it Going). Details. Jorine. Snyders Lake. Troy. New York.
MAIL Post Cards At Home. Everything furnished. Keep all money-Orders Filled Free. Rush name: Schipper. ${ }^{\text {nins. Rochester 21. New York. }}$
ONE man contracting business. $\$ 1.00$ investment. Free literature. McComb \& Son. Huntertown. Indiana.
MERCHANDISING with post cards! Details free, write. Simmons. 88 Weaver Buffalo 6. New York.
MINK Raising information free. Com plete. Lake Superior Mink Farm. Supe rior E E5. Wisconsin
MAKE Rubber Stamps, repair dolls learn invisible "reweaving, Molding Latex 1076-B, Peoria. Illinois.
NEW Exceptionally profitable plans ideas for home operated mail business Rush name. Miller, $1772-\mathrm{R}$ Carlyon Road East Cleveland 12. Ohio.
LIQUID Rubber. make flexible molds. Free Sample. Chaney. 1130 E. 16 th St. Jacksonville 6. Fla.

WHAT'S Your Field Of Interest? Whatever it is. specialized magazines will help you to greater success. Look over current copies of those covering your field through our Easy-to-Get-Acquainted service. Choose from 4,387 publications covering all fields hobsies. etc. Write for current list. It's hobbies. etc. Write for current list. It's
free. Commercial Engraving Publishing free. Commercial Engraving Publishing 19. Indiana.

MEN Wanted introducing regulators. senerator regulator and battery trouble Few spare hours make $\$ 25.00$ full time $\$ 1.000 .00$ monthly. Write how to start and get demonstrator free. Scientific Electric get demonstrator free. Scientific Ele

## POPULAR SCIENCE OPPORTUNITIES

$\$ 1000$ A Week Possible With Great Triple Profit Plan. Edlkara, Johnstown, Penna.
OPERATE profitable mailorder business. Splendid opportunity. For details write Harrison, Box 23, Beliflower, Calif.
EARN $\$ 2600$ more a year from hour each evening at home laundering venetian blinds. Others making over $\$ 10,000$ working full time! New Portable machine. Free booklet. R. X. Co., 442 N. Seneca Wichita 12, Kansas.

MAKE flexible molds! Cast plaques, bookends. figurines! Free sample! H Tooker, $630-$ A Chestnut. Hamilton. Ohio. OPERATE "Escalator" Mailorder system, selling our products or any products. Fastest, most revolutionary mailorder sys tem known. Write: Selbyco, Decatur 175, Ill
MAKF Money at home mailing literature offering fast selling books and merchandise. Everything supplied at low cost ville. Maryland.

BUY Wholesale thousands nationally advertised products. Save money! Make Money! Postcard brings details. Kemah Company, $5017-\mathrm{E}$ Washington, Houston, Texas.
MEXICAN Feather Bird Pictures $200 \%$ Profit your own business. Sample Offer Beautiful picture with hand carved cedar frame and glass $\$ 2.50$ Value, only $\$ 1.00$ Postpaid. Free Details. Specialty Products Co., 302 New Market Ave., South Plainfield. New Jersey
EARTHWORMS: Health and profits Details 25c. Earthworm Gardens, Dept PS12, Box 428. El Monte, Calif
ELECTRO-plating. Profitable home business. Autoparts, mirrors, novelties, giftwares, baby shoes. Easy, inexpensive home processes. Free booklet. Tyco Metals, Box 13231-CP, Houston 19, Texas.
LEARN Piano Tuning quickly at home. Make big money-tremendous field! Amazingly easy. Free information. Empire School of Piano Tuning. Champaign 1, Ill.

50 MAIL Order Plans full or Spare time catalog free your name address. Lindholm Service, Box 2504, St. Ann Station, Minneapolis. Minnesota.

EARN amazing profits by following our instructions; selling nationally advertised watches, etc. Enclose 25 c , refundable. Receive multi-colored salesman's catalog and confidential price list. Result Sales D, 580 Fifth Ave., New York.

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, Grand Rapids, "Minnesota.
MAKE Perfumes And Cosmetics At Home, write "Carey Laboratories," 1914 Chouteau, FS-12, St. Louis 3, Missouri.

EARN $\$ 15,000-\$ 30,000$ annually. Franchise protected. Guaranteed minimum merchandise to buy. Self-employed one of most exclusive and noncompetitive businesses in United States and Canada. Send 50 c for explanatory book. Money refunded when book returned. Harrell \& Company, Box A-2, Louisville. Illinois.

BUILD luggage and cases at home. We sell your product. No special tools or equipment needed. Free details. Casecraft 805-X Sunset Blvd., Los Angeles 12.
PLEASANT Spare Time Work. Write RTK, Box 6693-C. Cleveland 1. Ohio.
PACKAGED food mailorder business. Home operated. Everything supplied. Suc cessful proven plan. Free details. Frazar Foods. Desert Springs 11, California.

WHAT must I do? Read "Success Today"" and "Success Poison". $\$ 1.00$ postpaid. Merrell Quinn, P. O. Box 967 GROW plan
GROW plants. flowers. Details free. Shiffers, Box 129, Millersburg, Penna.

MAKE Money mailing cards; circulars. Pleasant: Profitable. Paton, Box 55-A.

EARN money at home, making rhine stone jewelry. Free catalog. Ebert, Box B183, East Orange, New Jersey.

FREE Folder-''Make Big Money by mail The Sure way That Pays". New different. Fullmer, 92J Greenwood, Poca tello. Idaho.
DO Mailing At Home-Get Orders In Every Mail. Keep Every Cent. Everything Furnished. Genmerco, Box $142-\mathrm{N}$, Dorchester 24. Mass.
HAVE Home Mail Business-Get \$10 Orders In Every Mail-Keep $\$ 8.00$. Every-
thing Furnished. Hutchinson, 401 C Adams, thing Furnished. Hut

WILL establish you in business with our capital. Part-time or full time. No invest ment or experience needed to start Winona Monument Co.. Winona. Minn.
MAKE Profitable Products - Formula Catalogue Free. "Imsco"

CONVERT hand mowers to power mow ers. Do it now, this winter. Sell th Handy-Dandy conversion kits. Easily in stalled on 16 to $20^{\prime \prime}$ mower. Use any small gasoline or electric motor. Quick delivery. Kits purchased with or without engines. Also new garden cultivator. Takes less than a minute to change attachments: Weed Whacker, Lawn mower. Snow plow and Rotary tiller. Discount to dealers Le Claire Manufacturing Company, Le Claire. Dept. P.S.. Iowa.

EARN money! Amazing plans! Easily mastered at home. Details free. Bruns, 216-E West Jackson Blvd., Chicago 6, Ill.

START a lettershop on a shoestring! Sales $\$ 56,000$. Started $\$ 36.00$. Information? Wells. Box 13. Basking Ridge, New Jersey,

FREE! Unequalled, big profits, home mailorder details. Mailord, PS-12, Southampton. New York.

PROFFTT! Without Investment!! Through our Watch-Clock-Jewelry -Camera-PenTechnical Supply 55-PS West 42 nd Ster Technical Supply, 55-PS West 42nd Street New York 36.

WOMEN! Make Big Money at home Sew ties for us. It's fun. Earn $\$ 10$ day easy. No selling. no cxperience, no machine necessary. We supply everything Help us fill huge demand. Exciting details free. Fashion Ties, 2521-X, Manchester Inglewood 4, California.
\$100.00 WEEK-Preparing Income Taxes. Box 1343 , Port Arthur. Texas.

UNUSUAL homework opportunity. Spinning Angora Sparetime, Men, Women Angora House. PSM, Springfield, Illinois. $\$ 2,000$. MONTHLY-Easy. Instructions Free. Sundbergs. 1552 Essex, Willow Run Michigan.

NATURAL semi-transparent wood. Light shines right through it, richly illuminating the lovely grain. Make unusual items tha sell on Sight. Generous sample $\$ 1.00$, postwood. Florida.
3.658 GOVERNMENT-owned inventions available to anybody for free use. Details 25 c . Box 122, Allenhurst. New Jersey.
SILICONE-Make and apply invisible masonry water repellent for cinder block, asbestos siding or any porous surface, Sample and instructions $\$ 1.00$. Printech, Box 384. Princeton. New Jersey
UP To $\$ 10,000$ Yearly! New, Exclusive Mail Order Program! Participation limited. Rush 3 c stamp for further details. Diego 4. California.
START your own profitable home mail order business! We supply everything Write today! Studio Products, Box 564-"D."' Glendale 5, California.
$\$ 15.00$ THOUSAND Possible - highest prices compiling mailing lists and addressing from them; longhand, typewriter. Particulars free. Almon Torrey. Rowley. Mass. $\$ 250$ WEEK reported! Free book " 505 Odd, Successful Businesses." Work home Expect something Odd! Pacific-36C
Oceanside. California.
EARN $\$ 2.00$ Hour! I do-making Sandals. Youngs, 1308-PS South First, Arcadia, California.
JOIN "Money Getter's Guild'"; get monthly magazine; money making tips: Sample 10 c . Costar, ${ }^{12}$ G.P.O. 972 . New -ork 1.

BUY it wholesale. Manufacturers. Dis tributors. Over 850.000 items Literatur free. Olsen. 1231-B East Third St., Duluth 5. Minnesota.

BE appointed Notary Public. Details free. Magnolia Press, Box 1272-S, Bur bank. Calif.
\$46 FROM Square Foot Plywood; Jigsaw necessary. Write: Woodart, Bridge water. Mass.
MAIL Order Business. Money making opportunity. No inventory. Beverlyhouse $5460-\mathrm{E}$ Beverly, Los Angeles 22, Calif.
MOLD Making Liquid Rubber; sample pint, with instructions, $\$ 2.00$ postpaid Plastercraft Supply Company. 3051 St Clair Ave.. Cleveland 14. Ohio.

SET and sharpen circle saws in minutes without equipment. "Filmtreet", files and hack. saws,' supply. both st Hows cos Hobby. 3503-3 Chestnut. Baltimare 11. Md. $\$ 500,000 \mathrm{BY}$ mail from home. Free Folder. Publicity, Kalamazoo 65EC, Mich

DOLLARS in the mail for you! Put your ad here and watch orders fill your mail box. For as little as $\$ 8.00$, you can adver oppe your product or service in the classified Monthly cember i2nd Write today for order blank and free cony of booklet "How To Mak Money Out of Classified Ad To Mak" O. K. Kelly, Classified Adv. Mgr. Dept 1253, Popular Science Monthiy, 353 Fourth Ave.. New York 10 . N. Y.
38

## MONE MMAKING OPPORTUNITIES

SELL Titania gems: $\$ 9.75$ carat wholesale. More briliant than Diamonds. Fre catalogue. Diamonite, 1404-S Mitchell. Oakland 1. Calif.

SPARETIME Profits Taking Subscrip tions, All Magazines. Wholesale Catalog Free. Cassell Agency, Westfield 1. N. J.

DETECTIVES Earn Big Money. Experience unnecessary. Detective Particular
free. Wagoner. P-125 West 86th. N. Y. 24

MAILORDER-Operate profitable home business using Free Advertising Method reaching millions. Revealing iniormation

free. H. G. Seidel. 7070 Hollywood Blvd. | free. Th. G. 28 , California. |
| :--- |

SCHOOL Seniors-Sell Classmates America's most beautiful Graduation Name Cards, Largest selection. Highest commission. Outsells all others. Free sample kit. Printcraft, Dept P, 1509 Maple St. Scranton 5, Penna.

MAKE Money addressing Einvelopes! Our information reveals how. Only 30 c . BusiLouis, Missouri.

MAKE Money-At home by mail. Fast. Easy. Liebig Industries, Beaver Dam 2, Wisconsin
$\$ 10,800$ PROFITS! Your Own Mailorder Businezs! No risk! "Success Plan" Free Treasury, $709{ }^{\text {W. }}$
PS-18. New York.
101 WAYS To Make $\$ 1,000$ At Home. Details free. Business 5urveys, 36
Fairfax, Los Angeles 51, California.
MAKE $\$ 2600$ a Year Spending 5 Hours A Week. Start At Home. New Machine Small Investment. Free Booklet, A. Z.

GET Facts- $\$ 4.00$ merchandise, $\$ 2.00$ treatise 100 money makers. $\$ 6.00$ value $\$ 2.00$. Kahn, 506 West 45th, Chicago 9.
ROSARIES-Make Your Own! For gifts -fun-profit! See complete line of religious goods-gold filled and sterling rosary parts. Medals, books, statues, novelSies. Big group of make-it-yourself for New Wholesale Illustrated Catalogue-just off the press. bigger than ever! Greylock Creations, Box $1048-\mathrm{PS}$. Pittsfield. Mass.
HOW To Earn Up To $\$ 500$. for each Script, writins for Television. New, Dif ferent! Particulars Free! Wonderful Products, Box 2113-A. Santa Fe. N. M
ADDRESS advertising postcards. Must have good handwriting. Lindo, Watertown, Mass.

GET $\$ 10.00$ by Mail: Keep $\$ 8$. Terrill, Bogard 2. Mo.
\$35 WEEKLY addressing envelopes. Instructions s1 refundable. Adservice, Spring Valley 36. New York.
ALUMINUM awnings baked enamel colors factory prices. Write All Weather Comfort. Box 10254. Tampa. Florida.
TRIM Hair Without "Barber." Miracle clipper sells on sight. Keeps hair neat. Ohio.

START A Buying Service. buy wholesale thousands nationally advertised products. Make big profits selling at sizeable discounts. Postcard brings details. American Buyers. 630-S Linden. Buffalo. N. Y.
OPERATE profitable mailorder business write for details. N. J. Bode. 223 So. Jeferson Ave., Canonsburg. Pa
FREE! " 301 Profitable Small Businesses!" Amazing shoestring plans! Work Home! Start Sparetime! Deumant Sureys, Kenmore 23-T. New York.
WORK At Home. Typists. longhand addressers. Prepare mailing lists and address literature. Be your own boss. Details free. Suppliers Mailing Service. Stillwater 9 , Minnesota.
WIN contest money. General Contest Bulletin gives hundreds of tips. Lists cureral Contests. 1609-A East 5th. Duluth. Minnesota.
EARN Money Evenings copying and duplicating comic cartoons for advertisers. Adservice. Argyle 2. Wisconsin.
YOU can buy wholesale! Save up to $70 \%$ on Nationally advertised jewelry appliances. watches, etc. Free information. Do-
rinda Enterprises. Box 77. Huntington Station. New York.
DOLLAR Maker "Tips." A gold mine of Information and Knowledge. Contains over 1000 valuable , Dollar-Making and the book you want. Price $\$ 2.00$ ppd. utors. Box 733, Faintsville, Kentucky. "YOUR own Mailorder Business." Details free write John Franco.
Avenue. Corona 68. New York.
LEARN professional candy making. profitable home business Details free. Pate. Kissimmee 2. Florida
MAKE to $\$ 4.50$ hour doing common pen lettering. National Artists. $8011 / 2-\mathrm{C}$ North Marsalis. Dallas 3. Texas.
BUY Wholesale! Nationally advertised products. Tremendous discounts. Particulars ree. Econ-O-Mart. Box 535A. Mor-
ristown. New Jersey.
MILLIONS For Small Businessmen. Large list. $\$ 1.00$. Proven Enterprises, 334
S. Wabash. Rm. 1. Chicago 4. Inl. BUY Wholesale thousands nationally advertised products. Save money! Make Money! Postcard brings details. Kemah
Company, $5017-\mathrm{F}$ Washington. Houston, Company, $5017-\mathrm{F}$ Washington. Houston, Texas.
EARN $\$ 50-\$ 100$ Weekly operating home mail business. We show you how. Write Lewis Bartlett. Richland. Georgia.
OWN. Operate. Route-"Wishing Wells." Place these New $\$ 8.50$ Skill Games on counters in Cafes. Clubs, Luncheonettes, etc.- collect "coins weekly. Details Free!
"Legalchero." Box 929 . Long Beach 1, Calif. WEEKLY extra income mailing circulars for advertisers. Complete instructions 25 c . Enterprise. 21-D Sanford. Boston 26. Mass.
FREE! Complete Mailorder Business! Terrific Profits! No investment. Write to-
day Vita-Mins. 2908 -PS, Beverly Bouleday. Vita-Mins. 2908
vard. Los Angeles 57.

AMAZING process permanently seals snapshots. cards. etc. in plastic. Earn ex-
tra money taking orders. Send 60 c and tra money taking orders. Send 60c and two snapshots for sample work and par-
ticulars. Refundable first order. Variety Sales. Box $11533-\mathrm{P}$. Los Angeles 48. Calif. EARN Money. Sparetime Homework, Free Literature. Wiese. 1516 Franklin,
Waterloo. Iowa Waterloo. Iowa.
WE Pay Cash for Boxtops. Labels. Wrappers. Coupons. Bottle Caps. etc!! Par-
ticulars free Boxtops. PS-983-E Main. ticularis iree.
Columbus 5 . Ohio.

WANTED: Typewriter owners. Make handsome profits. Write today. Groves
Company. 682 Hastings 3. Nebraska.
MAKE Seashell Salt-Peppers, Pitchers, Slippers, Vases, Ashtrays. We furnish material \& instructions. Lastufka Products. Box 10248 . Tampa. Florida.

MANUFACTURE Rhinestone and Pearl mendous profits. no skill needed. Postcard brings illustrated catalog of settings. stones, etc. A. V. Cutt Co.. Inc., $210-\mathrm{H}$ Fifth Ave.. New York 10, New York.

BE appointed outfitted Notary Public. Thousands needed. Men, Women. World's
400 RADIO Stations active. Free radio advertising. Pay commission only on orders received. Free information. Mishek, Waseca 1. Minnesota.
FREE, Book " 505 Odd Successful Businesses. Pacific-35C. Oceanside. Calif.
MEN-Women: If you are interested in addressing advertising literature for national firm, rush 3c stamp for further information. Advertisers Service. Box $4097-$ PS. San Diego 4. California.
TO $\$ 35.00$ Weekly Upholstering spare time. Instructions $\$ 1.00$. Custom Upholstering. Oxford 2, Penna.
\$\$\$ IN Personalized Baby Record Books. Sell By Mail Use Same Literature We Do. No-Co-Ro. Oakland 6-P. Calif.

EARN extra cash addressing envelopes. Send stamped envelope to Professiona $\frac{\text { Mail Order Survey. Box 1428. Mobile. Ala. }}{\text { MAKE money by mail! I do. Information }}$ MAKE money by mail! I do. Information

1. Remson. 158-10A Sanford Ave.. Flushing 58. New York.
$\$ 500.000$ BY mail from home. Free Folder. Publicity. Kalamazoo home. Free DOLLARS in the mail for you! Put your ad here and watch orders flll your mailbox. For as little as $\$ 8.00$, you can advertise your product or service in the classified opportunities columns of Popular Science cember 22 nd. Write today for order blank and free copy of booklet "How To Make and iree copy of booklet How To Make Money Out
O. K. Kelly. Classified Adv. Mgr.. Dept. O. K. Kelly. Classified Adv, Mgr. Dept. 12v3, Popular Science Mon York 10 . N. Y.

39 FORMULAS, PLANS, ETC.
FORMULAS-All kinds. Latest products. Literature free. Kemico, Park Ridge 15. Ill. 500 MONEY Making Formulas, 25c Postpaid. Allen, Dept. PSC, Clinton, Missouri. ART work. Plaster casting. marble-like hardness. Also washable. Formula $\$ 1.00$ E. McLean, Scotsguard. Sask.. Canada.

REAL Manufacturing Formulas Lists Free. Cumming, Chemist, Gordon Avenue. Syracuse 4. New York.
FREE Formula Catalog. Anything analyzed $\$ 35.00$. Western Chemical. Salem. Ore. OUR laboratory tested formulas and know-how put you in business. Free infor-
mation. write Stark Co.. Grafton. Wisc. mation. Write Stark Co.. Grafton. Wisc. ANY Formula $\$ 3.00$. Chemical Instruction Sheet-catalog

LABORATORY Tested Formulas. Catalog free. Pont Chemical Company. Terre Haute 1. Indiana
40

## PLASTICS

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 needed. Course pays for itself. Write for Free booklet. Interstate Training
Dept. D2-N. Portland 13 . Oregon.
NEW liquid casting plastic. Clear. colors. Embed flowers. insects. coins. Saw driil. carve. Send 25 c for Castolite Creations Manual and proved Success Plan showing how to make money at home. Castolite. Dept. P-102. Woodstock. Ill.
PLEXIGLAS, Lucite. Any size sheets.
 for postage. Minimum order $\$ 3.00$. Almac Plastics, 600 Broadway. New York City.

LEARN Plastics at home. Complete course- $\$ 5.98$ postpaid. Dime brings samplastic Projects. Box 5151 . Detroit 35, Mich

PLEXIGLAS sheets-cut to size-clear, all thicknesses-standard outdoor transluscent colors. McClarin Plastics, P.O. Box 168B. Hanover. Pa.
"INTERNAL Carving of Plastic's"' illustrated manual. catalog. internally Plastic's. Box 1812. Salt Lake City 10. Utah. PLASTIC Sheets, Rods. Tubes; etc. Free List. Plastic Supply Co.. 2901 N. Grand List. Plastic Supply Co.
Blvd.. St. Louis 7. Mo.

PLASTICS-Cements-Dyes-FindingsCarvings. Wholesale prices;, 64 page catalog free. "Trace \& Carve", pattern book for carving and coloring fish, birds, animals. only 35 c . Taylor \& Art. Inc., 1710 East 12th St.. Oakland 6. California.
FIBERGLAS, Polyester, Plexiglas. Acetate, Vinylite: Casting, coating plastics: My own Fiberglas "How', book now ready - $\$ 2.50$. Fast service. best prices. Catalog - 10 c . Airmailed- 35 c . Gem-O'Lite. Box 6868 P . North Hollywood, Callfornia.

UNUSUAL Christmas decorative materials fill our complete catalogue. Van Horn Plastics, 1905 Ingersoll, Des Moines. Iowa.

## 41 CHEMICALS \& APPARATUS

SPECTROSCOPE for quick chemical analysis $\$ 3.00$. Cutting Sons, Los Altos, California.

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 $\mathbf{H}$.
Winn. 124-B West 23 rdStreet. New York. N.

ILLUSTRATED Catalog: Chemistry. mineralogy. biology 20c. Tracey Labora tories. Evanston, Illinois.

CHEMICALS and apparatus for industrial. analytical and private laboratories. Co.. 1176 Mt . Hope Ave.. Rochester 20 . N. Y.

CHEMISTRY: Brand new, step-by-step A painstakingly designed course for al ages. Not a toy. Not a plaything. Cultural. Practical. Fascinating. Constructive. Firs lesson 25c. Parkway Laboratory. 1004 c Second Ave.. Pittsburgh 19, Pa.
AMAZING New Book of Science. Experiments. Formulas and catalogue of Laboratory Supplies. Only 25c. National Scientific Co.. Dept. 15. 2204 W. North Ave. Chicago 47 . Illinois.

## 42

## HELP WANTED

FOREIGN Employment Construction Work. If interested in foreign projects with high pay, write Foreign Service Bureau. (Dept. P.S.). Metuchen. New Jersey FOREIGN \& Latin American Employ, ment 1953 "Foreign Service Directory", gives Up-To-Minute Facts on Military \& Civilian Construction. Government Jobs. Major Oil Listings, Aviation. Transporta-
tion. Steamship Lines. Mining. Importers. tion. Steamship Lines, Mining. Importers. Exporters, How-When-Where to apply $\underset{\$ 1.00}{ }$ application forms. Hot List Firms Hiring. $883-$ S. Hollywood 28, Calif.

ADDRESS advertising postcards. Must have good handwriting. Lindo, Watertown, Mass.
ALASKA Directory-Jobs. High Wages. Labor $\$ 2.95 \mathrm{hr}$. Plumbers $\$ 4.00$. Carpenters $\$ 3.34$. Truck Drivers $\$ 3.37$. etc. Homestead facts. Job List. Application Blank with Directory. $\$ 1.00$ post paid. "Foreign Opportunity Directory" Foreign Job List $\$ 1.00$ postpaid. COD- $\$ 1.87$. Air Mail $\$ 2.00$ Specify Listing. Alaskan Directory
Waseca Minn. Waseca. Minn
CONSTRUCTION Jobs: Monthly listings. $\$ 1.00$ Construction Employment
CONFIDENTIAL reports. Highest paying jobs in 28 countries. including U.S. East. Many average $\$ 1450.00$ monthly Skilled. unskilled. laborers. trades. supervisory. clerical wanted. Only \$2. including Satisfaction guaranteed advisory service Box 2954 SB. St. Louis 17. Missouri.

FOREIGN Job News and Domestic. Send $\$ 1.00$ for World Wide Construction Projects, How-When-Where to apply. Global
Reports Monthly. Box $883-S x$. Hollywood Reports
28, Calif.
ALASKA!! Last American Frontier. $\$ 1.00$ brings 1953 Business Directory \&
Government Map. Military \& Civilian Government Map. Military \& Civilian
Construction; Homestead \& Highway facts: Construction; Homestead \& Highway facts;
Mining. Aviation. Fur Farming. Grazing. Timber. Travel directions. List of firms hiring. How to apply. Alaska Opportunist. Box $92-\mathrm{S}$. Hollywood 28 , Calif.
JOBS on ships and yachts, excellent pay. Foreign Travel. Davenport's. Dept. 4. Box 1354, GPO. New York 1. N. Y.
FOREIGN \& Domestic Jobs. Up to \$12.000. Alaska. So. America. Central America. Far East. U.S. Where-How-to apply. Latest listings world-wide jobs, red hot. "Foreign Opportunity Directory" gives civilian \& defense construction. oil companies, aviation. transportation, mining. steamship companies, employment agencies-all kinds of workers needed. Application blank included with Directory, $\$ 1.00$ post paid (COD \$1.87) Air Mail \$2.00 Alaska Special Job List $\$ 1.00$ postpaid Specify Listing. Foreign Opportunities. Waseca, (PS1), Minn.
CREDIT Correspondents wanted. Work furnished. Small investment. Very profitable. Write National Correspondent Minnesota.
JOBS-Foreign and Domestic. skilled. unskilled, clerical. etc. Highest pay. Free information or send $\$ 1.00$ for complete details. Job Application Service. P. O. Box 1022B. Baton Rouge 1. Louisiana
$\$ 1300$ MONTHLY for truck drivers, $\$ 1400.00$ monthly for carpenters. electricians, plumbers, mechanics, $\$ 1200.00$ for clerks and laborers. Replacement hiring now being done. Full information and complete foreign listings, with current information on Spain job. $\$ 1.00$. Women's listings. $\$ 1.00 .25 .000$ men and women needed for new stateside project! Complete information and other domestic listings. \$1.00. Dept. 4-L. Opportunities Unlimited, 1110 Commerce Bldg.. St. Paul, Minn.
WORLD Wide Employment: Want to travel? Big pay. Transportation free. Most trades available: Monthly listings, oil, ship, manufacturing. and many more. Positions available in most foreign countries. How to apply, application forms, contracts. etc. $\$ 1.00$. World Wide Employment Service, 1017 Federal Ave., Zanesville, Ohio.
MEN Earn $\$ 1,500.00$ per month on Foreign projects. (See Reader's Digest December 1952 issue. page 21) Men Wanted Now on Foreign, Latin America and Far North projects. Truck Drivers, $\$ 3.55$ hour. Clerks. $\$ 3.00$ hour. Electricians, $\$ 4.00$ $\$ 3.00$ hour. Most all trades wanted. Up to $\$ 3.00$ hour. Most all trades wanted. Up to all over 40 hours. Transportation paid for all over 40 hours. Transportation paid. 8 Spain, South Korea will start new bases Spain, South Korea will start new bases of over 20 sheets $9^{1 / 2} \times 11$ listing over 200 of over 20 sheets $912 \times 11$ listing over 200 firms now hiring, conditions. Wages. hours, etc.: also latest issue of our monthly Bulletin listing new contracts and coupon Worth $\$ 1.00$ on subseristion. All for $\$ 1.00$. Lancaster Avenue. Department 30. Dallas Texas.
KANSAS City Want ads mailed. 50 c per classification. Kithcart, 2630 Charlotte, Kansas City. Mo.

FOREIGN \& Alaska Latest List Contractors openings. \$1. Quinn. 1218 South Clayton, Denver, Colorado.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as $\$ 8.00$, you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The February issue closes on December 22nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising" O. K. Kelly, Classified Adv. Mgr. Dept. 1253, Popular Science Monthly. 353 Fourth
Ave., New York $10, ~ \mathrm{~N}$ Ave., New York 10, N. Y.

GOLDEN California-Men needed. Thousands of openings. Jobs to $\$ 5.000 .00$ year unskilled. $\$ 8.000 .00$ year skilled. Act Now Send \$1.00; California Job Opportunities Box 870-J. Los Angeles 53. California.
HONOLULU Help Wanted columns airBlock. Honolulu. Hawaii.

## 42A EMPLOYMENT SERVICES

FOREIGN Jobs Contracts underway and soon starting in Africa. South America. Canada. England. Europe. South Pacific. Middle East Mexico and Alaska Send $\$ 1.00$ for foreign job news. information. application forms. etc. DCS Foreign Job News. Dept. 268-NX. Bridgeport, IIl

OVERSEAS Jobs. Big pay. transportation expenses. Clerical. professional, mechanical workers. Most all trades. Latest listings. airline. construction, manufacturing, oil. steamship companies. government agencies, many other opportunities. Up to date information on securing employment. contracts. income tax, application forms. Rouge, La

CONSTRUCTION Job List. Published Monthly. \$1.00. Dempster's Construction Scout News. Dept. 268-NW. Bridgeport, Ill. 43

## AGENTS WANTED

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide. listing hundreds of companies who'll pay you well full or part-time. No experience
needed. Opportunity. 28 E . Jackson. Dept. needed. Opportunity. 28 E. Jackson. Dept 18. Chicago 4. Illinois.

AGENTS-300\% profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co.. 431-E North Clark, Chicago.
ABSOLUTELY Free-Sales Kit. Yours for the asking. Send postcard today requesting kit showing new line. belt tials. cap badges. choice 3000 different ini blems. Write Hook-Fast. Box 1425 PS. Providence. R. I.

START Your Own Business on credit. Your own boss. 1658 of our Dealers sold $\$ 5.000$ to $\$ 27.500$ in 1952 . We supply stocks. equipment on credit. 200 home necessities Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleighs. Dept. L-UPSC. Freeport. In.
BIG Money making opportunity. Exclusive line work uniforms. Jackets, pants. Every businass prospert Outfit Free MasEvery business prospect. Outnt Free, Ma
ter Div.. Dept. 725 , Ligonier. Indiana.
MAKE Christmas Money At Home
Take renewals and subscriptions for all magazines. Big Christmas pronts now nished Free Catalog. Write McGregor Magazine Agency. Dept. 510 A . Mount MorMagazine Ag
ris. Illinois.
MAN to earn $\$ 150$ and up per week. Long needed invention. Advertised worldwide. Prospects are everywhere. Full or part time. Exclusive No investment. Free samples Write Red Comet. Inc.. Dept. 392-G. Littleton. Colorado.
BUY Wholesale- 25.000 items-Catalog $\mathbf{2 5 c}$. Matthews. 1472-A3 Broadway, New York City 36.
101 WAYS To Make $\$ 1.000$ At Home. Details free. Business Surveys. 365 So. BUY wholesale and save $50 \%$ on big name merchandise. Xmas Gifts. Make big profits selling your friends or for your own
use. Our 1953 Catalog is ready. Rake. use. Our 1953 Catalog is ready. Rake. WHERE To Buy 800.000 Articles Direct from manufacturers at wholesale prices. Save up to 50 ,' on nationally advertised merchandise. Rush $\$ 1.00$ for big 52 page
book. Glass Publishing Company Ellwood book. Glass Publishing Company, Ellwood City. Pa.
"FOG-Stop" Windshield Cloth. Instantly removes blurry Mist. Frost, Sleet. Snow. Stops windshield fogging. Samples sent on
trial. Kristee 124 Akron. Ohio thal. Kristee 124. Akron, Onio.
ADDRESS advertising postcards. Must
have good handwriting. Lindo. Watertown, have
Mass.

STRANGE "Dry" Window Cleaner. Sells like wild. Replaces messy rags. liquids. Simply glide over glass. Samples sent on trial. Kristee 126. Akron. Ohio
GOLD or Silver letters, numbers. Windows, Doors. Trucks. ${ }^{1 \prime \prime}$ to $6^{\prime \prime} .500 \%$
its-Free ${ }^{5}$ Prof-
Samples. 79th. Chicago 20.
HAIR growth Factor Discovery. Inventor. Pasyk Co.. PS-12. Toledo 8. Ohio. $\$ 200.00$ WEEKLY! Million Prospects! Details free! Sycamore. Box 13-PS. Oak Park, Illinois.

BUY Wholesale thousands nationally advertised products ,, at big discounts. Free "Wholesale Plan." American Buyers, 629-S Linden. Buffalo. New York.
BIG Profits In Spare Time! I'll send Free Assortment Full-Size Samples fine Foods. Household Necessities to ambitious Men-Women who need money. Friends. neighbors buy eagerly. Send no money.
Just write Blair. Dept. 55 L Y. Lynchburg. Va.
CALENDARS. Advertising Novelties, Matches. All styles. including Religious. Varnished. 12 sheet. Girls. Hundreds of Advertising Novelties. Book Matches, etc. Fleming Calendar Co., Promotional Division. 6539 Cottage Grove. Chicago 37, Ill. IS $\$ 210$ a week worth a postcard to you? Then rush card with name and address amazing new Automatic Refrigerator Deamazing new Automatic Refrigerator De-
froster
"like not cakes! " Write to Mr. Lewis. D-Frost-O-Matic Corp.. Dept. $\frac{\text { J-103, } 173 \text { W. Madison. Chicago 2. Ill. }}{\text { FREE hosiery! Introduce sensational }}$ hosiery by giving every man and woman free trial pair to prove how good they are! Amazing nylon stockings guaranteed against runs and snags. New miracle onesize nylon two-way stretch socks. Contain no elastic yet fit any size foot. Never sag. Comfortable like second skin. Actually guaranteed one full year. Earn to $\$ 3$ hour in spare time. Mail postcard for free sample stocking and money-making outfits. Absolutely no obligation. Kendex. Babylon 84. New York.

LIFETIME vitamin business! Sell senSational Food supplement! Regular $\$ 3.00$ Money Back Guarantee. National Hestpaid. Products. Dept. PS2. 150 Broadway. New York 38.

BALL Pens $\$ 10.00$ Gross. D.E. S.E. Blades $\$ 4.75 \mathrm{M}$. YoYo Tops $\$ 12.00$ Gross. $\frac{\text { Lutzker. } 871 \text { East } 170 \text { th. New York City } 59 .}{\text { MAKE Money Introducing World's }}$ MAKE Money Introducing World's cut-
est children's dresses. Big selection, adorable styles. Low prices. Complete display free. Rush name. Harford. Dept. L-1341, Cincimnati 25. Ohio.
BUY direct from factory wet and dry mops. wringers. fibre brooms. etc. Catalogue free. Hamm Broom Co., McSherrystown, Penna.
MAKE Extra Money. Sell front door name plates to friends. neighbors. Retail $\$ 1.98-$ you make $\$ 1.00!$ Free selling kit.
Modern Engraving Co., P.O. Box 194, Modern Engravin
Boston 14. Mass.
BIG profits selling ties ( $\$ 2.00$ values) $\$ 6.50$ dozen. Free catalog. Empire Cravats, 611 Broadway. New York 12.
WHOLESALE catalog! Nationally Advertised Merchandise. Pette Co.. 1554-PS W. 11 Street. Brooklyn 4. New York.

CALIFORNIA sweet smelling beads. sensational sellers. Particulars free. Mission. 2328 P West Pico. Los Angeles 6. Calif.
BUY Wholesale thousands nationally advertised products. Save money! Make Company. 5017-G Washington. Houston. Texas.

SCHOOL Seniors-Have Fun and Spending Money!!! Be Popular With Your Classmates. Send Postal For Details. Craft-
cards. Bc $235-\mathrm{M}$. Pittsburgh 19. Penna $\frac{\text { cards. Bc* } 235-\mathrm{M} \text {. Pittsburgh 19. Penna. }}{\text { AFRICAN Exports Save } 50 \% \text { Leather }}$ goods. Send $\$ 3.00$ for sample and literature. Drown, B.P.O. Box 302, Tanger, Morocco.

FREE Razor Blade"-wanted 10,000 men to try our blades. Send for free sample. no obligation. Distributors-Wanted. Mailomatic Service, 26
Brooklyn 1PS. New York.

DAY-GLO Daylight-Fluorescent Signs. Retail $\$ 1.00$ each. Three samples $\$ 1.00$ Edward Cook, 51 Martin Avenue, Saratoga Springs. New York.
RURAL Agents. $20^{\prime \prime}$ wood-chain saw. Cuts everything. Winter demand. Easy terms. Farmco-PS. Excelsior Springs, Mo. MEXICAN Feather Pictures. Sell on sight; $200 \%$ profit! Free details. Sample 20 c stamps. (No Coins). Sylvias, Apartado 9036 . Mexico City.
EASY handwork makes fast-selling useful articles. Sample free. Sunmade Company. Brockton 64, Mass.
DIAMOND Distributor Agents wanted by Diamond manufacturers to resell in franchised territory. Diamond guarantee furnished with all rings as well as literaor more of the following samples. Gents or ladies diamond rings or sets. Retail price ladies diamond rings or sets. Retail price

$-\$ 149.95 . \$ 299.95 . \$ 450.00$. $\$ 600.00$. Dealers | price- |  |  |
| :--- | :--- | :--- |
| $\$ 63.50 \quad \$ 126.75$. | $\$ 178.50$, | $\$ 240.00$ | | price-e | $\$ 33.50$ | $\$ 126.75$. | $\$ 178.50$ |
| :--- | :--- | :--- | :--- |
| Jobbers | price- $\$ 57.25$, | $\$ 114.50$ | $\$ 163.50$ | $\$ 220.00$. As a distributor you can make almost $200 \%$ profit selling these same prodmost 200 pront selling these same products for- $\$ 50.00$, $\$ 100.00$, $\$ 150.00$, $\$ 200.00$. 740 McKean Avenue, Donora 3. Pa.

"GENUINE Silverplating Polish". (Cloth rub on.) $\$ 1.50$. NuSilver. $508-\mathrm{PS} 12$, Aurora. Illinois.
FREE book " 505 Odd, Successful Businesses." Work home! Expect something Odd! Pacific-38C. Oceanside. Calif.
$\$ 1.00$ PROFIT selling $\$ 2.95$ photo enlargement offer Allen Studio. Riegler Bldg.. Little Rock. Arkansas.
DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as $\$ 8.00$, you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The February issue closes on December 22nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising', O. K. Kelly. Classified Adv Mgr. Dept. 1253, Popular Science Monthly. 353 Fourth
Ave., New York 10 . N. Y.

## 44 HIGH-GRADE SALESMEN

ADVERTISING book matches-Cash in on big demand-sell Union label matches. Cuts for all businesses and political par-prices-protection guaranteed on repeat prices-protection guaranteed on repeat Co., Dept. P-1253. 7530 Greenwood. Chicago.

EXCLUSIVE illustrated mailing card advertising automotive and other lines. Our 69th year. Commission basis. Immediate earnings. Permanent. State qualifications. American Publ. and Engr. Co., 79 Madison Ave., New York City.
AD Matches! Sell Amazing Designs20. 30.40 and 240 -light book matches. Biggest spot cash commission; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women f full. part time. Buy Nothing! Sales kit furnished. Match Corp.,
Dept. PS-48. Chicago 32, illinois. 45

## EDUCATIONAL \&

> USED Correspondence Courses and Books sold and rented. Money back guarantee. Catalog free. (Courses Bought.) Lee Mountain. Pisgah. Alabama.
> HIGH School-No Classes. Study at home. Spare time. Diploma awarded. School, 2527 N . Sheffield. Chicago 14. Ill. BOOKKEEPERS! Increase your earnings! Operate your own simplified "Dol-lar-A-Week Bookkeeping and Tax Servce. Funl or spare time. Detalls Free. No North Carolina.
> BE a Real Estate Broker. Study at home or in classroom in leading cities. Write for Free Book today. "G.I. Approved." Weaver School of Real Estate, 301 Law Bldg.. Kansas City, Mo.
> LEARN Drafting-Fastest method. Low cost pay-as-you-learn plan. Drafting equipment furnished. Top grade industrial instructors. Free Catalog. Cesco Industrial Training Services, 1704-B Frederick, Fort Worth 7, Texas.

WANT A Diesel Job? New Opportunities to increase income. Higher Pay. More Money. We can help you Qualify, Tools. Shop method home training. Write toDivision. Interstate Training Service, Dept. B2-N, Portland 13, Oregon.

COMPLETE Your High School at home in spare time with 56-year-old school. formation booklet free. American School. Dept. X946, Drexel at 58th. Chicago 37, Ill. Dept. X946, Drexel at 58th, Chicago 37, II. man Overnight! Free Booklet! Bijou, Box 1727-VC. Hollywood 28, California.
FOR an extremely profitable lifetime business, operate a Collection Agency. Quickly learned. Write Cole Associates. Syracuse 2, New York.

MINISTER'S-laymen's religious courses. Free Bulletin! Midwestern Schools, 517 Merchants Bank Building, Indianapolis, Ind.
LIGHTNING Calculation-number magic -short cuts. Increase efficiency. amaze friends. Send $\$ 1.00$ for sample lesson. Information free. Box 931, Del Mar. Cailf.
HIGH School Diploma at home. Licensed teachers. Approved textbooks and all materials furnished. Southern States Academy, Box 144, PX, Station E, AtWINDO
WINDOW Display money making home course. Pan-America Art School, 321 West 56 th Street. New York 19.
BECOME a Doctor of Psychology or Metaphysics, Learn secret of contentment, happiness. Win degree of PsD. or MsD. Solve mental worries. Free book. College of Universal Truth, 5038-K Broadway, Chicago.

MEDICAL Laboratory Technicians in great demand. We train you in your own Institute. Box $973-B$. Austin, Texas.
OWN A Collection Agency, Big Money! Free booklet. Franklin Credit, Roanoke 7, Virginia.
POPULAR Piano. Rapid Course. Young Studios. 7051 Middlepointe, Dearborn, Mich. EARN While You Learn Auto And Diesel Mechanics. Master this top paying trade. Many graduates earn $\$ 100$ a week and up. intormation write Dept. No. 262 . Nashville Auto-Diesel College, Nashville 3, Tenn. STUDY for Degree of Doctor of Psychology (Ps.D.), Doctor of Metaphysics (Ms.D.), or Doctor of Divinity (D.D.) Write College cf Divine Metaphysics, Dept. P-S, 2811 North Illinois Street. Indianapolis. Indiana.
EDUCATIONAL books used correspondence courses bought, sold, rented, catalog free. Willard Bayles, 211 Essex, Hackensack, New Jersey.
WELDING training pays at Hobart Welding School. Box P-1231, Troy. Ohio. VA Contract. Best equipment. Catalog Free. instantly. \$1; guaranteed. Ziemben, 6123 Orchard. Dearborn, Michigan.
FREE home study course in basic economics. offered as a public service. Recommended by many leaders. Send postcard for complete information. Henry George School, Dept. P. 50
York 21. New York
WORK For "Uncle Sam"! Start high as $\$ 316.00$ month. Men-Women, 18-55. Qualify Now! 30,000 jobs open. Experience often unnecessary. Get Free $36-$ page book show-
ing jobs. salaries. requirements. sample tests. Write: Franklin Institute, Dept. tests. Write: Franklin Instit
PIANO Tuning Pays. Learn this profitable profession at home. Our Tonometer and mechanical aids make learning easy. No knowledge music necessary. Diploma granted. Largest and oldest school-55th
year. G. I. Approved. Write for booklet. year. G. I. Approved. Write for booklet.
Niles Bryant School, 77 Bryant Bldg. Washington $16, ~ D . C$.
'CHINESE Know-How' teaches you miraculous techniques to personal power, profitable living. Amaze yourself! Be a Research. Box 4866. Washington 8, D. C.
SEND for Autogram. New pastime for mechanical minded. 50c postpaid. Auto-

USED Correspondence Courses and Educational Books Bought. Sold. Rented. Catalog Free. Educational Exchange, Summerville. Georgia.
LEARN Drafting and design at home. Simplified method. Text books and complete drafting equipment furnished. Free booklet. Roth Technical Institute, Dept S12. Box 2283, Youngstown. Ohio.
M.I.T. Graduate, former M.I.T. instructor, offers courses in mathematics. physics. drafting, blueprint reading. Write. Technical Instruction by Cor
Box 69. Cambridge 39, Mass.
CORRESPONDENCE courses, educational books, bought, sold. rented, exchanged. Reasonable. Lists free. Magnolia Press, Box 1272-S. Burbank. Calif.
YOU, Too, may become successful. You need not fall flat on your face under handicaps or stand paralyzed before golden opportunities. Tap unused personal powers With our human Behaviour home study formula. Rush your request or free detalls. Personal, Psychology School. Box 1924-S. Louisville 1. Kentucky
RECOGNIZED College Degrees through Hume Study. Tahoe
Pueblo. Reno. Nevada. 46

## CONTESTS

CONPESTING provides fabulous home income for thousands. Qualify your entries through the original New York service project. Enclose stamp. National Con-
test Bulletin. Box $2685-\mathrm{PS}$. Miami 16. Fla.
WIN Big Cash Prizes! Mutual Contest Bulletin gives many tips. Lists current Contests. rule Contests, PS-983-E. Main, Columbus 5. Ohio.
WHEN you need contest help. Write. Contests. 13 Earl. Red Bank. New Jersey. 47 DETECTIVES
DETECTIVES-Work home-Travel. Experience unnecessary. Detective Particulars iree. Write. Waroner. P-125 West 86th, New York 24 ,
DETECTIVE Training. Phillips Secret Service System. 1917-C North Kenneth, Service System.
Chicago 39, Ill
SECRET Service. fingerprint training at home, in spare time. Write. Associated Special Investigators, Box 434, Saint John,
N.B.. Canada.

## 48 LANGUAGE OUTFITS

IT'S Fun learning a language by Linguaphone. At home, in leisure time. quickman. Russian. Japanese- 29 languages by man, Russian. Japanese- 29 languages by Linguaphone Conversational Method. Save Linguaphone Institute, 5412 Mezz .. RockeLinguaphone Institute.
feller Plaza. New York 20.

## 50 BUSINESS SERVICE,

INFORMATION, NAME LISTS
WOMEN Mail Buyers List. $\$ 5.00$ thousand. Lakeland Sales. Butler, New Jersey.
MAILING lists. All types. $\$ 5.00-1000$. Melody Mailers, 8031 Biscayne, Miami, Fla

MAILING Lists. All kinds $1000 \$ 5.00$. Dixie Service. King, North Carolina.
NAME Lists! Nationwide. Bulletins Free. Mailtrader, Box 643, Ann Arbor. Michigan.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mailtise your product or service in the classified opportunities columns of Popular Science Monthly. The February issue closes on December 22nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising', Money Kut Of Classined Advertising Kelly. Classified Adv. Mgr. Dept. 1253, Popular Science Monthly, 353 Fourth

## 51 SPECIAL SERVICES

LETTERS Air Mailed From Old Mexico. Mexico City - Guadalajara - Mazatlan A. Espejo, Box 217, Tijuana. Mexico.

VOCATIONAL Analysis by Mail. Write Personology Foundation, 1001 N. Vermont, Hollywood. California.
BIBLE questions answered free. Jon. Farguson. 116-14 141 Street. South Ozone

## POPULAR SCIENCE OPPORTUNITIES

## AUTHORS SERVICE

NO luck finding a book publisher? Write for Free Booklet PS. Vantage Press. 120 West 31st. New York.

BEGINNING Writers: Get $\$ 1$ to $\$ 20$ checks daily writing simple children's Experies, articles, poetry in your sparetime. reveal how. Details Free $W$ Herman 7016 Euclid. Cleveland 3, Ohio. 53

## ADVERTISING

ADVERTISE: 24 words, 100 Canadian Newspapers $\$ 5.50$ Lists Free. Advertising Bureau, $10511-\mathrm{P}$ Springfield, Chicago 43 .

ADDRESS advertising postcards. Must have good handwriting. Lindo, Watertown, Mass.
500 RADIO Stations which accept advertising on commission and 200 Magazines which give Free publicity. Including instructions "How" $\$ 2.00$. Satisfaction guaranteed. Brass. Box 1664-PS-3, Chicago 90.
GET Thousands of Dollars worth of National Advertising for your new product, for only a few dollars. Williams Agcy. 1117-B-2 Investment Bldg.. Pittsburghi $22 . \mathrm{Pa}$.
54 CARTOONING, SIGN
"HOW, To Make Money With Simple Cartoons", A book everyone who likes to draw should have. It is free; no obligadraw should have It is iree; no obliga-
tion. Simply address Cartonists' Extion. Simply address Cartoonists
change. Dept. 1912C. Pleasant Hill. Ohio.
CARTOONISTS: Amateur. Professional. Prepare for Animation with Max Fleischer's plan. Write Vera Coleman. 60 East 42 nd Street. New York. N. Y.
BIG income painting signs. No expensive course. Old Timer. 257 Maple.
CARTOON Fun. Self-Teaching Outfit. $\$ 1.00$ complete. Selumart, Box 29 . New York 72, N. Y.
CHALK Talks. Laugh Producing Program, \$1.00. Illustrated Catalog 10c. Cartoonist Balda. Oshkosh. Wisconsin.

## 55 TYPEWRITERS \&

TYPEWRITERS. Printing Devices. Office Machines, supplies, appliances. Dixie
Graph. King. North Carolina.
VARITYPERS, IBM electric $\$ 100$. Sachs. 119 W. 23 rd (PS), New York.
TYPEWRITERS $\$ 22.50$ up. Adders $\$ 12.95$. Meier's. 118 Spruce. Wichita 7. Kan. SPECIAL! New and R'econditioned Typewriter, Bargains, "Typewriter Wholesalers', Basking Ridge. N. J.
56

## RUBBER STAMPS \& OFFICE SUPPLIES

THREE Line Rubber Stamp, $\$ 1.00$ ! Morey's. Box 94. Redwood City 2. Calif. 3 LINES. $\$ 1.00$. Fast Service! Catalogue.
Johnson Press. Box $6-$ B. N.X.C. 26 .

## 5\% PRINTING, $\quad$ MULTIGRAPHING, ETC.

SALESBOOKS. Labels, Calendars, Samples for 50 c . Write, O'Tool, Hammondsville. Ohio.
$10081 / 2 \times 11$ LETTERHEADS, $10063 / 4$ Envelopes, $\$ 2.00$, 250 each. $\$ 3.75$. 500 Business cards $\$ 1.95$. 1.000. \$2.50. Standard Missouri. Missouri.
BUSINESS, Personal Printing. Catalogs Free. Howprint. 723-S Eunice, Webster Free. Howprint. ${ }^{723}$
Groves 19. Missouri.
BUSINESS cards samples. prices free. Malmart. 177679 Street. Brookiyn 14. N.Y.
MIMEOGRAPHING, mailing. Qualityfast service. Mimeographers. 7404-58, BUSINESS
BUSINESS. Personal stationery. Catalog free. McIlvaine, Box 86-PS. Brooklyn 30,
New York. New York.
BUSINESS printing. Samples. Homestead Press. $2718-\mathrm{S}$ East 58 th Street, Huntington Park, Calif.
 ark. Ohio.

## 58 PRINTING OUTEITS,

DO your own printing. Save money Simple rules. We supply everything. Print for others; good profit. Raised printing like engraving, too. Have home shop. Details free. Kelsey Presses. V-8, Meriden. Conn.
MAKE your own, self-molding, rubber printing cuts. Plexirubber. Argyle 2. Wisc.
CAST your cuts, Rubber Stamps. Catalog Presses, Supplies. Paper, 10c. Custom Box 211-S, Springfieid. Missouri.
PRINTING toy-real printer's metal type. Two colors of ink. Rollers, etc. $\$ 4.00$ Bogin. 2611 West Second St., Brooklyn Bogin, New York.
59 PATENT ATTORNEYS
C. A. Snow \& Co.-S-427. Snow Buildent Attorneys. Write for information.
INVENTORS. For "Invention Record" form. contact Carl Miller. Registered atent Attorney. Woolworth Building. N. Y INVENTORS: Without obligation. write for information explaining the stevs you should take to secure a Patent. John $N$.
Randolph. Registered Patent Attorney. 207 Randoiph. Registered Patent Attorney. 207
Columbian Bldg.. Washington 1. D. C.

INVENTORS Send today for, booklet "Patent Protection for Inventors", giving detailed patent information and preliminary steps to take toward patent protection. also "Evidence of Invention" form.
Victor J. Evans \& Co.. $841-\mathrm{P}$ Victor J. Evans \& Co.. ${ }^{841-1}$
Building. Wasinington 6. D.C.
INVENTORS: Learn how to protect your invention. Unless the inventor is familiar with patent matters. he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and prepared to serve you in handling your patent matters. "Patent Guide for the Inventor" containing detailed information concerning patent protection and procedure with "Record of Invention" form will be forwarded to you upon re-quest-without obligation. Clarence A. Patent Attorneys, 32B-K District National Building. Washington, D. C.
REGISTERED Patent Attorney offers services. Sanders, 6430 Evans, Chicago 37. Illinois.
"INVENTOR'S Guide" free. Frank B. Ledermann. Registered Patent Attorney 154 Nassau Street. New York.

INVENTORS-If you believe that you have an invention, you should find out how to protect it. The firm of McMorrow, Berman \& Davidson is qualified to take the necessary steps for you. Send for copy of our Patent, Booklet "How to Protect Your Invention" and "Invention Record' form. No obligation. McMorrow. Berman \& Davidson, Registered Patent Attorneys,
143-W Victor Building. Washington 1. D.C.

PATENTS-Irving L. McCathran, 316 McLachlen Bldg. Washington 1. D. C. Registered Patent Attorney

INVENTORS: When you are satisfied that you have invented something of value write me, without obligation, for information as to what steps you should take to secure a Patent. Write Patrick $D_{\text {. Beavers, }}$ Registered Patent Atty., 938 Columbian Bldg.. Washington 1. D. C.

## 60 FOR INVENTORS

INVENTORS. if you have an invention for sale, patented or unpatented write Institute of American Inventors. Dept. 30A,

INVENTORS. For "Invention Record" form, contact Carl Miller. Registered Patent Attorney. Woolworth Building. N. Y.

CASH For your ideas. 280 Manufacturers need inventions. patented or unpat-
ented. List free. Invention Bureau, 208-S Clinton. Oak Park. IIlinois.

INVENTIONS Promoted. Patented or Unpatented. Established 1911. Write Adam Fisher Company. 183 Enright. St. Louis, Mo.

INVENTORS: Without obligation. write for information explaining the steps you should take to secure a Patent on your invention. John N. Randolph. Regisiered Patent Attorney, 206 Columbian Bldg. Washington 1. D. C.
INVENTORS-If you consider your invention to be something of importance. take steps to protect it with a United States Patent which gives you the right to exclude others from making. using and
selling your invention as claimed "Patent Protection for Inventors" outlines steps to take to vore patent outhis sceps to take to secure patent protection Mailed Evans \& Co.. Merlin M. Evans. Registered Patent Attorney, 842-P Merlin Building. Washington 6. D. C.

INVENTORS-Send for free patent information book and inventor's record. Registered Patent Attorney, Associate Attorney, \& Advisor Navy Department 1930-1947. Gustave Miller, 123PSI Warner Building. Washington 4. D. C.

INVENTORS: Learn how to protect your invention. Unless the inventor is familiar with patent matters. he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and prepared to serve you in handling your patent matters. "Patent Guide for the Inventor" containing detailed information concerning patent protection and procedure with "Record of Invention" form will be iorwarded to you upon re-quest-without obligation. Clarence $A$ O'Brien \& Harvey Jacobson, Registered Patent Attorneys, 32A-K District National
Building. Washington Building. Washington. D. C.
MARKETING assistance, Product development and design. May we serve you? Manufacturers Service. P.O. Box 83 Bloomington, Illinois

INVENTORS-If you believe that you have an invention, you should find out how to protect it. The firm of McMorrow. Berman \& Davidson is qualified to take the necessary steps for you. Send for copy of our Patent Booklet "How to Protect Your Invention" and "Invention Record" form. No obligation. McMorrow. Berman \& Davidson, Registered Patent Attorneys,

PATENT Searches, $\$ 5.00$. including patent copies. Same reliable search as conducted for patent attorneys. Free protection forms, 48 hour service. Patent Service Institute, ${ }^{\text {945-B }}$ ( Pennsylvania Avenue. Washingion 4. D.C.
INVENTORS: Develop your invention profitably. Get the 'Truth About Patents' Jackson Heights, New York.
FINALLY there is a publication devoted exclusively to describing your ideas and inventions to manufacturers. Rates reasonable. Postal brings details. Da
Lee. Box 142. Hampton. Virginia.
FROM one Inventor to another: Have licensed over 60 of my own inventions. I can help you market yours. Also thorough patent searches and commercial evaluations. Free information. Jacquelin E. Bldg.. Washington 8. D.C.

SEARCHES-Put your patent searches in the hands of a Registered Patent Attorney or Agent as he qualifies to give a Worthwhile patentability report. Record of invention form upon request and information on patent protection. Patrick $D$. Beavers, Registered Patent Attorney. 939 Co-
lumbian Bldg., Washington 1, D. C. lumbian Bldg.,
OBTAIN patents yourself. Eliminate attorneys fees. Information $\$ 2.00$. Staisfac11th Ave.. N.E.. Seattle 5. Washington.

INVENTIONS Sold. Leased. Complete Services. M. Joyce Humphries, 1425 Landtitle. Philadelphia 10.
43 THINGS to do before applying for patents. Free information. Fred C. Roth patents. Free information. Fred. 26 St.. Brooklyn 10. N.

PATENT Searches $\$ 5.00$. 48-hour service. Patent Applications prepared. For free Record of Invention write Miss Ann Hast-
ings, P. O. Box 176, Washington 4, D. C.

PATENT Searches S5.00. 48-hour airmail service. Patent Applications prepared. In service. Patent Applications prepared. In-
vention protection forms free. Write Patvention protection forms iree. Write Path ent Engineering Service. ${ }^{711}$
N.W.. Washington $5 . D . C$.
PATENT Searches $\$ 5.00$. Reports airmailed in 48 hours. Patent Applications prepared. Free Record of Invention. Write Raymond L. Smith. Patent Searcher, 622 Sheraton Building. Washington 5. D. C.

## 61 INVENTIONS WANTED

INVENTIONS wanted. Patented: unpatented. Tremendous Manufacturers lists. Global Marketing Service. 1404 Mitchell. Oakland 1. Calit.
INVENTIONS promoted. Patented or Unpatented. Established 1911. Write Adam Fisher Company 183 Enright St. Louis. Mo.
INVENTORS: Hundreds of manufacturers have requested our assistance in locating marketabie new products. Complete Inventors Dept. $30 \mathrm{C} .631-\mathrm{E}$ Street. N.W. Washington 4. D. C.

INVENTIONS Wanted Patented or Patent Pending. 23 years experience Promoting Inventions. National Service Bureau 3122 Meramec. St. Louis 18. Mo.
INVENTIONS Wanted. Patented, unpatented. Send for free form "R." Gilbert Adamec. Patent Broker. 55 West 42 St. N. Y.
CASH Buyers for inventions, patented or patentable. National Inventors Instior patentable. National Inventors Insti-
tute. 4097 East 131 st St.. Cleveland 5 . Ohio. INVENTIONS Wanted. Patented. Pending only. Inventors Patent Exchange. Hartford 1, Conn.
IDEAS. inventions sold. Broker Service, 2408 West Washington. Charlescon. W. Va. 62 PATENTS FOR SALE
PATENTED, automatic harr curler patented hinging chain paper clip for licensing. Thomas M. Cruce. Billings. Montana.

## 64 MODELS, MODEL SUPPLIES

SHIP and Yacht model fittings; blueprints. Send 25 c iur illustrated catalog No. 28-Listing hundreds of items. A. J.
Fisher. 1002-2 Elowan. Royai Oak. Mich.
1953 CAR Models. $1 / 25$ scale. all metal. chrome trim. Send for catalog. Ajax Toy Co., Dept. PS-12, 2637 W. Division St. Chicago 22.
BUILD Historic ships. vehicles. 50 c to $\$ 9.00$ kits. Illustrated Catalog 10 c . Ideal Models. 19 West 18th Street. New York 11.

SHIP and other scale models. Most complete line in New England. Kits, fittings. plans books, tools. engines. motors. MusInc. Dept. PS54. 342 Atlantic Ave., Boston 10. Mass.
LIVE Steam Engine. $101^{\prime \prime \prime}$ high. ready-to-run, $\$ 5.95$ postpaid. Catalog 35 c . Merlo Company $50-18$ 94th Street. Elmhurst 73. New York.

POWER Models. Unusual steam, gasoline and traction engines, fittings. metals. Anniversary catalog 50 c . Charles Cole,
Ventura. Calif. Ventura. Calif.
SOMETHING new-Scenic ship models. kits. For framing or shadow box-Carve and paint yourself-photos and description 10c. Richard Orr. Ship Studio. No. Easton, Mass.
BUILD 5.000 piece miniature homes, nett. 6578 Van Ness. Los Angeles. Calif.
LIVE Steam Locomotive. Atlantic 4-4-2 1-2". Models. 54 page book of drawings covers patterns, core boxes machine fin-
ishing. Both sizes. Accessories too $\$ 1500$ ishing. Both sizes. Accessories too. $\$ 15.00$ Pustler. 4086 Barnes Road. Santa Rosa. Calif.
LIVE steam locomotive catalogue of supplies, rough castings. and blueprints for ten engines. Send 25 c to Yankee Shop, Box 275B. Danvers. Mass.
SCALE models of horse drawn vehicles. Buggy $\$ 1.95$. Surrey $\$ 2.59$. Carriage $\$ 2.95$. stage coach $\$ 3.59$. Add 25 c mailing charge Models. Inc.. Mound Valley. Kansas.

STEAM engines. boilers. castings. Cata$\log _{\text {way }} 25 \mathrm{c}$. Anton Bohaboy. 2297 Price. Rahway, N. J.

HOME CRAFTSMAN
LEATHER. tools. lacing, supplies. Free Catalog. National Handicraft, 199 William St.. New York 7.
'PRACTICAL Painting, Wood Finishing" shows how to get professional results. Furniture finishing. workshop projects. home decorating. Complete Modern brush and spray methods. Tricks you've never seen. Write Home Craftsman, 110̄-F Worth St.. N. Y. 13 .
93 "ORIGINAL Idea", Jig Saw patterns $\$ 1.00$. Professional drawing, quality printing. Full size shelves. coys, lawn orna4343 Lindell. St. Louis 8 . Mo.
"TOPS" in everything for Leathercraft. Lowest prices. Genuine "Craftool" stamps. Catalog 10c. Crown Leather Company, 22 Spruce Street. New York 38.
PLASTICS home-craft course for Men and Women. Tells and shows now 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 Dept. D2-N. Portland 13. Oregon.

LEATHERCRAFT Metal Tooling. Textile Painting. Beadcraft. Shellcraft. Many other crafts. Send for Free big. illustrated catalog today! Kit Kraft. Hollywood 46. Cali:

BIG Savings Leather-Now, for first time. you can buy full sides of top grain cowhide at our special. amazingly low tannery-to-you' prices. For details. Write Dept. 6. W. D. Byron \& Sons. WiliansSTART Your Own business manufacturing driftwood lamps. Kits $\$ 7.00$. S. Patchett. $2187-$ N.W. 24 Court. Miami, Florida.
OUR biggest Leather and Craft Catalog yet: 1000 's of items. Send 25 c (refunded with first order). Russo Handicraft Supplies. Dept, 212. 245 S. Spring. Los An-
LEATHERCRAFT Supplies. Pre-cut kits, tools. etc. large stock. Catalog 10c. refunded first order. Whitman Saddle Mig. Co., Ohio Powers Street. D-12. Cincinnati
23. Ohio.
MAHOGANY Dressed kiln dried Honduras ${ }^{1 / 4^{\prime \prime} \times 5} 51 / 2^{\prime \prime} \times 36^{\prime \prime}$ (1 lb.) $\$ 1.00$ ea.. $3 / 4^{\prime \prime} x$ $5^{1} 2^{\prime \prime} \times 36^{\prime \prime}\left(31 /{ }^{\prime \prime} \mathrm{lbs}\right.$.) $\$ 1.50$ ea. Add Postage. Other sizes available. Herb. Baumgartner, Box 2913. Brentwood 17. Mo.

FREE 48 Page Leathercraft Catalog including easy-to-follow instructions on lacing. wallets. etc. Get started in this easy fun-to-do-hobby today. Tandy's leathercraft prices are lowest! Write Tandy Leather. Box 397 -S. Tulsa. Okla.

BUY wholesale nationally advertised power, hand tools. thousands other prodPlan." American Buyers, 630-SS Linden, Plan. American Buy Buffalo 16. New York.
LEATHERCRAFT For Pleasure or Profit. Make easy-to-assemble purses. belts, gloves. woolskin toys. 100 other items for gifts or to sell. Send 10 c today for big
catalog. Largest
Leathercraft catalog. Largest Leathercraft Stock in
U.S. J. C. Larson Co., 820 S . Tripp, Dept. 3754. Chicago 24

CRAFT Leathers, Supplies. Lacing. Kits, Tools. Send 25 c for latest catalog. Jonas Handicraft Co.. 30 Frankfort Street, New York 38. N. Y.

129 NEW full size Jigsaw Patterns. Unusual novelties. gifts. lawn figures up to 22 inches high. action (merry-go-round) windmill. toys. useful gadgets. Artist drawn. \$1. Craftplans, 1321-B South Michigan. Chicago 5.
LEATHERCRAFT. New Stylecraft folder Free. New Kits illustrated. Filigree Belts, Billfolds. Purses. etc. Send 25 c new catalog. Refunded first order. Apache Leather Co., 2804 East Washington St., Phoenix, Arizona.
89 FULL size Jig Saw patterns of beautiful shelves. ornaments. toys. novelties plus "How. where to Sell." Only \$1.00. Mastercraft 124S. 7041 Olcott. Chicago31. Inl.
KNOCKDOWN Cedar Chest. Lumber and Veneers. Free Price List. Giles Co.. Brownsboro. Alabama.

SQUAREKNOTTERS: Make belts. handoags. lanyards. dog leashes. etc. Special offer! Beginner's book. catalog and quality P41. 39 Henry St., Brooklyn 1. New York.
101 FULL size patterns. Smart new gifts. novelties, lawn figures, shelves. action windmills. aiphabets, Plus "Make Money Jig Sawing" Only $\$ 1.00$. Mastercraft 125 S . 7041 Olcott. Chicago 31. Illinois.
KNOCKDOWN cedar chest and lumber free price list. Bedio:d Lumber Company. Shelbyville. Tennessee.
LAMP size cypress knee $\$ 1.00$. Cy Products. Dept 5. Lafayette. La.

FATHERS'" 15 Full Size Christmas and Birthday Gift Patterns For Your Young Craftsman To Make. Send 50c. Pride and Joy Company. 214 Dane, Randolph. Wisconsin.

A Selection of the most unique and fascinating Jig Saw patterns; money makers. $\$ 1.00$. H. Singe
wood. Indiana
100 FULL size jig saw patterns. up to $20^{\prime \prime}$ high only $\$ 1.00$. Pattern Service. Medway 8. Mass
EARSCREWBACKS-Pinbacks-dozen 25 c . gross $\$ 2.00$. Deskpens $\$ 1.20$. Cosmo-
politan Metalcrafters. Box $176-\mathrm{PS}$. New poiltan
LEATHERCRAFTERS: Big illustrated catalog of materials, tools, kits, 10c. Art's Leather. 411 Joseph Ave., Rocnester 5. N. Y. OVER 100 new full size jig saw pattterns for lawn tigures, toys, novelties. etc. O.ily $\$ 1.00$. Free ball pen with each order. Andco Fatterns. 1488 South. Toledo. Ohio. LEATHERCRAFT Tools. Leather Embossing Plates. Craft Accessories. Dies. Catalogue 10c. Louis Jones Engineering Company. 1613 Main. Fort Worth. Texas.

WE Supply Ready Markets For Your Handicrafts." Big information folio and complete details-250. Home Arts \&
Craits. 310 Davidson Rd... Westby. Wisc. TRIPLE the life of your Christmas Tree Lites. 25c. Clyde Clymer. I incoln 4. Neb.
14 ALPHABET Patterns. Monograms Numerals. $1 / 2^{\prime \prime}-4^{\prime \prime}$ high. Walker Studio. PS-A12. $4343{ }^{2}$ Lindell. St. Louis 8. Missouri.
90 ALL new full size lawn ornament and novelty patterns, up to $20^{\prime \prime}$ high. Only \$1.00. Mastercraft 122S. 7041 Olcott. Chicago 31, Illinois.
MAKE Your Own Furniture! New 256page book "How to Build and Repair Your Own Furniture" shows you how to save big money making. and repairing tables. chairs. bookcases. desks. cabinets. shelves. much more! Step-by-step directions, hundreds of illustrations. Only $\$ 2.49-$ moneyback guarantee. Popular Science, Dept. 1253 C .353 Fourth Avenue, New York 10. N. Y.

## 66 BULLD IT YOURSELF

BUILD Your Own "Tractor". Free information. Eltraco D-5. Camptonville. Calif.

CLOTHES Dryer-Rotary Drum: Cabinet Type. Plans, instructions. \$1.00. Artinet Type. Plans, instructions. \$1.00. Arti-
san Tecnnicraft, P. O. Box 846 . Fhoenix, Arizona.
BUILD a Table Model Power Hack-Saw. Cuts patterns in Metal. Plastic, Wood Plan $\$ 1.00$. A. Harvey. Thornwood. N. Y.

AUTOMATIC Clothes Dryer. Build yourselit $\$ 50.00$. Complece plans $\$ 1.00$. Nunley Enterprises. Dept. A., 3390 Wiley, San Leandro. California

EUILD a treasure and metal detector. Lightweight. Sensitive. Inexpensive. Complete kits. Free Literature. Dept. H, Electronic Applications. Box 4975, Washington 3. D.C
BUILD Inexpensive Concrete Blockmaker. Motor or Hand. Then Make Blocks for Five Room House for only $\$ 95.00$. Free Details. Clyde Lee. Mountain View, -1, Oklahoma.

BUILD copyrighted concrete block duplex $\$ 1300$. Living room. kitchenette, bedroom. bath each side. Blueprint. instructions. material cost list $\$ 1.00$. Bafley tle Rock. Arkansas.

BUILD three dedroom rancher-large rooms-firepiacz-only $\$ 1200$. Plans $\$ 1.00$.

SEND for big new 1953 illustrated catalog that will show you how to turn your spare time into cash-making quick-selling. highly profitable lamps. Every home a prospect. Hundreds doing it--you can. too. No experience or special tools required. Catalog No. 7 contains 56 pages filled with shades. shade frames. figurines and bases. oil lamp converters. boring compound and dozens of similar items. Also all kinds of sockets cords. pipes harps finials bases and hundreds of other parts-everything you need. Special 8 -page section shows 6 beautiful lamps in kit form-ready to assemble. You buy wholesale. sell at retailmake Big profits. Send 25 c today for new 1953 catalog and wholesale price listyou'll be glad you did. The 25 c will be refunded on your first order Gearon Co.. 6. Illinois.

BUILD luggage and cases at home. We sell your product. No special tools or $805-\mathrm{Y}$ Sunset Blvd.. Los Angeles 12 .
"CONCRETE Block Homes." 32-page booklet on how to build. $\$ 1.00$. H. C Lightfoot. Civil Engineer. Richboro, Penn.
GARDEN Tractor two-four wheel drive auto parts. Information. Tractor. 14493 Arrow. Fontana. Calif.
CABIN. cottage. hunting lodge ranch house! Have any one with aid of amazing new book "How To Build Cabins \& Ranch Houses ": 256 pages. 207 pictures. 17 dif ferent plans-any one worth more than times the low cost of entire book! In not delighted return book for fun refund. Send only $\$ 2.49$. 353 Fourth Avenue. New York 10. N. Y. 67

## OLD GOLD, JEWELRY, <br> WATCHES, ETC.

RHINESTONES. jewelry settings. cameos. sequins. beads. Send 10 c for Illustrated Catalog. J \& M Novelties, Dept. CP-4. Griffith, Indiana.

JEWELRY making. Send 20c for illustrated catalog. Milady-Fair Co., G.P.O. trated catalog. Ming Milady-
1328 .
5000 JEWELRY Styles you can easily make yourself, Rhinestones, Pins. Earrings. etc. Lowest Prices Guaranteed. In-
structions and Catalog-10c. Barry's. 166 structions and Catalog-10c, Barry's. 166
Ardsley Court. Newark. New Jersey.
TWO New Books show how to make jewelry at home and how to sell what you make. Send 25c for "How To Make Costume, Jewelry" and "A Success Plan For You," Castolite, Dept. PJ-102. Woodstock. Illinois.

WATCHES wholesale catalog 10c. Kavanagh. 607 Knickerbocker Ave., Brooklyn 21, New York

JEWELRY Wholesale direct to you. Elgin, other national brands. $50 \%$ discount. Write, catalog 10c. Brock-way Plan, 1145 High. Topeka. Kansas.
10 HIGH-grade Swiss Ladies'-gents' Wristwatches needing minor repairs $\$ 18.00$. Catalog 10c. Berkowitz, 1150 Castle hill. New York 61 . 69

## FOR THE HOME

FREE Trial. Send no money, We'll gamble you'll like Magnecatch 140--"the most powerful marnetic catch on the marReplace broken friction catches in 10 min Replace broken iriction catches in $10 \mathrm{~min}-$
utes with only a screwdriver. Ideal for new utes with only a screwariver. Ideal for new Alnico lifetime magnet in beautiful crys-tal-clear housing. Fully guaranteed. Write tal-clear housing. Fully guaranteed. Write
for postpaid sample; try for 30 days. then remit $\$ 1.19$ or return to Magnecatch Corremit $\$ 1.19$ or return to Magnecatch Cor-
poration. 320 North Meridian Street, Inporation. ${ }^{320}$ North ${ }^{\text {manapolis }}$. Indiana.
LANDSCAPE your property, build trellises. arbors. gates. fences. garden screens. outdoor fireplace-barbecue. flagstone walls. beautiful garden furniture, a garden pool. much more! Amazing new "House \& Grounds' book even shows how to add a breezeway-carport, terrace. porch or patio! 256 information-packed pages. aver 700
pictures. Send only $\$ 2.49$ to Popular pictures. Send only
Science. Dept.
$\$ 253$ C. Science. Dept.
New York 10.
FOAM Rubber Furniture CushionsFactory Seconds- $50 \%$ discount. Prices Free. Perma-Foam. 140-A Main Street.
East Orange. New Jersey.

CESSPOOLS. septic tanks. outdoor toilets cleaned deodorized. No pumping digging or moving necessary. Inexpensive, Details. Chemical Cesspool Cleaning Co. Boston 34. Mass.

## 70 OF INTEREST TO WOMEN

NYLONS 8 c pair. Anklets 12 c pair Socks 9c. Print 17c. Panties 12c. Dresses \$1.95. Slips 47 c . Undershirts 17 c . Rugs 70c. Robes $\$ 1.65$. Spreads $\$ 2.65, \$ 70.00$ Watches - $\$ 18.95$. Jewelry Sets $\$ 1.25$. Pens 8 c , Combs 1c. Aspirin \$1.00-1.000. Brushes 9 c. Razor Blades $5-2 \mathrm{c}$. Electric Razors logue 25 c if sent immediately. Sibert's. logue 25 c if sent im
Chattanooga 4 . Tena.
GOOD Money In Weaving, Weave rugs at home for neighbors on $\$ 69.50$ Union Loom. Thousands doing it. Booklet free. Union Looms. 154 Post St.. Boonville. N.Y.

ADDRESS advertising postcards. Must have good handwriting. Lindo. Watertown, Mass.

AFRICAN Exports wholesale prices hand made leather goods. French perfume. Send $\$ 3$ for sample and literature. Drown, B.P.O. Box 302. Tanger, Morocco.

LADIES. earn extra cash by addressing advertising postals at home. Write. Vali Co.. Box 1042. Muncie 10. Indiana.

## 71 FOR SALE MISCELILANEOUS

PEARL shell two pounds $\$ 5.00$. Sample \$1.00. Terrell Nichols. Box 125. Bowie. Texas. BUILDERS-Contractors-Home Owners -Buy That Safe Now. Wall and Floor safes. Write for information. Ernie Scott, 7905 Birchdale. Chicago 35. Illinois.
NEW! Retractable Pen \& Refill 750 postpaid. Lehman. 1125 Evergreen. New York 72. New York
BIG discounts on branded quality mer-chandise-order now for Xmas. Free catalogue. Ascot Sales. $45-34 \mathrm{~B} 218$ Street. Bayside. New York.
BAROMETER-German 85 mm . Forecast weather accurately. Guaranteed. $\$ 5.95$ $\frac{\text { Taylor. } 600 \text { Nimitz. Desplaines. Illinois. }}{\text { DU-AL Hone. Entirely new product ex- }}$ DU-AL Hone. Entirely new product, extremely fine. hard and sharp. for doubleedged razor blades. pocket knives, surgical
instruments. tools. etc. Eliminates stropinstruments. tools. etc. Eliminates stropping. Will give many more smooth shaves per blade than ever had before. Far out
performs all blade sharpeners tested. Will periorms all blade sharpeners tested. Will last years. Price $\$ 1.00$ postage paid. De
Nayson Corporation, Box 931 . Philadelphia $5, \mathrm{~Pa}$.

## 72 WANTED MISCELIANEOUS

SCRAP Mercury (Quicksilver) containers supplied. Tantalum-BismuthTungsten. Metallurgical Products Co.Established 1909. 35th \& Moore Streets, Philadelphia 45 Pa
SAW Filer and Grinder. Box 574, Pearl River. New York.
QUICKSILVER. Platinum. Silver, Diamonds. Prompt Payment. Mercury Terminal. Norwood. Massachusetts.

## 74 RAZOR BLADES, SHAVERS

100 HIGHEST Quality Blades $\$ 1.00$. Sample 10c. $\$ 20$ Electric Shavers $\$ 4.95$.
Paul Hollman. 7004 Merrill. Chicago 49. IIl.

## 75 TATTOOING SUPILLES

TATTOOING Course and Supply Brochures. 25c. Zeis School, 728 Lesley,
Rockford. Ilino1s.

## 76 DRAWING SUPPLIES \&

IMFORTED West German Precision Lotter "Geared Head" Drawing Instrument Empire Engineering Supply Comprochure. 114. Canal Street Station, New York City 13. N. Y.

## 77 TREANIRE FINDERS

GOLD. Silver. Metal Detectors, Geiger Counters for Uranium. Mineralights. Sensational new fully guaranteed models. None Finer. Information Free. Detectron Co... 5420 Vineland Ave., North Hollywood
California.

TREASURE-M-Scope Geiger Counters -Mineral Locators. Why buy scomething inferior when you can buy the best at a
lower price? Backed by years of lower price? Backed by years of experience, Fully guaranteed by factory, Detects minerals, metals. gold. silver. coins. Payment plan available. Proven superior performance. Free 16 page illustrated booklet.
Fisher Research Lab.. Inc. Palo Alto. Calif.

TREASURE Hunters! New 11-pound featherweight Model 101 locator for gold. silver and minerals. Money-back guaranfor uranium prospectors. Completornters mation free. The Goldak Company. 1540 | mation free. The Goldak Company ${ }^{1540}$ |
| :--- |
| . Glenoaks Blvd.. Glendale 1. Calif. |

SELECTIVE metal and mineral detector. Revolutionary design. Distinguishes metals from black magnetic sands. Readily detects metals under salt water. Also Electron:cs Company. 2018 N . Dayton. Phoenix. Arizona.

LOCATE Hidden treasure. distinguish minerals from metals with Model 100 Detector. Weighs 5 pounds, extremely
sensitive. Factory assembled ( $\$ 79.90$ ) or sensitive. Factory assembled ( $\$ 79.90$ ) or
kit form ( $\$ 39.90$ ). Free Literature. Dept. G. Electronic Applications. Box 4975 . Washington 8. D.C.
"SNOOPER" Geiger counter. Only $\$ 29.95$ complete. Super-sensitive. Pocket size. Find a fortune in uranium. Order back guarantee. Free catalog-Scintillator and larger uranium and metal detectors. Precision Fadiation Instruments. 2235 CPS So. LaBrea. Los Angeles 16. California.

## 78 WATCH REPAIRING

WATCH and clock repairing books for hobbyists. Free information. North American. Dept. $23-\mathrm{M} .2330 \mathrm{~N}$. Milwaukee. Chicago 47. Illinois.
WATCHMAKERS' - Jewelers' complete informative catalogue 20c. Bengal Company. Culver City. California.

WATCHMAKERS' Tools. Materials. Supplies, Watches. Catalog. Gales, Box 1000 Chicago 90. Illinois.

5 ELGIN. Waltham. Illinois, Hampden Gents' wristwatches needing minor repairs. \$18.0c. Write for prices. B. Lowe. Holland Bldg.. St. Louis 1. Mo.
WATCHMAKERS! Beginners! Watches. Movements. Descriptive list. Box 150. Chicago 90. Illinois.

## 79 MISCELLANEOUS

"SANTA Claus" Personal letter will delight your children. Information free. Santa's Letter. 501-P Elgin. Houston, Texas.
ADDRESS advertising postcards. Must have good handwriting. Lindo. Watertown, Mass.
WOW!! this French-type perfume really sells. $60 \%$ off! Free sample. Elliot-Stuart. 27. Calif.

BUY vitamins direct. Amazing savings. Catalog free. Matoska, White Bear Lake. Minn.
BUY Wholesale thousands nationally advertised products, at big discount. Free $631-\mathrm{E}$ Linden. Buffalo. New York.
PLASTIC Tea Aprons $\$ 1.00$ (Refundable). Harrison. 14913 So. Wanette. Bellflower. California.
COPPERWARE cleaner guaranteed simple old-fashioned formula 25c. Opsah1 $\frac{1720,2 \text { Carmona, Los Angeles. Call. }}{25 \text { TO } 50 \% \text { discount: Appliances Gift- }}$ ware Cameras: Catalogue 50 c refundable. Dart, 3812 Atlantic Ave., Brooklyn 24, N. Y
MAGNETS-Permanent Alnico. Never loses magnetism. Excellent for map and $\$ 1.00$. Pritt Co., Dept. MS-12. 12 West 27th. N.Y.C.

EASILY home made windmill gives plenty power. Guaranteed instructions $\$ 1$ Ziemban. 6123 Orchard. Dearborn. Mich ASTOUNDING! Secret of Persuasion! Churchill. Montreal 16 Canada.

BIG interesting mails three months 25c, year $\$ 1.00$. Harvey Teeple, Decatur, Ind. SENSATIONAL new "Sand Ease" sanding blocks for removing old finishes and preparing new wood. smooths plaster. Faster and more economical than sandpaper. Five large $2^{\prime \prime} \times 3^{\prime \prime} \times 5^{1 / 2^{\prime \prime}}$ blocks Postpaid $\$ 1.00$. J. C. Ivey Company. Dept. S, 414 Main Street. Cincinnati 2, Ohio.
FREE Catalog Organic Dates. Figs, Nuts. Honey. Tontz. Elsinore. Calif.
WORK Clothes below wholesale cost. Quality cotton pants 89 c , shirts 79 c . coveralls $\$ 1.69$ and shop coats $\$ 1.59$. All clothes reconditioned. sterilized. We will ship anywhere C.O.D. Write Eastern Processing Co.. Box C. Franklin Station, Baltimore 23. Maryland.
RECEIVE magazines, samples, catalogues, Mails from everywhere. Offers hundreds. Larger listing 35c. Rorick, Box 86 M . Cincinnati 26. Ohio.
HEARING Aid Batteries. Lowest Prices. Ellis. Box 51. York. Pa.
300 BIG Mails guaranteed, samples, offers. plans, propositions, 12 months listing. $\$ 1.00$. (refundable). Wright Publications. 2276 Hubbard. Memphis 8. Tenn.
FREE! Gold plated cameo ring. Send 6c in stamps. Doc. Box 12. Phillipsburg. N. J. YOUR Leather Jacket renovated expert7. Freeport. N. y. Berlew Mfg. Co., Dept.

```
80
PERSONAL
```

DETECTIVE'S Opportunities. Detective particulars free. Write. Wagoner. P-125 West 86th. New York 24.
"HOW Can I Find Out?"' You Can! Information confidentially developed. Any matter, person. problem, World-wide Officially licensed. Established 1922 . William Herman. 170 Broadway. New York.
INCREDIBLE! Become Mental Superman Overnight! Free Booklet! Bijou, Box $1727-$ VC. Hollywood 28, California.

LETTERS. Remailed promptly. 25 c . Dietz. 158 East 102nd Street, New York City 29.
LETTERS remailed from Colombia $\$ 1.00$. Kent. Apartado Aereo 1700 , Medeliin, Colombia.
ADDRESS advertising postcards. Must have good handwriting. Lindo, Watertown, have

MIAMI remails, 25c each. Melody Mailers, 8031 Biscayne. Miami. Florida.
"X-RAY Mind." Dangerous power over others. Inquire. Send dime. Krishnar Institute, 1912 Lincoln-Park-West. 222-SZ, Chicago 14.
DRUG Sundries Wholesale, Men, Women. Illustrated list 25 c coin. Ally, 1123 Ellicott. Buffalo 9, N. Y.

LETTERS remailed 25 c , private receiving. forwarding address available. Lenza, 3122-B Arizona. Santa Monica 2, Calif.
MAIL from The Sunshine City! Letters and cards remailed 25 c . The Florida Shopper, Box 428. St. Petersburg. Florida.

LETTERS remailed from Panama. $\$ 1.00$. United Services. Box 530. Colon. Panama. POWERFUL mental telepathy practical. Joe Johnson. Globe Rd., Lewisburg. Tenn. HAND Guide. Corrects your Penmanship in 10 hours. Write Perfect Penmanship, in 10 hours. Write Perfect Penm $665-35 \mathrm{P}$. St. Louis, Missouri.

MIAMI, Miami Beach complete Sunday classified, Jobs. Rentals. etc. Airmailed $\$ 1.00$. New Year's 'Orange Bowl'" Edition $\$ 1.00$. Letters remailed 25c. six $\$ 1.00$. Six postcards $\$ 1.00$. Page. Box 1097. Coral Gables, Florida.

LETTERS remailed from Los Angeles or Long Beach 25c. R. Harrison, 14913 So. Wanette. Bellflower. Calif.
BIBLE reveals Time Of End. Free Write: Harvest, Jefferson City. Missouri. PROSPERITY through atomic mind power. 9 c brings formula, Gosomar. 6th
Floor, 90 West Broadway, New York City 7 .

KING of Siam Palace postcard enclosed free! Siam-letter reairmail $\$ 1.00,3$ for $\$ 2.00$. $5-\$ 3.00$. Surianont. Box 696, Bangkok. Siam.
KANSAS City remails. 25c, registered \$1.00. Kitheart, 2630 Charlotte. Kansas City. Mo.
MIAMI. Miami Beach. Remails 25c. Arthur Warner. 901 NW 50th St.. Miami. Fla. PARIS-Letters reairmailed $\$ 1.00$. Lucas, 50 Rue du Four. Paris 6. France.
"INTERESTING Mails"-25c keeps your mail box full three months. Bentz. DeskJ/2. Chatawa. Mississippi.
REMAIL Xmas Cards 25c fool your friends. fake Texas Xmas vacation. Jackson. P.O. Box 7223, Hackberry Sta.. San Antonio. Texas.
FRENCH Canada remails-Montreal postmark 50 c each-Conrad Legault. 12272 Desenclaves. Montreal, Quebec. Canada.
LETTERS. post cards remailed from nation's capital. Fast. dependable 25c. Ken-Mac. P.O.B. 6713 . Washington 20 . D.C. APTITUDE, Personality Test. Positive inspirational with detailed personalgraph
$\$ 2.00$. Free particulars. A. Willis. Director, $\$ 2.00$ Free particulars.
MEXICAN Law. General Practice Attorney. 1203 Arizona Street, El Paso. Texas. AT Last! A budget that really works! Make your dollars go farther. Send today for printed expense control budget with complete instructions. Only $\$ 1$ postpaid. Ludecke. Box 85 . South Gate. California. LetTERS remailed San Francisco Postmark 25 c . Private receiving-forwarding mark 25 c . Private receiving-1orwarding address available. Shank
GOD-Universe-Mind. How can their unlimited power bring wealth. success. happiness into personal affairs. job. business and profession? What is the secret? Write for Free literature-it could change your life! Cosmo-Psycha. Dwr. 3246, Olym-
pic Station 7. Beverly Hills, California pic Station 7, Beverly Hills, California.

## HOW TO SAVE MONEY ON Home Repairs! tinkering wher T001S <br>  <br> Only ${ }^{51}{ }^{49}$ <br> NEW BOOK MAKES IT EASY! <br> NOW you can save up to $50 \%$ on household repairs if you follow simple instructions in the big new illustrated book, Tinkering With Tools! Here you'll find everything you need to know about woodworking, shingling, plastering, interior and exterior painting, plumbing, wiring and masonry! In a jiffy you can learn how to repair faucets, valves and traps, electrical appliances, how to refinish floors and furniture, lay sidewalks, panel walls, renew sash cords, stipple walls-hundreds of home repairs so easy to make! <br> Never before have so many money-saving helps-plus hundreds of pictures-been packed into one big 260 page cloth-bound DeLuxe volume to sell for ONLY $\$ 1.49$ ! A book this big should cost $\$ 3.50$ or more!

## SEND NO MONEY—ORDER TODAY

Mail your order now, and pay postman on delivery ONLY $\$ 1.49$ plus shipping cost. If after 7 days' FREE TRIAL you aren't completely satisfied, return book and we'll gladly refund every cent. Write to:

POPULAR SCIENCE, Dept. 1253
353 Fourth Avenue, New York 10, N. Y.

## New Thrills for Model Railroaders!



Hundreds of new ideas that will save you money and make model railroading more fun than ever! Shows how to lay your own track, how to make automatic signal systems, culverts, roundhouses, tunnels, switches and other modern railroad equipment.

It's easy to follow the clear, simple instructions and diagrams in this new book. Shows how to make freight cars, baggage cars, pullmans and day coaches. In addition, there are complete instructions and blueprints for building a Pennsylvania R. R. type locomotive.

## SEND NO MONEY

Just write for your copy of MODEL RAILWAYS today, and pay the postman only $\$ 2.49$ plus a few cents postage on delivery. If you prefer to remit now we pay postage. Money back if not satisfied. Address

POPULAR SCIENCE MONTHLY—Dept. 1253
353 Fourth Avenue
-


## PLYWOOD BOAT KITS <br> (Freight Included) $12 \mathrm{FT} \quad \$ 9700$

 14 FT \$12900Build this 12 or $14-\mathrm{ft}$
sport runabout from ready
cut parts. Kits
ete the boat shown. Send for free tolders of all models as low as $\$ 32.00$ freight included

TAFT MARINE WOODGEAFT
Dept. W, 636 39th Ave., N. E., Minneapolis 21, Minn.


## EVERY DAY <br> taking orders for sensational plastic Auto Seat Covers <br> Every car owner your prospect <br> ...y your own seat covers as bonus <br> Here's the BIG MONFY business . . . tak

> BIG OUTFIT FREE
> Write Today! limited, Just frow eam owners with prospect un Seat Cover values, Newsen materials, ine quality superb tailoring, perfect fit : pLt's Low PRICES . . . all help you get orders for the asking. No experience needed. Earn -pare hours or full time. Start now . . SEND NO MOXEX . we supply everything neeted. Rush name and address for big sales outfit. FinvF. Write today.
KEY PRODUCTS, Dept. 6312, 800 N. Clark St., Chicago 10, III.

## Make Your Home Draft-Proof

## WITH 

## over $\mathbf{6 0 0}$ million feet sold!

Home owners from coast to coast keep their fuel bills low with INNER-SEAL, the flexible, tightsealing weather stripping! INNER-SEAL's exclusive patented construction - spring steel molded in live sponge rubber - makes a pressure-tight seal that keeps heat IN . . . keeps cold OUT! Tough neoprene coat makes INNER-SEAL waterproof, abra-sive-resistant, durable. INNER-SEAL is adjustable, fits perfectly even on warped frames. Easy to install, lasts for years . . . has dozens of handyman uses.

For your overhead garage doors - heavy-duty INNER-SEAL Weather Strip Cushion . . . seals out moisture, cold, dirt . . . prevents doors from splintering or freezing.
 Get your FREE copy of the new 24 page booklet "Why \& How To Weather-Strip". Available where you buy your hardware or building supplies.

OR, WRITE DIRECT TO DEPT. PS-12


$$
=0
$$

BRIDGEPORT FABRICS, INC., BRIDGEPORT 1, CONN.


## New VITALATOR With

## Real "Swedish Massage" Action!

Einjoy this new. pleasant way to masage away fatigue. soothe iumby nerves, ease tencion! Fxacllent for facials, after-exercise massige, aching muscles, headaches, "waistline control," hair and sealp health. Preferred by thousands for its wonderful Swedish Massage action . . . the rotary massage method which feels so good and is so good for you! \ I A AI.ATOR operates on IC or DC. Just slip it over your tingers: turn it on. and thousands of gentle massage pulsations travel through your finger tips to ease body aches and pains, relax tense muscles.
VI'TALATOR is compact. lightweight, easy to use. And so enjoyable-melts away tiredness and fatigue, leaves you feeling refreshed. relaxed. Anyone can use it, and everyone will enjoy it. Order by mail today-only $\$ 15.50$ postpaid. Check, money order or C.O.D. Immediate delivery. Try VITALATOR for 10 days at our risk-if not delighted, return for immeliate refund. including postage.

## HUGH CLAY PAULK

304 Kansas Ave., Dept. V-29, Topeka, Kansas


Beautifully hand crafted ... a model for every skier. Giving or receiving, every winter sports enthusiast prefers to see internationally famous Northland skis under the Christmas tree.

look for the Deer Head Trademark Write for FREE booklet on how to ski

NORTHLAND SKI MANUFAGTURING CO. 94 Northland Park • North St. Paul 9, Minn.

WORID'S LARGEST SKI MANUFACTURERS


More than 32,000 in use. Kit includes pre-cut marine plywood and wood parts, brass screws, seam compound, full instructions. A rugged boat, easy to assemble. Free booklet.

## Sea Shells of Branford <br> In Canada <br> 8270 N. Main Street Branford, Conn. <br> Roberts-Ross, Ltd. Orillia, Ontario

FRAMED IN FAME-Safety-Engineered


MODEL 1-UCO, shown, features $1 \frac{1}{1 / 2}$ square axle of solid steel; 2500 lb . capacity. Comes completely equipped, except for tires. List price $\$ 65.29$ postpaid (when paid in advance). Other models to 5000 lb . capacity. We manufacture a complete line of trailer parts; write for Brochure 14-L.
HAMMER BLOW TOOL CO.
"As old as the Industry!"
WAUSAU, WISCONSIN


Imagine, beautiful Cattleyas, Exquisite Cymbidiums, and other colorful varieties...growing, blooming, right in your own living room! A single Orchid plant on a card table or window sill, can multiply into a fortune! NO EXPENSIVE EQUIPMENT NEEDED! GROWS IN ANY CLIMATE! Learn the amazing secrets, with easy-to-follow instructions. WRITE TODAY FOR FREE ILLUSTRATIONS and details on obtaining already potted ORCHID PLANTS FREEI ORCHID-LAND
DEPT. 4B, BOX 27801, LOS ANGELES 27, CALIFORNIA



##  FOR ADULTS ONLY

THEY'RE TERRIFIC! Brand new series of exclusive records. Spicy songs packed with teasing wit and lusty humor. The kind you will like. Complete set of SIX DIFFERENT SONGS on finest quality 78 or 45 R.P.M. records (state choice), sent prepaid for $\$ 4.95$ in sealed package. No C.O.D.'s.
NATIONAL, Dept. 478, Box 5, Sta. E, TOLEDO 9, OHIO



## GIANT BALLOONS

Surplus U.S. Gov't. (new-overage) Neoprene weather, target balloons For FUN or PROFIT. Great sport in dances, fairs. MONEY-MAKERS. Use these balloons to attract crowds to civic events, conventions, exhibitions rade shows. TERRIFic for high schoo and college PROMS. All sizes are approx. inflated sizes Postage prepaid on prepaid orders.

3 ft dia. 49c-6 ft. dia. 99c 13 ft . dia. \$1.59-20 ft. dia. \$1.95
, "Marksman" AIR PISTOL
It's a target pistol but it looks, feels, muzzle loads and cocks like an army .45. You can hav fun indoors in rumpus room or basement; or out in "he back yard ,' your friends Caliber 177 accurate, high-powered, guaranteed, Complete with free supply of BB's, darts \& pellets. Full payment must accom- \$.................................... EXTRA AMMUNITION AVAILABLE
Darts, 50 \& doz.-BB's, 15 for 150-Pellets, \$1.50 for 500 Add $10 \%$ for handling \& delivery of air pistol and ammunition

WAR ASSETS DIV. volume sales co.
Dept. S-12-53 3930 Sunset Blvd. Los Angeles 29, Calif.


FINE BOWS and ARROWS selegted raw materials Catalog 5c send for it

HAND BOOK-lllustrated Instructions on Making and Shooting Archery Tackle-75c L. E. STEMMLER CO. Manorville (Box I) L. I. N. Y.

BUMPER STRIPS THAT GLOW RED PROIECT YOUR CAR FROM - NIIF ACCIDENIS


Reduce dangerous nite accidents, trim bumpers with these 1 " reflective strips Easily applied in 3 minutes. Glow fiery red when car lights touch them. Visi ble even in fog. 4 foot strip for $\$ \mathbf{1}$
one bumper, only $\$ 1$. Order now! one bumper, only \$1. Order now! 260 BelAir Dr., N.E. Grand Rapids, Mich.


Telescope Lens Kit Alus Planets, Moon Craters, New Stars Conquer Space Explore the Universe, Planets. Moon Craters, New Stars, objective lens, eyepiece lenses for 50 POWER. 100 POWER. 150 POWER 200 POWER, 250 POWER. and all necessary lens filtings. Easy to make rom simple step by instriction. Irinod and mount not included. BUSSE SALES CO., Hartford, Conn., Dept. PS-17

## COLORPRINITS From Your Transparencies

[^6]

## CHECK YOUR MOTOR THERMOSTAT

A dirty, damaged or over-age motor thermostat impairs your car's cooling system. This often results in engine "boil-overs" and loss of antifreeze. Also, an over-heated engine wastes gas and oil ... while one that runs too cold results in failure to warm your car heater.

So protect both your comfort and your pocketbook. Get your Service Man to check your car thermostat. And if a new one is needed -

## Replace with Autostat ${ }^{\circ}$



Get faster starts and faster warm-ups with Autostat. Get more miles per gallon, more comfort per mile. Save oil and reduce car maintenance. Types for every make and model; quality-made by the pioneer builder of car thermostats.


The new 2 U Impactool will do all these jobs-and do them fast-

- run and remove nuts
- tap
- saw holes
- drill
- drive and remove screws
- drill masonry
- ream
- drive and remove studs
- bore wood
- extract broken studs - run wire brushes

This newest and lightest Impactool has the time-proved Ingersoll-Rand impact mechanism that has an unmatched reputation for power and dependability in both air and electric Impactools. The "rotary" impacts do all the work. There's no kick or twist to the operator and the motor can't stall or burn out.
Ask for a demonstration of this new powerful little Impactool. Size 2 U Impactool only $\$ 97.50$, also available in metal kit with multi-purpose attachments. You'll find it featured by leading automotive jobbers and industrial distributors from coast to coast. Ask for a demonstration or write for catalog.


# Ingersoll-Rand <br> 11 Broadway, New York 4, N. Y. - Dept. S-12 

Originators of Impactools-Air and Electric

MEET YOUR NEEDS


0 popular science


# Diesels Even Run Bikes Now 

## This 11-pound kerosene

 engine makes riding cheaper than walking.
## By Harry Walton

NTOT content with shoving steam off the rails and nudging the gas engine aside on our highways, the diesel is now barking at the heels of bike riders.

You have to look twice to find this $3-h p$. job on the bicycle. Measuring only three by six by 13 inches, it nestles close under the pedals, keeping its 11 pounds as close to the ground as a politician's ear.

Nor will vou find any complication of sprockets, chains. pulleys or $V$ belts. The drive to the rear wheel is by a rubber friction roller in direct contact with the tire. If you should rum out of fuel (which scarcely seems possible) you can push a lever to free the roller, and pedal on.

Pedal to start it. Invited to ride, you give the midget another dubious look and hoist your poundage onto the bike. At once engine drag makes itself felt. You have to lean hard on the pedals to get moving, for you're spinning the crankshaft too. Then you remember to


ENGINE IS HUNG just below crank bearing on a single bolt. Drive roller can be disengaged from rear wheel for ordinary pedaling by lifting ball-tipped lever. Control cables, already connected, are simply tightened on handle bars. Installation takes 12 minutes.

HOW TWO-CYCLE ENGINE WORKS is shown in four steps. Precise instant of firing is controlled by degree of compression. Transfer slots in cylinder provide path for crankcase charge to get above piston. Slots are curved to give incoming charge a path that directs it away from exhaust port and helps scavenge exhaust gases with minimum loss of fuel.


AT TOP DEAD CENTER, CRANKCASE CONTAINS FUEL-AIR MIX. CHARGE ABOVE PISTON IS COMPRESSED TO FIRING TEMPERATURE.


ON WORK STROKE, CRANKCASE CHARGE IS COMPRESSED BELOW PISTON, WHICH COVERS BOTH PORTS.


AT END OF WORK STROKE, PISTON UNCOVERS EXHAUST PORT AND TRANSFER SLOTS. PARTIALIY COMPRESSED CRANKCASE CHARGE ENTERS CYLINDER AS EXHAUST OCCURS.


RETURNING PISTON CREATES VACUUM IN CRANKCASE, DRAWING IN FRESH AIR-FUEL MIX AS INTAKE PORT IS UNCOVERED. MEANWHILE NEW FIRING CHARGE IS COMPRESSED ABOVE PISTON.


WHEEL IS DRIVEN by a $21 / 2$-inch roller in contact with tire. With 1:3 reduction gear built into motor, this provides an over-all reduction of more than 30 to one. Tire diameter has no effect on top speed; engine will drive a 24 -inch bike at same rate as a 28 -incher.
cut in compression, and the pedals get even harder.
But suddenly the engine catches, takes off with a soprano bark. You're powerborne, and feel a bit foolish as the pedals go slack. As you hastily retard the compression control, the engine dies.

You turn the compression control fully back and start again. This time, when the engine catches, you adjust fuel and compression warily. Finding the strategic point where the engine runs smoothly, you relax to enjoy power biking.

Throttling down, you can roll along at little more than a walk. Open up the fuel, adjust compression to match the load, and you're rolling at a brisk 22 m.p.h., a good pedaling clip.

At this rate the engine is revving up to about 6,000 r.p.m., not an excessive speed in view of its alloy piston, rollerbearing big end, and ball-bearing shaft.

Hitting a hill, the engine buckles right down and pulls. Back off the compression a bit-it acts something like the spark advance on yesterday's cars. You slow down, but you'll keep rolling up any grade the average car can pull in high gear. On tougher ones, you help the engine by pumping.
Twentieth of a cent a mile. Importers of the German-built engine claim it will


STEEL CYLINDER, closed at head end, slides short way in finned housing to alter compression ratio. Nut turned by control cables works on threaded part of cylinder to govern its position. Transfer slots are closed by housing wall, forming channels for fuel charge.
run a bike about 150 miles on a tankful of juice-less than half a gallon.
With kerosene at 15 cents a gallon, this would work out to $1 / 20$ of a cent per mile. At today's price for half-soling, this makes riding cheaper than walking.

Of course the drive roller puts an extra friction load on the rear tire, which will therefore wear somewhat faster. The roller itself will require occasional replacement. And in addition to fuel, you have to buy motor oil, which is added to the tank. A jigger in the cap measures out correct proportions.

Compression ignites fuel. Strictly speaking, the engine is a two-cycle, com-pression-ignition job rather than a full diesel, since the fuel is atomized and drawn in with the air instead of being injected. But it works like a diesel in that there is no magneto, battery, spark or glow plug. Only compression heats the charge to the firing point.
You can buy the engine for either gasoline or kerosene operation. The only difference is maximum compression ratio -30 to one for gas, 33 to one for kerosene.
These compression ratios are for a cold engine. Once it's hot, they drop to less than half. The reason: the charge, as it enters the cylinder, is heated and

MIDGET PISTON is $13 / 32$ inches in diameter (cylinder bore is 28 mm .). Piston has three rings, pinned to prevent rotation. Big end of con rod, pressed between crank webs, is fitted with roller bearings. Shaft runs on ball bearings. Stroke is 30 mm . ( $13 / 16$ inches).
expands so that the actual amount (by weight rather than volume) is less.
You vary compression. When cold, the engine has to be pedaled about a block to start it. Once hot, it roars at the first turn of the wheel. There is no driving clutch-you let the engine die at stops, and pedal it to a start when you go off again.
Hard starting, always a problem with diesels and small ones especially, is largely overcome by controlling compression ratio. The cylinder and head are virtually one piece, made to slide a short way inside the finned, die-cast housing. A round nut working on a thread on the cylinder can draw it back or forth, changing the distance between cylinder head and crankshaft, and therefore the compression space. The nut is connected to control cables.
Turned all the way out, the compression control slides the cylinder so far back that a protruding pin strikes the finned cover, opening a valve in the cylinder head. This releases compression to make it easier to start engine. A twist of the wrist restores compression.

Imported by Newage International, Inc. of New York City, the engine is sold by Gimbels and other retailers throughout the country.

END


## Gasoline-Filled "Balloon" Goes Down Two Miles into the Sea

This weird craft is a "bathyscaphe" in which Prof. Auguste Piccard recently descended to record 10,330-foot depth in the Mediterranean. Like an earlier design (PSM, Dec., '47, p. 82), it maneuvered as an up-
side-down "balloon," unattached to any cable. Gasoline in the hull-like structure was the buoyant medium, magnets held or dropped iron ballast, and the ball at bottom was the passenger gondola.

## Jeep Attachment Munches Snow

Don't throw a snowball at this jeep-it can throw back faster than you can. An extra engine out back powers the horizontal screws by an outsize flexible shaft, shown curling over the hood. A high-speed impeller throws the snow as far as 100 feet off the road. The attachment, made by Brede Products, Minneapolis, weighs 850 pounds.

## Loggers Get Mechanical Loader

Here's a mechanical arm that has a 17 foot reach and enough muscle to lift 3,000 pounds of pulpwood at a clip. Jointed to bend like a human arm at wrist and elbow, it can pick up a quarter cord of eight-foot logs in its fist. The Badger Machine Co., Winona. Minn., makes it for mounting on any $1 \%$-ton or larger truck.



## New Styles in Helmets for Junior's Interplanetary Junkets

Snap-on helmet with domed top is official headgear on a popular TV show. It has simulated headphones and a hinged transparent facepiece that can be lifted while Junior downs his cereal before blastoff. This one is sold as a premium by General Mills.

Bubble job has shoulder plates and chest harness to keep it in place during intergalactic rough-housing. Flexible antenna on top is spring-mounted and plas-tic-capped for safety. Made by Arant Plastics, 1004 Folsom St., San Francisco.

Space cap has hinged goggles that flip up or down. Cone-shaped radar antennas around the lenses rotate to pick up blips from hostile raiders. A down-to-earth elastic chin strap holds it firm despite juvenile accelerations. Banner Plastics, Paterson, N.J.

## Vacuum Helps Build a Plane

Problem: how to fit a large corrugated metal tube inside a slightly smaller pipe? Solar Aircraft engineers solved it by applying vacuum to shrink the big pipe temporarily while the shroud is slid over it (right). The assembly is an augmenter tube for plane-engine exhaust gases that also gives warm air for cabin heating and anti-icing.
$\Rightarrow$ Chicken feathers may supply the bristles for paintbrushes, replacing Chinese hog bristles now blocked behind the Iron Curtain. A way has been found to convert feather protein into a synthetic bristle.


## They Say Now

Alexander W. Sterv, physicist: "Physics begins with the desire for knowledge and truth and ends in wonder-the wonder revealed by newly discovered truths of nature and in the miracle of existence."

An anonymous chemist, in "letters to the editor" plblished in Chemical and Engineering News: "Progress is usually made by questioning the unquestioned assumptions of 'the authorities.'"

Austin N. Stanton, president, Varo Mrg. Co.: "Many tests have been devised to predict the potentials of young people but I sincerely hope that none ever prove successful . . No one uses more than a small fraction of his mental capacity. Why should it be assumed that this fraction should be the same for any two individuals? . . . The one whose total mental capacity is smaller than his neighbor's might easily use a slightly larger fraction and surpass him in creative thinking and work."


THE STORY OF MOSES and the people, and spake unto them."-Exodus $19: 25$.
ments, illusir 86 Popular science

READING THE BOOK OF ISAIAH in the world's oldest edition. Prof. John C. Trever (see chart on next page) discusses the Isaiah scroll with a Syrian Orthodox dignitary in Jerusalem shortly after the scroll was discovered.

## Scholars say the discovery

 of more ancient manuscripts near the Dead Sea may be "the most sensational archeological event of our time."

OVER in Jerusalem this Christmas season, men are working hard and reverently, and with every chance of success, to throw new light on the Greatest Story and the Greatest Book.

They are bearded French Dominicans who are both scientists and priests. Members of the staff of the École Biblique et Archéologique Française-French Biblical and Archeological Institute-they have been entrusted with sorting out, preserving, and publishing a great new find of ancient manuscripts, the second in six years, from a cave above the Dead Sea. Scholars associated with the American School of Oriental Research are working with them.

The newly found manuscripts, originally written on sheets of parchment or leather, which were then sewn together to form scrolls, are now in fragmentsbushels and bushels of them-the largest no more than half the size of this page. They are brittle, and some so darkened with age that it takes infrared photography to bring out the writing.

But this much is already clear:
The manuscripts date back to the earliest days of Christianity, and before. They include many copies of Old Testament books that may prove to be the most ancient Biblical texts in the original Biblical languages in existence. They also include books dealing with a little-known sect of Jews with whom John the Baptist may have lived.

Bedouins (Arabian nomads) discovered the manuscripts last year but news of the find was held up until after the Kingdom of Jordan, which feared that the documents might be smuggled out

# Infrared Rays Clarify the Oldest Bible Texts 

By Herbert Yahraes


MAP shows where the latest scrolls were found, in ancient Essenes' country.


TIGHTLY ROLLED SCROLL of Lamech, which probably contains the most ancient account of the life of Noah. It appears as it looked when found. except that one fragment has
been removed. The manuscript is in Aramaic, the language of Jesus, and probably dates from early 1st century A.D. If so, it is the oldest Aramaic manuscript ever discovered.
of the country and sold elsewhere, had paid the tribesmen $\$ 42,000$ and given the treasures to Father Roland de Vaux at the École Biblique for preliminary study.
G. Lankester Harding, British-born archeologist who is Director of Antiquities for Jordan, calls the discovery "perhaps the most sensational and outstanding archeological event of our time."

Harding ought to know. Since 1949 he has been racing the Bedouins to new discoveries, and this year he and other archeologists completed a second season of excavation at a small, ruined settlement now called Khirbet Qumran. This
was built on a natural shelf several hundred feet above the northwest shore of the Dead Sea, in an area known in Biblical times as the wilderness of Judaea. The caves in which most of the manuscripts have been found are only short walks away.

Qumran turns out to have been the headquarters for the Essenes, or a related group of Jews-the sect that owned the scrolls and that hid them in the caves probably about 1,900 years ago.
The settlement consisted principally of a monastery-like building, which included a meeting hall for members of the order and a room fitted out with a

|  |  | $\begin{aligned} & \text { 3RD CENT. } \\ & \hline \text { B.C. } \end{aligned}$ | ? | ? | Etary IST Cent. | 9Th Cent. | ${ }^{20 \text { OH CEETI }}$ A. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| H | 1) | $\lambda$ | $x$ | $H$ |  | $\pi$ | 7 |
| $K$ | $y$ | ) | $y$ | 3 | \% | 3 | 2 |
| $M$ | 4 | I | $y$ | $\dagger$ | - | $y$ | 1 |
| S | 3 | $n$ | $\square$ | T) | $D$ | 0 | - |

how dead sea scrolls can be dated is demonstrated by a chart prepared by Prof. J. C. Trever, of Morris Harvey College, W. Va. It compares the forms of four letters from He-brew-Aramaic manuscripts of known date with the forms of the same letters as they appear in the Dead Sea scrolls. You can easily see that letters in the left-hand center column (Isaiah) closely resemble but are more mod-
ern-looking (and therefore later) than those from the 3rd century B.C. Letters in the right-hand center column (Habakkuk), on the other hand, are still more refined but not quite so much so (and therefore earlier) as those from the 1st century A.D. Scholars figure that the Isaiah scroll dates from late 2nd or early 1st century B.C. and the Habakkuk Commentary from late 1st century B.C.

the first page of isaiah, in the Dead Sea scroll, looks like this. It is written on 17 sheets of sheepskin. The sheets are sewn together with linen thread, making up a manu-
script 24 feet long. Since Hebrew reads from right to left, the first verse of Chapter I begins at the upper right. (Photos courtesy of American Schools of Oriental Research.)
table, bench, and inkpots for scribes working on the sacred scrolls.

Coins found in the ruins indicate that the Essenes lived there from some time in the second century B.C. until the time of the first Jewish revolt against Rome, in 70 A.D. Some scholars suspect that it was from there that John went forth to baptize in the Jordan River, just a few miles away, and to tell his questioners from Jerusalem: "I am the voice of one crying in the wilderness, 'Make straight the way of the Lord' . . ."

The story of the new finds actually begins in the spring of 1947, when an Arab shepherd-chasing a goat, one version says-stumbled upon a cave he'd never before seen and found a number of covered jars. These held nothing but crumbling scrolls wrapped in linen, so the shepherd and his companions-all of them Bedouins of the Ta'amireh tribehandled them with no particular care.

## Tribesmen Went to Bethlehem

One market day, though, the tribesmen took the scrolls up to Bethlehem, some 20 miles off, and showed them to a merchant who happened to be a member of the Syrian Orthodox Church. He sent them to Jerusalem, where the Archbishop later bought some of the scrolls.

Other leaders in his church, several antique dealers, and two visiting European scholars assured him the scrolls could be of no great age, but he got more welcome news from the American School of Oriental Research, which is supported, together with a school of the same name in Baghdad, by 60 American universities, colleges, and seminaries.

## Dr. Trever Unrolled the Scroll

It was Thursday afternoon, February 19, 1948-and cold in the school because the Arab-Jewish war had cut down fuel supplies-when Dr. John C. Trever, the acting director of the school, now professor of religion at Morris Harvey College, laid the largest of the scrolls on his bed and began unrolling it.

What he thought he saw he could hardly believe. There was a box of slides on his desk to illustrate a lecture on "What Lies Back of Our English Bible?" and he thumbed through these till he came to the section on early Hebrew manuscripts. One picture showed part of a Biblical text from the ninth century; the scroll on the bed was obviously far older. Another picture showed the socalled Nash Papyrus, containing the Ten Commandments and a few other verses from Deuteronomy. The Nash Papyrus
was only a fragment but it dated back to the first or second century B.C. and was the oldest copy of a Biblical work that had come down to us in the original Hebrew. Trever looked at this picture of it and then at the newly found scroll: the writing was strikingly similar.
The large scroll, almost 24 feet long, proved to be a copy of the complete book of Isaiah, and further study the next few days convinced Trever and a colleague, Dr. William H. Brownlee, that it was at least as old as the Nash Papyrus. With the Archbishop's permission, he photographed it, column by column, and rushed prints to Dr. W. F. Albright of Johns Hopkins University, a leading authority on ancient manuscripts. Albright wrote back: "The greatest manuscript discovery of modern times! . . . What an absolutely incredible find!"

Some scholars considered the find literally incredible. They said the manuscripts looked much like those written in medieval times, and one suggested, further, that they might have been stolen from some library.

Several sciences combined, however, to refute the doubters. Archeology established that the jars in which the manuscripts had been stored were similar to other pottery used in the first century of the Christian era. Paleography, the study of ancient writing, established that the script of the Isaiah scroll most nearly matched the script used by Hebrew copyists of approximately the second or first century B.C., while the script of most of the other documents was somewhat more modern, coming down into the first century A.D. (One document, a fragment of the book of Leviticus, looks as if it might have been written as early as 600 B.C., but in this case there is a suspicion that the copyist was trying to give his writing an antique appearance.)


SCENE ABOVE is typical of country in which the Biblical scrolls were discovered by Bedouin tribesmen.

Then in 1951, Dr. Willard F. Libby, University of Chicago radiochemist who developed the radioactive carbon 14 method of dating organic material, tested a sample of the linen in which some of the scrolls had been wrapped and reported a date of 33 A.D., with a margin of possible error of 200 years either way (PSM, Dec. '51, p. 98).

## One Scroll Has Not Been Opened

Among the scrolls discovered in 1947, besides Isaiah, one has been identified as a commentary on the Old Testament book of Habakkuk; one as a Manual of Discipline, containing rules and ceremonies of the sect that owned the manuscripts; and another as a collection of Songs of Thanksgiving.

There is also a scroll that hasn't been opened yet but that Dr. Trever, judging by a fragment of it, believes is an account purportedly written by Lamech, the father of Noah.

The fighting in the Holy Land made it impossible to follow up the Bedouins' discoveries until 1949. Since then Harding and archeologists from the École Biblique, the Palestine Museum, and the American School-sometimes ahead of and sometimes behind ransacking tribesmen-have found 40 or 50 other caves. All contained pottery fragments; some held pieces of manuscripts.

Caves 12 miles south of Khirbet Qumran have yielded documents that suggest when the end came to the Jewish settlement in this general area and why. One is a marriage contract dated in the seventh year of the reign of the Roman Emperor Hadrian, which was 124 A.D. Two others are letters from Simeon ben Kosibah to one of his generals, Yeshua ben Galgoleh. It was Ben Kosibah who led the Jews' second, and last, revolt
[Continued on page 248]


## Swimmer Hoists Her Own Jib and Makes Like a Sailboat

Mrs. Wynne Owen Smith, an English swimming instructor, serves as her own streamlined hull when she wants to do a
little yachting. Hoisting sail, she takes off with the mast strapped to her middle. She trims sail with her teeth and feet.

## Artist Customizes a Taxi

Roy Alderson, a London muralist, did the eye-catching paint job on the old taxicab at right. Hood, fenders and most of the body now look like pink quilted satin while floral medallions decorate the doors. To top things off, the body is framed in yellow and wears a set of painted green drapes. The job took three months.
$\mapsto$ Licking the flaps of bank-by-mail envelopes used by one California bank is no chore-the glue is peppermint-flavored.



1. Changeable blocks let a youngster build four different structures by exposing different sides of the blocks. When bored
with the fire house, the little girl above can turn the blocks into a colonial home, a service station or a $\log$ cabin.

2. Hollow cardboard blocks are big enough to train a baby to grip large objects, strong enough to support 100 pounds, light enough to be tossed safely. Sold flat, they can be put together by a six-year-old.
3. Car Wash sprays plastic automobiles as they ride through on a lever-actuated belt. No water gets on the floor-a pan in the base catches it from the nozzle and stores it for re-use.

4. Tractor is a scale model of an International diesel. Pushing levers on the 110 -volt control box makes it turn, climb, push, pull, reverse or bulldoze. Rubber treads protect floors for indoor play.

5. Coaling station tilts an operating dump car's load into an elevator, which hoists it to overhead position, then empties it into waiting car and descends for a new load. For O - or O 27 -gauge track.

6. Kit-built model of self-propelled rail diesel car has electric motor connected directly to the drive wheels, as in a real Budd

RDC. Ten inches long, it can haul three coaches. Truck and motor can be removed, serviced and reinstalled in two minutes.

7. The old tin whistle isn't tin any more and it does a lot more than whistle-it's an action toy, too. As a child blows into the mouthpiece, a tiny airplane makes a perfect loop around a plastic circle.

8. Tumble-down blocks channel destructive impulses into constructive building. A mallet knocks the stacked pieces apart. Children two to four can easily put Humpty Dumpty together again for another whack.


More jet power, more sweep of wing, and a low-drag fuselage make the F-100 the swiftest

## With the F-100 Super Sabre jet now in production,

By Herbert O. Johansen

THE " Y " has been taken off the North American YF-100 jet fighter.
That means it is no longer experimental, that the U. S. Air Force now has in production the world's fastest fighter -one that can sustain supersonic speed in level flight.

We-and the British, and probably the Russians-have for some time had jets that were capable of faster-thansound flight in dives accompanied by the sensational sonic bangs or, perhaps, in brief supersonic bursts boosted by jet
afterburner. But the $\mathrm{F}-100$ is a new breed of plane-it is supersonic in level flight. It is built and powered for supersonic flight as routine operation-not just as a stunt or an all-out record-setting, headline-making effort.

## A Whole Supersonic Air Force

The F-100 is a milestone, marking the coming-of-age of the jet age-the first in a series of new faster-than-sound fighting airplanes. Among these are the Air Force's McDonnell YF-101 twin-jet Voodoo long-range bomber escort; the Convair YF-102 delta-wing fighter; Republic's

fighter plane in our air arsenal.
the Air Force gets a truly supersonic weapon.
XF-103 research fighter and YF-105 fighter-bomber; Lockheed's YF-104; and for the Navy, the Douglas XF4D-1 Skyray delta-wing fighter (which in recent tests flew faster than 760 m.p.h.), the Grumman XF10F-1 Jaguar variable-sweep-wing fighter, and the McDonnell XF3H-1 Demon.

Some of these newcomers have been flown, some are being built and others are still on paper. Some may not get into production as better and faster models develop from lessons learned. But as the Ys-for-experimental drop off, our military air forces become truly supersonic. A


BIG INTAKE at nose lets $\mathrm{F}-100$ gulp vast amount of air needed for supersonic speed.

## P. 47 нuwnerarir

1 P\&W radial piston engine Horsepower: 2,000 Speed: 450 m.p.h.


THICK, STRAIGHT WING, stubby nose, protruding guns, bulging canopy of World War II Republic Thunderbolt would have acted as drag brakes at speeds that jet makes possible.

## P. 59 пиасыні

2 GE I-16 centrifugal-flow jet engines


JET POWER made its U.S. debut in this Bell P-59 Airacomet that first flew in October 1943. Absence of propeller enabled designers to clean up the fuselage.
daytime fighter, the $\mathrm{F}-100$ is a gun platform. Its main mission is to destroy enemy fighters over enemy territory to give us not only air superiority but the control of the air we would need during those last critical miles as an A-bomber neared its target. For that job it must be able not only to fly high and fast, but for long distances, which means great loads of fuel. So it is big; and, since it is big, it can carry under-wing loads of bombs or rockets for a secondary mission as a low-level air-ground attack weapon. Such external loads would necessarily slow the plane down, but once the load was dropped, the F-100 could fight its way back to base at supersonic speeds.

## More Wing Sweep Increases Speed

Although it is an evolution of the F-86 Sabrejet that has broken many speed
records and made aerial-combat history over MIG Alley in Korea, the F-100 Super Sabre is a new plane. That it is supersonic would mean that it can fly faster than sound at all altitudes, which varies from 660 miles an hour at a combat altitude of 40,000 feet to 762 miles at sea level. Bigger than the F-86 fighter, the F-100 is 45 feet long and weighs more than 20,000 pounds.

Most notable change is in the wing. Where the latest F-86 has 35-degree sweep, the F-100 has a thinner wing that is swept back 45 degrees. The tail also has more sweepback.
Power behind the F-100 is a new design in jet engines, the split-compressor J-57, claimed by the manufacturer, Pratt \& Whitney, to be the most powerful production engine in the world. With it, the Super Sabre is reported to have more

## F. 80 s.soming suir

1 GE I-40 centrifugal-flow jet engine
Thrust : 4,000 lb.


10 SABREIET
1 GE J44 axial-flow jet engine


FIRST OPERATIONAL JET FIGHTER, the Lockheed F-80 Shooting Star, met Red MIGs in combat in Korea. Although the wing is still straight, it is much thinner for less drag.
than 10,000 pounds of thrust and about 15,000 pounds with afterburner (the F-86D has 7,600 pounds of thrust with afterburner).

Split-compressor, or twin-spool, means that an engine has two compressors in series, each driven by a separate turbine. There are two shafts with no mechanical connection between the two turbines. The first (low-pressure) compressor feeds the second (high-pressure) compressor. The result is a higher range of compression ratios than can be obtained on a singleshaft compressor.

## Jet Speeds Bring New Designs

Among the advantages of the splitcompressor are lower fuel consumption for range or higher power output for speed and maneuverability; the elimination of "surging," or back-flow, problems


AS MORE POWERFUL JET ENGINES enabled planes to nudge the speed of sound, designers were forced to sweep back the wings, as in this North American F-86 Sabrejet.
in the thin air at high altitudes; easier starting, and fast acceleration.

As jet engines became more powerful, new fuselages and wings were designed around the engine, and the early Lockheed F-80 Shooting Star and the Republic F-84 Thunderjet were born. Wings were still straight, but streamlining sent speeds up 100 and more miles an hour. Then jet-engine power went up and greater speeds forced the designers to go to thinner and swept-back wings to delay drag and the turbulence that wings run into at transonic speeds.

Ever-increasing jet speeds have posed other problems. When our first jet plane, the experimental Bell P-59 Airacomet, was announced in 1944, the Air Force thought it had the makings of a simple, lightweight fighter that would burn almost anything as fuel. Kerosene was it-


Principle of split-compressor jet engine that powers the F-100 is shown in drawing above.
at first. Disillusionment came fast-as fast as speeds increased. Jet engines had to abandon kerosene for gasoline, and today that has had to be replaced by special, high-grade JP fuels.

Then there was the matter of weight. After all, a jet plane is only a shell built around a blowtorch. Nothing complex about that. But again, greater speeds and more powerful engines changed the picture-there was the pilot to consider.

Pressure suits enabled him to take the terrific Gs at jet speeds, but he must also fly and fight at high altitudes to take advantage of lower fuel consumption. That meant a pressurized cockpit and an im-
proved oxygen system to keep him alive should the pressurization fail.

Heat created by friction necessitated refrigeration of the cockpit, and because it is bitter-cold up there, heaters had to be provided to prevent guns from freezing. Add to this an ejection seat for the pilot in case of bail-out, computing radar gunsights and power controls, and you have what is mildly called "complexity."

Now that the Air Force has hit the supersonic, the question arises, "How much faster will we fly?"
Top fighter men in both the Navy and the Air Force say, "At least 100 miles an hour faster than the enemy."

END


SPEED OF SOUND varies with altitude. Critical speed area is the transonic where the air-
frame runs into violent turbulences. At supersonic speeds air becomes smooth again.


A SCHOOL OF HERRING looks like a football on Sea Scanar's screen. This school is 150 feet down, 10 degrees to starboard.

OUTLINES OF A CHANNEL detected by Sea Scanar. Screen indicates 240-degree scanning range, but beam's automatic swing is $\mathbf{1 8 0}$.


UNDERWATER "SEARCHLIGHT" that can shoot narrow beams of sound waves to port and starboard, up and down, protrudes from hull. Hoist raises it into a well when not in use.

ANEW type of sonar, sweeping the sub-surface like a searchlight, probes the dim depths ahead and on both sides of a ship as well as beneath it. Sonar units of earlier design have been able to beam their tiny, rapid bursts of high-frequency sound in only one direction-straight down. This has limited their usefulness.

Sea Scanar, as the latest sonar is called by its makers, Minneapolis-Honeywell, has already been tried out with considerable success by professional fishermen. And it is expected to become an important navigatonal aid as well.

The echoes it receives as its beams of sound waves hit fish, floating logs, reefs, piers and sand bars are visible on a radartype screen and audible in a loudspeaker. A fish sounds different from a sand bar, a reef from a log.

Sea Scanar is so sensitive that it has picked up the faint, bubbly trail of a line of swimming ducks at 400 feet.


## Garco, newest in a

long line of man-made men, can do homely tasks now but is cut out for more dangerous duties.

By Andrew R. Boone

CARCO, a mechanical man recently G "born" in a California garage, can saw, hammer, drill, mix chemicals, pick up papers, stack boxes, roll his eyes and have the shakes. He can also play chess.

In this last accomplishment he resembles a sensational robot of about 200 years ago. That celebrated member of the ancient mechanical family, dressed like a Turk, was the rage of Europe. He played chess with Catherine the Great, Frederick the Great, Benjamin Franklin and Napoleon. He even had the temerity to sweep the board clean after Napoleon had made three wrong moves.

Years after these worthies were dead and gone, some bright-eyed boys discovered that a small, skinny, unmistakably human man hid out in the boxlike chest under the chessboard and worked the levers that made the "mechanical" man seem so clever.

## Made of Discarded Plane Parts

Garco, latest in a distinguished line of man-made men, is a lot cleverer than this fraudulent Turk, but he needs human direction, too. He gets it, through a control arm and push buttons, from


HOW GARCO SOLDERS and does other chores is shown here. His right arm duplicates each movement of the mechanical arm that his creator, Harvey Chapman, is seen manipulating above. His left arm is worked by push-button controls.

Harvey Chapman, an engineer for the Garrett Supply Co. of Los Angeles, Calif. Chapman created Garco in three months, in his garage. The 90 -day wonder was put together and made animate with discarded airplane parts.

Garco is a well-oiled creature of Convair gear trains, Constellation electrical actuators, and DC-6 cabin-pressure regu-


"SLEEPY JOE," electrically heated copper man made by GE, tests flying suits for Air Force.

"RED FREDDY," built by the Navy, bleeds dyed water in four places to help teach first aid.


ANONYMOUS HEAD, made by GE to test oxygen masks, heats up, sweats and breathes.
lators, plus electronic circuits and enough sheet metal to make him decent. With the aid of a vacuum applied through his rubber-tipped fingers, he can pick up light objects with commendable delicacy. His brain is electronic, a neat accumulation of six aircraft servo systems. His nervous system consists of 1,200 feet of wire cable. A two-way radio transmitter enables him to make pertinent remarks.

Chapman brings Garco to apparent life by first opening the circuits and sending electricity surging into the complex metal body. He then lays his right arm along a five-jointed electromechanical control arm, which has a handgrip at the end of it. The joints can be moved up and down, in and out. As Chapman twists and turns his own arm-and the control arm along with it-Garco's right arm moves in exactly the same way. Garco is so sensitive, in fact, that if Chapman's hand shakes, Garco's does, too.

## Electronic Miracle

What happens is a minor miracle of electronics.

As the joints in the control arm move, through six electric channels they notify sensing devices in Garco's electronic brain that they have disturbed the balance in as many Wheatstone-bridge systems. The disturbance of each fires an electronic tube, which in turn fires a relay tube, which actuates one of the five .05 -horsepower motors in Garco's right arm.
So much for the right arm. Garco's left is manipulated by 22 push buttons, mounted on the case of the control arm.

The push buttons, in addition to working Garco's left hand and arm, move the robot's jaws and lips, increase his height six inches, roll his plastic eyes and enable him to bow at the hips.

Both of Garco's arms contain five tiny actuator motors. Three apply torque, representing the ball joints of a man's shoulder and elbow; the others, taking the place of tendons, apply linear push and pull.

Most of mechanical men of his-tory-and they go all the way back to Daedalus, who, if we can believe Plato, created statues that had to be tied down to be kept from running away-have been built as stunts.

About the only exception was a fabulous man of clay that Albertus Magnus, back in the thirteenth century, spent 30 years putting together. When he got through with it, the creature supposedly was able to walk, talk, answer questions intelligently and solve problems. But Thomas Aquinas, a puipil of Magnus and a youth with a wholesome fear of the Devil, attributed the clay man's gifts to the Evil One, and smashed it.

Magnus apparently was a man of awesome self-restraint. All he is reported to have said was, "There goes the work of 30 years!" But he said it in Latin, and the report may have gotten garbled.
Almost all other recorded mechanical men have been built to amuse and amaze the public and, directly or indirectly, make money for their creators.

## Robots for Science

In recent years, however, some have been built for scientific purposes.

General Electric, for example, developed an electromechanical head for testing oxygen masks at sub-zero temperatures, and a mechanical hand for fiddling with "hot" materials at Hanford and other AEC plants.

What's the justification for Garco? Well, he started out as a stunt, too. But Chapman thinks he should be taken a lot more seriously than that.
Why not, he asks, use creatures like Garco to do a lot of the highly dangerous but necessary jobs that more perishable men now do? For instance: mix the ingredients for experimental explosives, handle deadly bacteria and fungi, weld and salvage under water.
Robots of Garco's stripe, Chapman suggests, could also braze titanium in a vacuum, work under any degree of atmospheric pressure, handle radioactive stuff-even pilot the first rocket to the moon.

END


COLD-HEARTED SIREN, run by electric mechanism and radio, haunts Minnesota river.


QUARTER-TON ROBOT, directed by radio, manages to ruffle a German cab driver.

hand-Cranked bugler, made in Germany in 1810, reveals bellows that made him toot.


AN AIRLINER'S pressurizing system has three major parts-controls, air-compression and distribution components, and safety devices. Pilots set dials for altitude where system will start operating and for rate of change. Temperature control is set like home thermostat.

Compressed air from turbines is forced to
turn the cooling turbines which rob it of heat. Heat exchanger, bathed by outside air, cools captive air even more. Moisture is removed from it by centrifuge, baffles or filters. Rate of change in pressure is regulated by diaphragmed bellows, responding to difference between pressure of outside and in-

side air. It sends commands by electric circuit to regulator valves. Amount of pressure is regulated by bellows-and-diaphragm or spring-loaded valve sending electric signals to a pressure-limiting valve. System shown uses auto-type slipping elutch in compressors to change rate at which air is pressurized.

## How You Fly High in Comfort

$\mathrm{A}^{1}$LL over the world each day tiny is-
lands of pressurized air float around in a vast sea of atmosphere too thin to sustain human life. These are the cabins of modern airliners, flying from four to eight miles above the earth.

The airliners are pressurized automatically. They are depressurized automatically for landing. The crews dial what pressures and rates of pressurization they want. A big family of mechanical and electrical gnomes do the work.

The gnomes even react to emergencies. If the depressurizing system should fail on landing at mile-high Denver, for instance, passengers could be blown out the door as the locks were unfastened. But a gnome on the landing gear spills the high-density air from the cabin.

Another gnome retains pressure in the cabin if the pressurizing system gets out of order. Still another heats or cools the air as passenger comfort demands.

## One of Several Systems

Pictured here is a typical airplane pressurizing system. Several systems are in use. This one is made by the AiResearch Manufacturing Co. of Los Angeles. Among its components is a slipping clutch borrowed from the Ford automobile's automatic transmission.

Pressurizing systems are complicated, but their principle is simple. A turbinetype compressor, engine-driven, takes the thin air at high altitudes and thickens it. In the process, the air gets hot. So, depending on temperature demands for passengers and crew, it may have to be cooled. It's also dehumidified.

The next time you fly and escape the discomfort of having your ears "pop" when you land, credit the gnomes of the pressurizing system.


## Moving Day for 117 Tons Has Tractors Working Back to Back

What looks like a huge water tank loaded on the trailer above is a $48 \%$-foot-long, 117ton test cell for putting jet engines through their paces. Two Mack tractors with six


## Steering Post Bends Up in Crash

A new French steering column is intended to cut the chances of smashed ribs in car collisions. When the driver is shoved forward, the pressure pushes the wheel forward, too, until the swivel-jointed column is upright as shown above. The movement also automatically cuts off the ignition.
wheels each-one pushing, one pulling-and a pair of heavy-duty low-bed trailers hauled it through Indianapolis streets to deliver it to the Allison plant.


## How Many Fleas on a Squirrel?

The squirrel above is being de-fleaed to test a parasite-killing insecticide. Any bugs the vacuum cleaner misses are gathered with tweezers-and the count shows how good the flea-killer is. The College of Medical Evangelists, Loma Linda, Calif., is running the tests for the Army.


## By Bill Kreh

## Event One Thousand!

When a sub lies helpless on the sea bottom, men with the diving bell rush to the rescue.

TNSIDE the radio shack of the sub1 marine tender USS Gilmore, at Key West, Fla., a Navy radioman pounded out a message:

COMMENCE EVENT ONE THOUSAND X SUBMARINE SENNET X LAST KNOWN POSIT OFF AMIERICAN SHOALS ON COURSE 090 at FOUR KNOTS at 1900 X COMMENCE SEARCH X . . .

Three words in the message-EVENT ONE THOUSAND-meant that a sub-
diving beil is towered ONTO SUB'S HATCH

## neven...n.



1HUNT BEGINS in blue waters off Key West as surface ships search for submarine Sennet in EVENT ONE THOUSAND drill. A Navy blimp also participates.
marine disaster might be in the making.
The search-and-rescue sequence that the radio message set in motion is shown in the accompanying photographs.

This was only a drill, but no drill the Navy holds has more overtones of grimness than the search for a "missing" sub.

2
DIVING BELL, to be lowered onto sub's hatch, is prepared by crew of USS Petrel, submarine rescue ship. To give clue to location, sub emits noises.

Soon, aircraft, surface ships and even other submarines were off on the hunt.

Using the latest in sonar and radar, the search continued into the night. When a positive contact was made with the Sennet, the rescue vessel USS Petrel went into action. Nine hours after the

5 DIVING BELL is lowered into water from deck of Petrel before being cast loose for descent. Weighing $101 / 2$ tons, bell carries two crewmen, can rescue eight men at once.

6BELL is now secured to Sennet. One of "rescuers" from Petrel opens air lock in base and enters submarine through hatch. Bell can go to any depth a sub can.



3 MESSENGER BUOY, sent up by Sennet to show position, is retrieved by Petrel's crew as first step in "rescue." Diver will follow buoy's cables down to submarine.

Sennet had been reported "overdue," her crew was "rescued."

Actually, as this was written the U.S. Navy hadn't made a real-life submarine rescue since 1939, when the Squalus sank off Portsmouth, N. H. Thirty-nine of her men were rescued, and the Squa-

7 bell breaks water after being detached from sub to complete first round trip. Drill is precautionary. Navy has not had sub rescue job since Squalus sank in 1939.

4 DIVER is readied for plunge to ocean bottom. He will connect the other cables that will guide rescue bell to Sennet's hatch. Bell's buoyancy can be altered at will.
lus was raised to fight in World War II as USS Sailfish.

But as long as there's a submarine operating under the sea, there's the threat of sudden disaster. To meet it fast, the Navy keeps constantly in trim by drills like Event One Thousand. end

8 FIRST "SURVIVOR" from Sennet climbs out of diving bell. Submarine rescue vessels like Petrel usually are within easy sailing distance of any fleet of U.S. subs.


# Studeakaer Joins Wagon Train with 1954-Model Conestoga 




By Frank Rowsome Jr.

STUDEBAKER is back in the wagon business that launched the company more than a hundred years ago. But the wagon they are making now is scarcely calculated to tote pioneers across the plains. This one lugs the kids to school, hauls plywood back from the lumberyard, and carries the whole family, including the pup, on vacation trips.

This latter-day prairie schooner, the company's bid for the growing market
staked out by the Plymouth Suburban and the Ford Ranch Wagon, is called ( more or less inevitably) the Conestoga. On looks, at least, Connie is a comer.

Loewy wagon. Up front, it has the same sloped. downhill lines that made the Loewy-styled 1953 Studebaker such a snaky, "Continental" craft. Beginning at about the door, the lines square out, blending into the same shape that characterizes most current station wagonsthat of a miniature and rather sporty hearse. Pert little kickups of rear fend- IIO popular science
ers repeat the rear lines that helped make the '53 car such an eye-popper. For the lady of the house who wouldn't mind cutting a wider swath in suburbia, there are some juicy combinations of color and interior details, guaranteed to green the eyes of other matrons whose wagon interiors are finished in utilitygray fiberboard.

Never a company to let the gewgaws crowd out the gears, Studebaker has also built some solid service into its wagon. It is a two-door, two-seat vehicle, able to carry six persons plus some 32 cubic feet of payload. If you want more space, flip-flop the rear seat so it lies flush with the floor, which gives room for three people and 64 cubic feet of enclosed payload space. If you aren't exceptionally tall, you can spread a sleeping bag out on the $69 \frac{1}{2}$-inch-long rear floor. (If you're more than five-nine, try it kitty-cornered, or let your feet sleep out on the tail gate.)

Engineering the wagon. When the Conestoga project came up, Studebaker design people figured they might have to beef up their basic chassis. This turned out to be unnecessary (one exception: frame steel on the six-cylinder job is going to be a few thousandths


INSTRUMENT PANEL is redesigned with a single shroud over instruments, and has new flat switch toggles. Interior colors and fabrics are going to be extra-luxurious this year.
thicker). The wagon's dry weight checks out at only 170 pounds more than that of a four-door sedan. The Conestoga does carry, however, these changes:

New rear springs. Standard rear springs, fitted to an experimental Connie, gave a fine ride at moderate loads. When Studebaker engineers piled in a severe overload-some owners will inevitably heave in a passel of cement bags-the Conestoga sat sadly down on its haunches. The answer to that was a special two-stage spring. It has two extra leaves arranged so that they don't come into play until the wagon is heavily loaded. With up to three people aboard,


VERTICAL FINS on grille are the best recognition feature for ' 54 jobs. The $V-8$ hood ornament was put on in mid-1953 after Mercedes squawked about earlier Y-shaped one.


FLOP THE REAR SEAT and there's $881 / 2$ inches of floor length with the tail gate down. Tailpipe dumps the exhaust in turbulent air behind wheel to lessen chance of any swirl-in.


SPRING partly counterbalances weight of rear window. If you want to drive with it up (in hot weather, a wagon is almost as breezy as a convertible), snap this link over a pin to lock it up. But don't forget to unsnap link before closing window or you'll bend bracket.
the new springs have the same rate as the old ones, and the same easy ride. But when you pile the pounds on the tail gate, she won't squat down like a depressed rabbit.
New shock valving. Having jiggered the springs this way, Studebaker changed the valving on the rear shocks so they'd have a matching damping characteristic. Connie rides well. without that trundling little jowl-shake some wagons have.

Axle and tire options. A Conestoga buyer will have a chance to tailor it to suit his country and his expected service. Depending on the engine he elects (six or V-8), on his transmission (automatic or manual with or without overdrive), and whether or not he lives in a hilly country or wants economy or performance, he may get one of a half-dozen
rear-axle ratios. These range from 3.54 to 4.88. If he expects to be lugging heavy loads, larger, extra-ply tires will be fitted.

Other '54 changes. Aside from Connie the rest of the line stays close to ' 53 . There is a new front grille with vertical fins, and bumper guards have been redesigned to overcome an annoying tendency to underride and lock onto other cars. The armrest in the rear of the swanky hard-top coupe has been made removable-not that you can now seat a passenger in the middle, where his tail bone would still clunk inelastically on the drive-shaft tunnel-but a youngster can now stretch out across the rear seat.

Better brakes. The best mechanical news for 1954 is that they've beefed up the brakes. The previous ones got by, but they were hardly distinguished performers. The new ones are bigger, have self-centering brake-shoe pivots, and deliver far better stopping performance.
In the engine department, Studebaker's OHV V-8 has gone from 7.1 compression to 7.5 , which was an option last year. This boosts output around two percent, to about 122 or 123 hp . Octane requirements increase slightly, though the engine is still contented with regular gas. (Studebaker doesn't plan to blow any bugles on this power rise.) Other changes under the hood are minor: new linkage to prevent throttle movement on hard turns or panic stops, and a bit more copper in the V-8 radiator.

## FACTS ON '54 STUDEBAKER

Model: Commander Regal Station Wagon.
Engine: $90^{\circ}$ V-8; 120 hp . at 4,000 r.p.m.; compression ratio, $7.5: 1$; piston displacement, 232.6 cu. in.; piston travel (in feet per (ar mile at 20 m.p.h.), 1,637 ; bore and stroke, $3 \frac{3}{3 \prime \prime}$ by $3 \frac{11}{1 / 2}$; torque, $190 \mathrm{lb} .-\mathrm{ft}$. at 2,000 r.p.m.

Weight: $3,368 \mathrm{lb}$.; per hp. 28.07 lb .
Transmission: standard, manual shift (overdrive and automatic available); rearaxle ratio, 4.09 with standard transmission, 4.27 with overdrive, 3.54 with automatic.

Steering ratio: 33.8-24-33.8 (over-all); radius of turning circle, left, 19\%'; right, 191\%',

Effective brake-lining area: 173.4 sq . in.

Springs: front, coil; rear, 6 semi-elliptic leaves, $21 / 2^{\prime \prime}$ by $50^{\prime \prime}$.

Outside dimensions: height, $622_{8 \prime \prime}^{3 \prime \prime}$ (loaded); over-all length with bumpers and guards, $19519 / 32^{\prime \prime}$; width, 69 n" $^{\prime \prime}$; wheelbase, $116 \frac{1 / 2 "}{}$; overhang, front $353 / 16^{\prime \prime}$, rear $4315 / 16^{\prime \prime}$; tread, front $56{ }^{\prime \prime \prime}{ }^{\prime \prime}$, rear $55^{\prime \prime \prime}{ }^{\prime \prime}$.

Inside dimensions: seat-cushion width, front $59 \frac{112 \prime \prime}{\prime \prime}$, rear $59^{\prime \prime}$; leg room, front $42 \frac{122^{\prime \prime}}{}$, rear $41^{1 / 2 " \prime ;}$ headroom, front $38^{\prime \prime}$, rear $36^{\prime \prime \prime}$; seat height, front $14^{\frac{1}{4} \prime \prime}$, rear $14 \frac{1}{2}{ }^{\prime \prime}$; vertical distance, steering wheel to seat cushion, with seat in rear position, $5 \%$ "'; front-seat adjustment, horizontal $51 / 2^{\prime \prime \prime}$, vertical $15 / 16^{\prime \prime}$.

Tire_size: 7.10 by 15 .


1Beaters to Clear Road Ice. Hammerended chains attached to revolving drums on this proposed highway-maintenance machine would break up packed ice so it could be swept away by conventional road scra-
pers. The mechanical chain gang would be towed by a truck or trailer but would carry an independent engine to turn the drums at fixed speed. Drums could be raised or lowered to suit road or ice conditions.


2Window to Simplify Parking. Power steering now makes parking easier-but you still have to see wnere youre going. This window, set into the lower part of the door, would help by letting a driver see the far curb. In hot weather, the parking window could be opened to provide extra ventilation.

3 Hunter's Cap to Light Up. A sportsman who wore this blinker light on the top of his head could slink through the brush without danger of becoming a target for careless hunters who aim mainly by ear. The bulb, under a colored dome, is powered by a small battery carried in the wearer's jacket pocket.


4 Bumper Guard to Deflect Car. Sideswipes and even head-on collisions might do less damage if cars were equipped with these deflecting guards. The rigid channel, bent in a broad arc, would be bolted to either or both sides of a bumper. If the car rammed an obstacle, the guard would tend to shove the car sideways.


5 Flashlight to Be Recharged. A new set of flashlight batteries would be as near as a wall plug if your torch were powered by a wet cell and had a built-in charging unit. This standard-size flash would have a recthargeable battery and a rectifier assembly that would slide out of the case and plug into any AC or DC outlet.


6Fuselage to Form Second Plane. A plane intended for high-speed flight usually has to be carried aloft and launched at suitable speed. According to this French invention, the carrier and carried plane could form a single airborne unit. After the
composite plane passed the minimum flying speed of the high-speed subsection, the mother plane would accelerate to pull away from its passenger. The small unit could rejoin the carrier by flying in behind it and locking itself in position.


7Liquid Filter to Cool Pipe. Before smoke from the bowl of this pipe reached the mouthpiece it would pass through a chamber partly filled with liquid. As the smoke whirled over its surface, the liquid would cool the smoke and, says inventor, absorb some of the tars. Valves would prevent liquid from leaking into bowl or stem.

8 Ladder Rail to Steady Climber. The
feeling of unsteadiness that makes ladder climbing dangerous for many people might be overcome by a safety rail that would give a climber something to hold onto, This attachment would consist of a pair of mounting brackets and an extension rail that could be pulled out to any desired length.


9Billy to Fire Tear Gas. A policeman would always have a useful piece of equipment at hand if he carried this doubleduty club. The body of the club would contain a hollow tube, the handle a firing mech-
anism for tear-gas cartridges. Pressing a plunger on the handle would launch the cartridge toward its target. A sliding cap would protect the plunger against accidental discharge.

[^7]
## - $A$ cross a vast land laden


"...there to toss the blizzard from his path Across the prairies of Saskatchewan."

## with snow... Canada

## delivers the Christmas Mail

## By Wesley S. Griswold

GIVEN a frosty dominion 3,800 miles broad and 3,000 miles deep to crisscross on his appointed rounds, the Canadian postman at Christmas faces a task for which he must call upon nearly every type of vehicle devised by man.
This epic mobilization of transport, ranging from the simplest, almost ageless means to the most mechanistically modern, has inspired photographers of Canada's National Film Board, and we have here chosen fitting fragments from the verse of Canadian poets to caption their romantic pictures.
To the laboring postman's aid come planes on pontoons,
"Empty prairie slides away on all sides ..."
-Avne Marriott


"There is virtue, too, in a grey and dragonish sea."- Chaners Bruce

"Cold-blooded things yet not marine,
And not of earth, but half-between ..."-E. J. Pratr
"Comes like a swallow veering home."



()ne spurl: aleums in euch eye..."-Len Kexsedr
wheels and skis. Trains of railroad cars and trains of sleds, drawn by tractors specially footed to tread snow "high to a horse's belly." help carry the burden of gifts and holiday messages across the white continent from Come By Chance, Newfoundland to Spuzzum, B. C.

Yuletide mail is borne by ship and ice canoe, by snowmobile and handcart, by dog sled and by a solitary, shipbased helicopter, by pack horse, and by horses hauling buggies or sleighs-"slides," the Newfoundlanders call them.

It's a job of heroic proportions, enlisting more than 33,000 extra helpers for the 42,000 Canadians who regularly man the country's efficient postal service. It begins in late June, when the government ship C. D. Howe lifts anchor at Montreal and heads for Arctic waters still flecked with ice, carrying in its hold Christmas mail for the Eskimos and the many other Canadians who live and work in the remote Northeast. It picks up momentum just before Thanksgiving, when packages for relatives overseas funnel into eastern and western ports to be hoisted aboard ocean liners. It

"W ill they come again, the great spirits, Bringing us gifts as they promised . . .?" - Arthur S. Bourivot
reaches its sprawling, bustling climax early in December, when the flood tide of mail and postal clerks laps over into church halls, automobile salesrooms, schools and fraternal clubrooms.
It's an essential job that, as Archibald Lampman, a Canadian poet, has written, goes on "all day without stint and all night long with the sweep of the hissing drift."

"And our hearts were great with happiness And brothers we called them..." - Arther S. Bourivot


## Blanket Wraps Up Flame

A new blanket is made of glass-but it's to put fire under wraps, not you. Its glass fibers are coated with a plastic compound to give added strength, durability and resistance to weather. Standard Safety Equipment Co. of Chicago makes it.


## Come on Up, Parking's Fine

This giant car lift lets two cars park where one parked before. Called a Sky Park, the machine was perfected by the Simmons Machine Tool Corp., Albany, N. Y. It is designed for use at parking lots or curbs.


## Skates Roll or Slide

The sole plates of this German boy's skates carry axles as well as blades. When there's no ice, he just adds wheels for sidewalk cruising. The "convertibles" were shown at a fair in Nuremberg.

## Earphone Silences Television for All but One Listener

Junior's TV programs get you down? You can read in peace in the same room if he has his own earphone which he wears like a hearing aid. A flick of the dial returns the sound to the regular loudspeaker. Kentrol Corp., Philadelphia, makes it.
$\mapsto$ A special cleaner for plastic dishes is now on the market. M-E will safely remove coffee, fruit and other hard-to-budge food stains, says Maid-Easy Cleansing Products Corp., Mount Vernon, N. Y.



## CONTROLLER-LAUNCHER could be in airplane, on surface ship or on land hundreds

 of miles from target area.
what it "sees" to equipment that digests it and puts the missile on course. The only human hand involved in its flight is that of the controller who launches it. He can be hundreds of miles from the target.

The delta-wing missile pictured would
be propelled by an expendable jet engine -the same kind powering fighters and bombers. Its speed would be considerably short of $1,000 \mathrm{~m} . \mathrm{p} . \mathrm{h}$.-far less than that of rocket-powered missiles. In case it got off course, it would be equipped to destroy itself in the air.

END


## Station Wagon Runs on Three Wheels

IF YOU want a really low-priced car, reasons James $V^{\top}$. Martin, inventor of the small three-wheeler shown above, you have to eliminate a lot of the things that make a car expensive to produce, and still not sacrifice large-car roominess and high performance.

Here are some of the parts of a conventional car that are not found in this little vehicle: chassis frame, axles, steel springs. propeller shaft, universal joints, differential gears, shock absorbers.

The Martin Stationette is being engineered for production by the Commonwealth Research Corp., New York City, to sell for around $\$ 750$. It has 49 inches headroom, the seat is the full width of a normal car and there is a 43 -cubic-foot storage space over the rear engine. The car is 114 inches long and has a 52 -inch tread. Air-plane-type suspension, a rubber shock cord, takes the place of springs on the prototype. An unustal wheel to replace all springing is planned for the production model.


FOUR-CYLINDER, 24-horsepower, water-cooled engine is rear-mounted. A cruising speed of $\mathbf{5 0 - 5 5}$ miles an hour is claimed.


NEW TYPE OF WHEEL, invented by Martin, has solid-rubber rim and flexible-rubber spokes, is claimed to provide all springing needed.

## Games Disclose Secrets



The mathematical odds against a perfect bridge hand, if the cards have been properly shuffled, are

## $635,013,559,599$ to 1

 Shannon at the University of Washington play the card game called "Monopoly." This is a game in which players are dealt cards representing various quantities of "money," with which they "buy or sell real estate." The object is to obtain ownership of as much "property" as possible. When Monopoly is used for scientific experimentation, the cards are dealt purposely to make some players "rich," some "moderately well-to-do," and others "poor."Then, while the play is progressing, dice are thrown, and

## Strategy Helps <br> in Finger Game

according to how they lie, one or another of the players is notified that he has "inherited a fortune," or "suffered a disastrous fire" or "experienced a lingering illness." His cards are then changed to accord with these strokes of good or bad luck.


In this game. Hoo plavers simultaneously show one. two or three fingers: and one of them tries to cull out the total number of fingers shown by both. Thus it incolves both luck and skill in outguessing the other fellome. On the busis of complicated mathematics, Dr. Johtn Jon \eumann has worlied out the best strategy: Kepp guessing that the combined number of fingers shou'n is four: in pery l- games. shoit one finger five times, two fingers four times. three fingers three times -but not in any. rezular order. You
 should at leasi break pern. probably win. What lappens if you and your opponent both follow this strategy: Von \eumainn doesn't say!

While training, experience and education are useful to everybody, they are more useful to the rich than the poor.

The results of these experiments interlock with those achieved in an exciting new aspect of science called "the theory of games." The known principles of probability have been applied to games which employ a combination of luck and skill, in ways that involve tremendously complicated mathematical formulas. And human behavior in games of the type mentioned, which involve some skill and some luck, has been found to be identical with what people do in competitive business and with strategy and tactics in war.

## Flouting Math-Proved Principles Can Be Ruinous

In all these activities, there are good and bad broad, general courses of conduct, which can be mathematically proved to be such.

Some of these principles, of course, have in the past been practiced intuitively by shrewd individuals, whether they were playing cards, running a business or fighting a war. Now for the first time their shrewdness can be underpinned with scientific facts. Learning these principles might not make you ${ }^{\bullet}$ a good poker player or a successful general, but flouting them is fairly sure to be ruinous.

Examples of the contests that reveal these principles are nearly all card games; excluded are games of pure chance like throwing dice or betting on a roulette wheel. Excluded also are games like chess, checkers and ticktacktoe where no element of luck enters in. and each player knows at every moment the situation confronted by himself and his opponent.
Prof. R. Creighton Buck of the University of Wisconsin, one of the leaders in this new activity, emphasizes the underlying principle when he defines a game as "any situation involving groups with conflicting interests, in which the outcome is only partly controlled by each party." And Dr. Oskar Morgenstern of Princeton. another leading authority, highlights the point by observing that we habitually apply the language of games to such things as business and politics, speaking of "a political deal," or of "playing the stock market."

## Some Formulas Can Be Applied to All Types of Chance

"When thev are examined by the methods of modern mathematics." says Dr. Morgenstern, "it becomes evident that many of the forms of economic and social behavior are strictly identical with-not merely analogous to-games of strategy."
The most remarkable part of the matter is the discovery that mathematical formulas often can be written which cover the best procedure in games, business and war alike. The United States Army, Navy and Air Force are today spending millions of dollars annually studying the relationshin of games to war, and are deducing principles which will be of great importance in the future.

Several centuries ago, it was learned that there are mathematical laws of probability which apply to matters where there is a strong element of pure chance. The first scientist to go deeply into the question was the famous German philosopher and mathematician, Gottfried Wilhelm Leibnitz (1646-1716). Coming down to modern times, the person who best deserves to be called the father of the new science is Dr. John Von Neumann of the Institute for Advanced Study, the internationally famous intellectual center at Princeton, N. J.
Dr. Von Neumann, now 50 years old, was born in Budapest, Hungary, and studied mathematics at various European universities. When it became clear that Hitler was going to dominate Central Europe, he came to America and became a professor at Princeton University. Experts regard him as one of the greatest mathematical brains in the world. For many years he has performed valuable services in belp-

## Strategy Doesn't Help in Roulette

Itere the ressult depends on pure chance. and mathematicians say no, "system" is safe. One of the commonpst systrms is to select one color red or black -and lierep bettinge on it. If you lose. douible your bet next time and so on. Thus one wimning bet will slizhthy. more thun comprensute for all previous losses. But hiss system assumes that red is sure to turn ") atter blacki has wom a fer times in succession, und rien cersu. Acturlly: ajerer blacli has tron II) times in a rour. the chluncere that it will come "up nyain is will exachly 5onIf you staried by belling :- on red. on the elecenth try.
 you are simply bet. ting s?..0) 18 on an eren clumes.
ing the American armed forces in the development of new weapons.
A few years ago, in collaboration with Dr. Morgenstern, he wrote a book. The Theory of Games and Economic Behavior. Although every page is sprinkled with difficult mathematical formulas, so that the volume is hopelessly beyond the understanding of the average layman, it has gone through edition after edition as mathematicians, sociologists and military strategists have pondered its revolutionary proof that in games and other activities which involve some skill and some pure luck or chance, there is always one best strategy.

Business competition is like a card game. You know the strength and weakness of your own position but you can only guess at those of the other fellow.
This is also true of war. The commander of an army knows what forces are at his disposal, and the general character of the terrain over which he must fight. Usually he knows something about the size of the enemy army, but not very accurately, and he can only guess at what that enemy is about to do. The combination of his skill in maneuvering his own troops, his accuracy in guessing
what the enemy will do, and of course the relative size and strength of the forces on each side, will determine the outcome.
Using modern electronic computing machines, thousands of hours have been spent in doing the complicated mathematical calculations that are needed to discover the best strategy in various games which use both skill and luck. As an example of the complications that exist, Dr. Von Neumann worked out the simplest possible two-handed game of poker. In this there are only two players, only three cards in the deck, and only three bids, two of them by the dealer. Even so, there are 1,728 possible combinations of play. To figure out approximately the best strategy for each player would require two billion multiplications and additions.

## It Pays to Know the Lats

Thousands of people lose large sums of money every year in gambling because of a misunderstanding of the laws of probability. They try to play a "system" in such games as tossing a coin or in roulette. Despite all the stories you
[Continued on page 246]

## New Games Test Luck at Piloting Spaceships, Assembling Cars



Blast off is based on the current interest in space travel. Players pilot tiny rocket ships through the heavens. They land on moving planets-Jupiter, Venus. Mercury, Mars, Saturn-pick up cargoes of rare mincrals and try to be first to return to earth. Flights are determined by spinning a pointer, and victory depends mostly on luck.


Assembly line gives each player an automobile factory to manage. According to his luck in throwing a die and spinning a pointer, he puts together plastic auto parts -motors, bodies, wheels, steering postsand rolls completed cars off the assembly line. Highest producer wins. Both games are made by Selchow \& Righter, New York.


## Breath Operates TV Set

A costrol switch so delicate that a breath of air can change it permits handicapped persons to operate a remote-control TV set. Blowing lightly through one of the mouthpieces shown above switches the loudspeaker on or off. Blowing through the other shifts the set from one channel to the next. The secret is a delicately balanced vane inside each mouthpiece. Moved by a breath, the vanes actuate cam-operated switches controlling relays. These in turn operate the control mechanisms. The device, shown being used by a polio patient in her home, was developed by the Lion Manufacturing Co. of Chicago.


## Well Filters Out River Mud

Problear: how to tap the Mississippi without getting Mississippi mud. Engineers who needed new water sources for a refinery solved it by the horizontal well system shown in the drawing. The big 13 -foot central shaft was sunk 112 feet deep near the bank of the river at Hartford, Ill. Then smaller perforated pipes, 104 to 176 feet long, were pushed out horizontally from the shaft into sand and gravel beds that underlie the Mississippi. Filtered through these beds, the water is perfectly clear by the time it reaches the collecting pipes. The well will supply Shell Oil up to $10,000,000$ gallons of water a day.

## $\mathbf{2 0 7}$-Ton Casting for 50,000-Ton Press Rides 16-Wheel Flatcar

Riding the rails at right is the heaviest single object ever imported through the port of New York and the biggest casting ever made in the British Isles. It is part of a 50,000 -ton-capacity hydraulic press that will forge air frames for the Air Force.
$\longrightarrow$ Another smidgen of matter in the atom has been made in the Brookhaven cosmotron. Called the neutral V particle because of the shape of its vapor trail, it's similar to particles found in cosmic rays.



USING SKIS OR WHEELS of their dual-purpose landing gear, as the snow condition per-
mitted, Air Force C-47s airlifted Seabees to the site, tested the airstrip as it took shape.

# Airstrip Made of Snow Helps Guard Far North 



A HARROWING JOB was the first step in building the snow airstrip. Tractors with broad, wood-slatted treads hauled special disk harrows on runners, like this one, across the trackless icecap. Chewing up the virgin snow made it denser and evener in texture. It was then compacted by huge rollers, shown on opposite page.

Often a train of two tractors, a pulverizer and a roller combined the operations.

ON AN icecap near the North Pole. in Danish territory, the U. S. Nary and Air Force this year built a firm airstrip entirely of snow. In fact, the mile-long rumway, 150 feet wide, was simply a compacted layer on top of several hundred feet of suow.

It was the first snow runway to be built so far north. The special equipment used, shown here at the job, was disassembled and airlifted to the location, along with the Seabees who put it together and set it to work.

Building the airstrip successfully out of material so abundantly at hand was a heartening demonstration to the men who are constructing a network of powerful bases in Arctic regions to protect the air approaches to northeastern Canada and the U. S.

## Snow Is Pulverized. Then Packed Down

The technique was simple. It consisted of pulverizing virgin snow and then packing it hard with huge rollers. The surface became harder as it settled. Scraping and rerolling kept it in usable shape.

The equipment had been thoroughly pretested at Camp Hale, Colo.; in the Sierras; in Alaska; and at Kapuskasing, Ont.


TESTING SNOW DENSITY before the pulverizers go to work, this man is weighing a measured depth of snow. He got it with sampler (near right hand), melted it for water equivalent.

Tcin-FOOT, 11-TON ROLLERS of steel packed the pulverized snow. Most had a corrugated surface (above). Rear blades, seen on uncorrugated roller below, prevented caking.

Planes on skis made the first landings and take-offs, but by early June the airstrip was strong enough to be safe for wheeled aircraft.



## Copter Plays Cops and Robbers

DOWN the highways and byways of rural England, a speeding car twisted and turned. But the driver never shook off the ominous roar that pursued him-the roar of a helicopter that clung grimly to his tail. Suddenly police cars loomed ahead at a crossroads, blocking him off. The fugitive car ground to a halt, trapped-just 14 minutes after the copter had sighted it from the air.

British police officials were playing cops and robbers to show student bobbies how
the helicopter could be used to capture escaping criminals. The "wanted" car with the fleeing hold-up men was given a head start, then a description was radioed to the piot of a Bristol Sycarore conter. The pilot had no idea where the wanted car would go, but he quickly spotted it from the air. As he followed it at 150 -foot altitude, he kept in constant radio touch with ground police in squad cars who headed off the fugitives.


HEADQUARTERS gets pilot's reports on fleeing car, relays them to squad cars in area.


PILOT'S-EYE VIEW as squad cars bottle up wanted car, coppers move in to nab "thieves."


As designed by Eliot Noyes (above). bubble house has traded igloo look for graceful lines.


## A modern architect proposes a new kind of living space in easy-to-build homes of gracefully arched design.

WHAT will it be like to dwell in a bubble house-a new design for living?
"Wonderful," says 42-year-old Eliot Noyes, Harvard-trained modern architect and industrial designer.
"To live in a bubble house," he ex.pands enthusiastically, "is going to be a wholly new experience. Because the system of building them is economical, we shall be able to afford more space than in conventional houses. But it will also be a new kind of space and will feel very different from any houses ever built be-
fore. We are all used to living in boxshaped rooms with flat ceilings. Now we can live under great arching surfaces which curve overhead. And they will also be beautiful shapes outside."

Economy of the bubble, or Airform, house is in the simplicity of its basic construction. Concrete is pressuresprayed over an inflated neoprene-nylon bag. When the concrete has set, the balloon-like bag is deflated-and there is the shell of the house. It takes 24 hours to do the job.

The shape of the bag thus determines

the shape of the house. It can be ugly or beautiful. It is all in the design of the bag. And that is where architect Noyes of New Canaan, Conn., comes into the picture, with the promise of 600 square feet of living space for around $\$ 6,000$. Two experimental bubble houses have just been completed at Hobe Sound, Fla. The models on these pages are larger, more elaborate-and more expensive.

The concrete-sprayed-over-a-balloon method of construction itself is not new. It was invented by a California architect, Wallace Neff, and is now controlled by the Airform International Construction Corp. of New York City. Aside from a few homes in California and the Southwest, and a group of experimental bubble houses in the East, most Airform construction as residences has been for mass


OPEN PLANNING like this is possible because no supporting beams or partitions are need-
ed. Where privacy is essential, partitions could be extended up to a false ceiling.

Triple Bubble Provides Separate Children's Area

LUXURY VERSION at left, with $\mathbf{3 , 0 0 0}$ square feet in triple bubble, has separate garage with plenty of room for two cars and space for tools and garden implements. One of side bubbles would have master bedrooms (right below) and guest room; other end unit would be children's play and sleeping area. Bubble in the middle would be a completely open, domed space to meet the living needs of the entire family (left below). Model was made to show Airform shapes and a possible arrangement. Doors and windows would be integral parts of bubbles.
housing in Venezuela, South Africa and Pakistan.

These served admirably in taking natives out of squalid huts into comparative luxury. But they were an ugly, igloo-like shape-with little thought to good design. One example was doors and windows, which were stuck on as appendages, having no relationship to the lines of the bubble form.

Recently Eliot Noyes saw the possibilities of this type of housing and, with the cooperation of Airform, has helped redesign the bag so that it will become a mold for bubbles beautiful.

With the bag supplied on a rental basis by Airform, any local contractor with concrete-spraying equipment can put up Noyes-designed bubble houses.-Herbert $O$. Johansen.


CURTAINS and low, room-dividing partitions would be used to a great extent for privacy.

People with hermit complexes, however, shouldn't live in bubble houses.


# Coming Up... Mechanical Groceries 

You Pays Your Money . . .

Customers will carry around a combination key and adding machine to unlock shelves and total their purchases in an automatic grocery store now being planned. Raking the key over a toothed latch would free a can or carton and simultaneously spin gears to add the cost of the item to the bill. Gravity chutes will keep the shelves full. Clarence Saunders, veteran chainstore promoter, invented the "foodelectric."

## . . . And You Takes Your Choice

Tiie English vending machine below gives a choice of 25 different grocery items. As each item drops down, its cost is deducted from the total amount of money you've put in and a cash balance appears on a lighted panel. You can keep on buying until the money fed into the machine is used up.


## Brushes Bend to Coat TV Tubes

If you've ever tried to build a ship in a bottle, you'll understand the problems of workers who paint the inside of TV tubes. In a 21 -inch tube there are nearly 500 square inches to be covered with black graphite-an electrical conductor. As shown at right, the job is done at GE in less than two minutes with double-jointed paintbrushes.


nollow pecking. as he trudges up and down display windows, can be heard throughout the land-and in several foreign countries as well.
Yogi gets around, mostly vertically, on five vacuum cups attached to a ratchet powered by a key-wound spring.

## No Good for Industry

Wigal was bitten by the germ of the idea for Yogi five years ago when he started idly fingering a vacuum cup that he'd found. Why not use a series of these things, taking hold and letting go in rotation, to make something move?
It took Wigal five years of strenuous parttime elaboration of this thought before he produced Yogi.

He tried first to apply the vacuum cup idea to some industrial process. That didn't pan out.
At last he decided to use the principle in a toy. He had already invented two.

What he needed now was an unusual toy. He finally settled on a woodpecker. People much more often see a woodpecker climb than fly, and the vacuum cups ought to be just the thing to turn the trick, he figured.

The first model was cumbersome and heavy. In it he had fitted vacuum cups to the prongs of a sprocket that was turned by gears powered by a clock spring. One trouble was that the cups gripped surfaces with such enthusiasm that it took an impractical amount of force to pry them loose.
So Wigal developed a new type of vacuum cup, one that would release itself easily and quickly. This enabled him to simplify his toy and reduce its weight from three-quarters of a pound to a little more than an ounce. Then he fitted five vacuum cups on a ratchet, which he "flatated" on a horizontal axis inside the bird.

The spring, made of thin wire, surrounds the bird's axis and is wound by a key fixed to one end of the axis. As the spring unwinds the axis turns slowly, loosening the grip of one vacuum cup while forcing the next one against the surface Yogi is climbing. This goes on until the spring is wholly unwound. Then be ready to catch Yogi as he falls.

Wigal now works with Tigrett Enterprises in Jackson, Tenn., manufacturers of Yogi. He is a good-looking bachelor of 37 , who at 14 , in his native West Virginia. "invented" a hand-operated mechanism for changing the pitch of an airplane's propeller in flight. A helpful patent attorney soon discovered for the bright lad that the same idea had been applied to the blades of steamboat propellers on the Ohio River 40 years earlier.

This setback gave Wigal a high regard for patent attorneys. To all would-be inventors, he says, "Get the best one you can to search the field for you before you waste time and effort on an idea that somebody else may already have patented."

## Rules for Inventors

Speaking with the authority of an inventor who has already struck it rich, Wigal also has these sound suggestions for the man who feels inventive:

1. Have a steady job while you invent. You can get mighty hungry waiting for an idea to pay off.
2. Don't discourage easily. Be satisfied if only a few of your ideas succeed.
3. Always ask yourself: "Is this idea something people need? Is it new and novel enough to appeal to them? If it's perfected, will it lure people into buying it?
Maybe you can make half a million, too--Robert P. Mahon Jr.


Shipwrecked Sailors Get Waterproof, Bump-proof Radio Station

A whole radio station for shipwrecked seamen has been packed into less than two cubic feet. Drop it 20 feet into the sea and it just floats around undamaged. ready to be fished out and put to work. The new lifeboat set weighs less than 60 pounds, yet includes a two-frequency transmitter and
receiver, an automatic keyer, a hand generator for power supply, an antenna and a collapsible 15 -foot antenna mast. The transmitter can be set to send automatic SOS signals as long as the generator is cranked, alternating between the two frequencies. Radiomarine makes it.


## Fourteen-Story Building Quietly Bolted, Not Riveted

There was no rat-a-tat-tat of riveters guns to disturb patients of the hospital next door when the new Medical Sciences Building (right above) went up in San Francisco. The 2,000-ton framework was put together
with more than 70,000 bolts, tightened with power-driven wrenches (left above). Bethlehem Steel, which made the bolts, says the process is as fast as riveting, makes stronger joints.

APPROACHING CHICAGO, white express flags


Grapes are whisked from California to Chicago on Fastest Freight

LEAVING BAKERSFIELD, the rear brakeman on the superfast freight gives a highball to the engineer, and 1,216 tons of seedless grapes, well-iced, head for eastern dinner tables.


Riding Santa Fe's No. 62 is as thrilling as racing a sports car 2,195 miles.

## By Kenneth Wylie

I
T IS nearing eight o'clock on a Thursday night in Bakersfield, Calif. At exactly eight, Santa Fe's No. 62, the world's fastest freight train, will pull out for Chicago with a consignment of two dozen refrigerator cars-"reefers," railroaders call them.

Only a relatively few hours before, vineyard men checked their crop of seedless grapes and found its average sugar content at just the right level for shipping.

The call went out for pickers, and soon stacks of thin crates started mounting in loading sheds beside the spurs and sidings where 62 is loaded.

Now stevedores are storing each reefer with 34,000 pounds of cargo.

Departure time ticks nearer, and the train crew is eager to take off. Now comes the icing show, staged by the railroad's Refrigerator Department-the R-D boys.

The R-D crew at Bakersfield takes over at 7:20 with an electronically controlled ice machine. This machine feeds on 300-pound blocks of ice. takes orders by radio and runs alongside the trains it services on its own set of 12 -foot rails atop an ice dock.

## Reefer Loaded in 90 Seconds

The bunkers of each reefer are loaded with around six tons of ice and a hefty sprinkling of salt. Total time for the whole train of 24 cars: 36 minutes, or one and a half minutes per car.

The icing is now finished, the wheel check is done, the conductor's flimsies are stuffed in his pocket and the engineer is in his cab.

The clearance comes.
"You've got a trainload, 62. Take off,"


FRESH FROM THE VINES, grapes are trucked aboard a "reefer," 34,000 pounds to the car. The cars get two icings on way to Chicago, where most are switched to eastern roads.
the intercom radio in our cab scratches, giving the engineer his control-tower okay.

The block signal ahead is green. The conductor gives his highball in the dim light, and No. 62 roars, spewing blue fumes as she heads into the darkness.

In no time we hit 60 , running for the foothills. Cuts, trestles flash by. Woods and night sky slant up and away as we bank around curves.
"Watch us walk through the mountains," the engineer calls over the scream of his diesels. The fireman pushes open the engine-room door on his side of the cab and goes back to make a check.

We really do walk through those bare California mountains. The four 200class Electro Motives whine as the grade begins to lift, but the only noticeable slowdown is for the twisting curves, some of them cutting far back in horseshoes and loops. Behind us the string of reefers bucks and leans.

Two-thirds of a continent away lies Chicago. Fifteen train crews besides this one will work 62 before she slides into the Windy City, Sunday noon. That's nearly twice as fast time for the run as the standard freight makes. Only a few streamlined passenget trains better it. Plenty of passenger runs are slower.

We're on a premium train, all right. It came into being because million-dol-

Iar California truit growers were willing to pay special rates to get their fruit to the country's biggest markets as fast as possible. To cash in on the highest market prices for their goods, they pay \$1,169 for each carload.

Big, gruff Jim Mahoney, Santa Fe's superintendent of transportation, was largely instrumental in creating a special freight train to meet their needs.
The secret of No. 62's speed is not alone its rate of travel on open track. Santa Fe's high limit for freights is 60 miles an hour, and not even 62 can exceed this. Freight rolling stock won't take the pounding of higher speeds.
What makes 62 so extra-frisky is its unusually small number of cars ( 15 to 29) and preferential handling all along the line as an "express special." That means faster checking, faster switching, faster servicing.
We find that out after we have shot down from the Sierras, our wheels pounding a brisk staccato on the long slope to the Mojave. The desert is wide and cool, with nothing but clear semaphores going by.

## New Hands and a Fresh Caboose

At Barstow, 141 miles nut of Bakersfield, we come to the end of Santa Fe's first division going east, and 62 quickly changes hands. Even a new caboose, fitted out with its own bedding, towels, books, coffee and lunch materials, is wheeled in for the nesv brakemen and conductor.
This happens at every division point -about 137 miles apart-and as 62 rolls into each yard, wheel crews do a special job and do it in a hurry.
"Rigid inspection," read the orders wired along our route to each yardmaster, but in the 10 or 15 minutes we pause at these points, all the crew can be expected to do is make a fast survey for hotboxes. Dragging brakes and hotboxes are a constant threat on a sustained high-speed trip. But the road puts its best equipment on this train, and it's expected to hold up. The really stiff check will come in Kansas City.

At Cadiz, Calit., the four diesel units start to scream again as we go up. out of the arid lands, twisting high into the ridge that stands as a barrier between desert and Colorado valley.

At a quarter to midnight on the second day of our journey, flood lamps in the Belen, N. M., yards light the truss work of another great icer. The crews clamber over our reefers, spending only half a minute on each one to fill its bunkers with 2,400 pounds of ice.

## Advance Word Sent to Yards

Nearly 900 miles to the northwest, at the Santa Fe yard in Argentine. Kan.the world's largest rail yard owned by a single road-the first steps have already been taken for 62 's reception.

Before we left Bakersfield, word had been flashed to every division on the Coast, Western and Eastern lines of the road that we were coming through.

At 20 minutes after 10 on Saturday night, the big yellow circle of 62 's headlight looms larger and larger beside the Argentine ice dock. We are exactly two hours ahead of schedule.
[Continued on page 242]


AT THE YELL "ICE," in the vast Santa Fe yards at Argentine, Kan., 300-pound chunks come rolling out on a conveyor from the Railway Ice Company's plant to the railroad's icer.


INTO THE ICER'S MAW go the chunks, which are then chewed up and spit down the elec-
tronically controlled machine's huge, armlike chutes, filling a reefer's bunkers in 90 sec.

## I'd Like to see them make...

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? Popular Science Monthly will pay $\$ 5.00$ for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.


A HEARING-AID CONVERTER that would let the wearer plug in on house current while listening to TV, to save batteries.-E. R. Woolner, New Bedford, Mass.


FRONT SHOCK ABSORBERS interconnected with hydraulic brake lines to keep front of car from diving on hard stops and prevent locked bumpers.-M. H. Muecke, Pasadena, Tex.


ICE-CREAM SCOOPS electrically heated so a housewife without the muscles of a lady wrestler could dig the stuff out of a home freezer.-Jos. Benzing, Forest Hills, N. Y.


MOTORCYCLES with hand warmers built into handle-bar grips for winter riding. Current could be supplied by the cycle's regular battery.-Arthur Hart, Hampden, Maine.


OVERSHOES with nonskid soles that wouldn't wear off. Mixing an abrasive in with the rubber for better traction might increase wear, too.-Frank Eagan, Blasdell, N. Y.


ANTI-TB DRUG, put up in vials by Pfizer, is a life-saving derivative of hydrazine.

MAKING PLASTIC EXPAND is feat of hydrazine. Here are product and its mold.

TO SAVE MOWING, hydrazine chemical, MH, is sprayed on grass along a highway.

ONION SPROUTS can be curbed or wholly stopped with hydrazine reparation.


The chemist's wand works magic with hydrazine, war-born fuel, as big-scale production begins.

## By Herbert Yahraes

IT LOOKS like the water from your faucet. It boils and freezes at just about the same temperatures as water. But this strange liquid, called "rocket water" by laymen and hydrazine by chemists, will take fire and burn with
a blue flame. It is just going into quantity production in the U.S.

Some consider hydrazine one of the best bets for fueling rocket-powered warplanes and guided missiles. It may be the stuff that will push the first spaceship free of the earth.

And with its aid, the chemists have


TYPICAL hydrazine-fueled guided missile is illustrated by simplified sectional view of a re-
already taken off on adventures into new worlds. For hydrazine serves as the starting point for making a myriad of new products. In some of its latest derivatives, it proves a veritable elixir of life. If you get sick, drugs based on hydrazine may make you well.

Other hydrazine compounds will help you control weeds, and even keep the grass of your lawn at just the right height, saving frequent mowing. You can buy your children a wonderfully light beach board made with the help of a hydrazine derivative. Under development is a whole family of new plastics, dyes, textiles and other products, all based on hydrazine.

## What Hydrazine Is

The men who handle rocket water wear rubber gloves and goggles, for it is toxic and corrosive. It smells like ammonia, of which it is a close relative. Both consist of nitrogen and hydrogen. Hydrazine has the chemical formula $\mathrm{N}_{2} \mathrm{H}_{4}$; ammonia, $\mathrm{NH}_{3}$. In other words, a hydrazine molecule contains two atoms of nitrogen and four of hydrogen, instead of an ammonia molecule's one atom of nitrogen and three hydrogen atoms.

A German chemist, Emil Fischer, predicted the discovery of hydrazine and named it as long ago as 1875. Isolating it took 12 years more, and the chemists who worked with it later found it hard to make and extremely costly. It might have remained little more than a chemical curiosity but for a startling development during World War II-
search type. Steel combustion chamber has $3 / 8$-inch-thick lining of heat-resisting carbon.
rocket-powered planes, introduced by the Germans late in the war.

To produce a lightweight, high-energy fuel for these planes, the Germans in 1944 disregarded costs and built the first two sizable hydrazine plants. The process used was originally devised by Friedrich Raschig in 1907. A familiar bleaching agent, sodium hypochlorite, broke down ammonia. The productschloramine and caustic soda-reacted with more ammonia to form common salt, water and hydrazine. Simple as it


GUIDED-MISSILE TESTS using hydrazine, and other fuels, have been under way at Army Ordnance test station, Malta, N. Y. Above, engineers check wiring of prototype model.
sounds, making it work was a headache. Hydrazine tended to break down before it could be recovered. And at best, the output contained only about two percent of hydrazine, and had to be concentrated. Nevertheless, the larger plant of the two produced more than 40 tons of hydrazine monthly.
It was hydrazine that provided much of the zip for the world's first rocket plane-the German's Me 163 interceptor. Its Walter rocket engine was fueled by a combination called T-Stoff and C-Stoff. T-Stoff was hydrogen peroxide, and supplied oxygen for burning the fuel. C-Stoff was hydrazine and wood alcohol, with a dash of copper salts to speed hydrazine's explosive reaction. The 415 -pound engine, developing a maximum thrust of 3,740 pounds, gave the plane a climbing speed of seven miles a minute and a top speed of 590 miles per hour. Hydrazine helped fuel a second rocket figiter, the BP-20.

After the war, U. S. scientists and engineers consulted with German rock-
et authorities, and studied the German hydrazine-making technique. Soon our armed forces began letting contracts for experimental work with hydrazine. In one such project, rocket motors burning hydrazine and other fuels have been undergoing trials in concrete-walled pits of Army Ordnance's 3,000-acre rocket station near Malta, N. Y.

## Secrecy Cloaks Progress

Results are hush-hush, and military men aren't talking about what fuels are currently used in our guided missiles. But the experts can point out this much without violating security: making hydrazine requires no strategic materials. It's easy to handle and store. As a fuel it's packed with energy, readily releasable. It ignites spontaneously and burns rapidly on contact with nitric acid or hydrogen peroxide, which act as oxidizers. It breaks up into lightweight particles that zip away at high speed, and so produce a powerful thrust.

These facts make hydrazine one of


ROCKET ENGINE roars into life as propellant is ignited in one of station's concrete test pits. Some of the models tested have developed a thrust of upward of 35,000 pounds.


ENGINEERS in control tower, at safe distance from test pit, work valves governing flow of fuel and watch through windows. Emergency control will douse pit with sprinkler system.


FIRST IN U.S. to make hydrazine by the ton is this new $\$ 3,000,000$ plant at Lake Charles, La. Massive concrete bulkheads (foreground) are to limit damage in case of an explosion.
the most promising of rocket fuels, perhaps the most promising. And it's no secret that U. S. production of "rocket water" is undergoing an unprecedented boom, with most of American makers' current output going to meet the needs of the armed forces.

## Big U. S. Output Starting

Really large-scale U. S. production of hydrazine is just getting under way. With completion last year of a $\$ 150,000$ plant at Newark, N. J., the Fairmount Chemical Co., a pioneer American maker of hydrazine since 1940, quadrupled its output. And now a great $\$ 3,000,000$ hydrazine plant at Lake Charles, La., has been put in operation by the Matholin Corp.-al new company devoted to manufacturing hydrazine, and conducting research on it, formed jointly by the Mathieson Chemical Corp. and Olin Industries, Inc. Military requirements are expected to take most of this plant's initial output, but it will also be able to supply a growing demand for hydrazine for non-military uses, its sponsorss say. And although the Lake Charles plant's
exact capacity is cloaked in military secrecy, they call it the first in this country to make hydrazine "on a tonnage scale."

Basically the method remains the Raschig process that the Germans used, but in U. S. producers' hands it has undergone important engineering improvements. And ways have been found to remove most of the 36 percent of water that the final German product contained, so that anhydrous or virtually water-free hydrazine, superior for many applications, is now commercially available.

The chemical is shipped in stainlesssteel drums, from which air has been excluded by pumping in nitrogen gas. This meets safety requirements for transportation by truck or rail. In a closed space, hydrazine vapor and air would form an explosive mixture, which could be touched off by heat, a static spark or even simply by contact with certain iron or copper compounds. But in the open, hydrazine is considered fairly safe to handle, no more dangerous in fact than gasoline.

## 2,000 Different Products

As an industrial raw material, hydrazine may be transformed into substances with a wide range of chemical structures -more than 2,000 , at latest count, and many with brand-new characteristics. Chemists have already developed a number of commercially valuable derivatives.

One of the most spectacular is the chemical that can help you have a wellgroomed lawn with only one or two mowings a season (PSM, March '53, p. 123). This is maleic hydrazide, or MH for short, made by the Naugatuck Chemical Division of U. S. Rubber Co.

Sprayed on grass, MH retards growth for six or eight weeks. It also looks good against certain weeds, particularly wild onions and garlic. Recent tests indicate, too, that it will help control quack grass, the bane of many a home gardener. ( In these tests, the weed was sprayed with MH and plowed under. Then a crop was planted.)

MH will do more impercant work. Sprayed on onions two weeks before they are harvested, it keeps them from sprouting all winter-without affecting color, odor or flavor. Potato plants sprayed with it yield a crop that can be stored without loss of sugar content. Tobacco plants treated with it won't produce suckers-a secondary growth that cuts both yield and quality.

## Hydrazine Attacks Poultry Disease

Other hydrazine products have agricultural value. Added to feed, one helps to prevent the poultry disease, coccidiosis. Another kills mites without killing the birds that feed on them. Others look like good insecticides.

Starting with hydrazine, U. S. Rubber Co. chemists have developed a new blowing agent-the thing that puts the sponge in sponge rubber and sponge plastic. The company calls it Celogen but chemically it is benzene sulfonyl hydrazide, or BSH. At normal temperatures, BSH is a white powder, but add it to a batch of rubber or plastic at temperatures above 135 degrees C., and it breaks down and liberates nitrogen gas. This leavens the material much as carbon dioxide, produced through the action of yeast, leavens bread.

One BSH end product is a beach board made of vinyl-plastic sponge. It weighs only 12 ounces, and its millions of tiny nitrogen-filled cells enable it to support up to 150 pounds in the water. More possible end products: sock pads, aircraft-wing lining, rug underlays, fishing floats, mine-cable floats, life rafts.

## Yields Life-Saving Drugs

Using hydrazine in a different way, chemists get drugs for saving life. Most dramatic of these, to date, has been the new antituberculosis drug INH-short for isonicotinic acid hydrazide. Now an improved form called streptohydrazid has been announced by a Brooklyn pharmaceutical firm, Chas. Pfizer \& Co. It combines the two most effective antiTB drugs, INH and streptomycin, and is
[Continued on page 262]

## What Are They Watching on Television?



The pictures that interest these three people are far, far removed from "Lucy." Can you guess what they are? Turn the page for answers.

## ...TV on the Job



1 AIRPLANE-ENGINE teSTS are televised by Pratt \& Whitney. Engineer (photo No. 1, preceding page) sees instrument wires.


2 butcher shows his wares to residents of Chicago apartment hotel. Shop is connected to the hotel's master antenna.


3 RED-HOT STEEL STRIP is telecast as it leaves rolling mill to let operator "see" around water sprays and control the mill.


## Welded-Steel "Basket Handle" Bridges River in Mexico



Mercedes Flips Its Grille
Lift the hood of the German Mercedes 180 -and the radiator grille comes right up with it. The four-cylinder, 52-horsepower engine boots the new car along at better than 78 miles an hour, putting 27 miles behind it for every gallon of gas swallowed.


Inclined steel arches welded together at the top are the unusual support for this new bridge over the Rio Blanco near Veracruz, Mexico. It's painted, too-the arches orange,
the horizontal tie girders cherry red. The design idea won a Lincoln Arc Welding award for Dr. Thomas C. Kavanagh of New York University.


## Wanted: Hot-Weather Cow

This bossy is masked for breathing in a climate chamber so researchers can tell how well she can take it in the deep South. It's part of a government crossbreeding program to produce a cow that won't hit a low in milk flow when temperatures soar.


## B-36 Doubles as Cargo Carrier

That old warhorse-the B-36-is hauling freight now. In each wing-pod saddlebag, the bomber above toted two B-36 engines and two quick-change engine assemblies across country to show how plane parts could be shuttled to and from forward areas.

# Nash Hikes Compression, 

> This L-head has the highest compression yet, but it still does its stuff on regular gas.

By Wilbur Shaw

THE Nash Statesman for 1954, sparked by a whopping 8.5 -to- 1 compression, cuts a good middle course between lively performance and comfort.

For years this Kenosha, Wis., outfit has puts its emphasis on comfort. Its cars have been noted for soft ride, fancy up-
holstery, double beds, and reclining seats. With this model, which shares with Buick the highest compression among U.S. stock cars and has the highest compression of any L-head, Nash has definitely changed its emphasis to engine.

The Statesman you'll see next year won't look much different-an altered hood line, restyled grille, and a Continental spare. But if you get in and drive it, as I did, the changes will be about as striking as the Petty-girl ornament on the prow.

The six-barrel L-head is basically the same engine that Nash has been using in


THAT'S PLENTY of cargo space in there, and for ' 54 it's made even bigger by hanging the spare outside. Apart from the fact that the car looks snappier, an outside spare means you don't have to unpack luggage on a roadside if you get a flat on a trip. That shelf behind the rear seat is steel-not fiberboard.

DUAL SPEAKERS-there's one like this on the other side too-let you catch soap operas or news with both ears. This seat folds down at night to make part of a double bed but doesn't recline for daytime snoozing like the other half of the front seat-too many guys are asleep at the wheel already.

## Puts Spare Tire Outdoors

its middle line of cars for years. The idea this year was to put a more powerful car on the road but still use this proven block and regular gas. Main problem: how to get more horses without letting it ping like a bunch of Swiss bell ringers.

Earl Munson, chief engineer at Kenosha, told me that his boys simply stole a glance at some favorite hot-rod tricks. They tossed in some of Nash's own, with this result: 110 horses, 10 more than last year, plucked from a 195 -cubic-inch engine. The bigger Ambassador has been hiked from 120 to 130 hp .

First, they relieved the "dam" of iron in the standard block between the top of
the cylinder wall and the valve ports. This lets the fuel mixture and the exhaust whip in and out in a straight line. Then they tossed out the old cast-iron head and substituted a high-compression aluminum one.

Munson explained why Nash went to aluminum:
"If you want more power from the same engine, one way to get it is to boost compression. Then you get both higher compression pressure and temperature, with resultant knock. You get it, that is, unless you avoid it by lowering either pressure or temperature.
"That's where the aluminum head



CONCAVE GRILLE is the most conspicuous style change in the new Statesman. When I first saw the car coming, I thought it was floating loose in there. Hidden brackets hold it.


PULL-OUT BIN in the center takes all those odds and ends that come tumbling out of an ordinary glove compartment whenever you open the door.


CONTINENTAL SPARE doesn't interfere with access to the luggage compartment. Outdoor spare is standard on a new Nash Rambler four-door built on a longer 108 -in. wheelbase.
comes in. It dissipates heat much faster than iron. There's a simple formula to illustrate the problem:
"Using the letter P for compression pressure, T for temperature, and PK for maximum permissible knock, we can set up a formula, $\mathrm{P} \times \mathrm{T}=\mathrm{PK}$. Let's say that PK in this case is 12 . So for our purposes no product of P and T can be more than 12. Suppose with the older engine $P$ is 4 and $T$ is 3 . That's all right, but we want to get more horsepower, and we want to get it by raising compression without raising PK above 12 .
"The solution we found was to lower the compression temperature to, say, 2which let us raise the pressure to 6 . You can see that a cooler aluminum head is a vital link in the process."

With their relieved block and high compression, the engineers had a hot baby on their hands that gulped for air and put out exhaust at unusual rates.

DUAL CARBS take air from the filter through a big tee connection. That aluminum head helps Nash run at 8.5 compression on ordinary gas. There's a new straight-through muffler that slices maximum back pressure in half, with a resonator on it to preserve Nash's typically quiet purr. They did things inside this power plant too-enlarged the intake manifold, relieved the block a little, put in bigger valves and a high-lift cam. Those two asbestos-covered lines running up from the exhaust manifold lead heat to automatic chokes-the carbs themselves sit on insulating gaskets to protect them from engine heat and vapor lock.


Dual carbs, improved valves and cam shapes, and a new exhaust system were next on the docket.

After we went over the engine, I took one of the four-door sedans out on Nash's track. The ride is amazingly soft, and the car handles about as well as you could wish for with such gentle springing. We got up to 80 easily on the $1^{\frac{1}{4}-}$ mile oval, but since the track is only slightly banked, I didn't try to shove the sedan higher. There was plenty of pedal left.

Braking was good. They have widened the front brake shoes from 2 to $2 \frac{1}{2}$ inches. I am glad that Nash is one company that doesn't just put in more power and let it go at that.

END



## Helicopter Blades Go for a Test Whirl on "Merry-Go-Round"

Spun by a 700 -horsepower electric motor, rotor blades for Britain's Bristol helicopters get strength and flutter tests on the odd-


## Torch Burns Holes in Concrete

Shooting a flame of 8,000 degrees F ., the cutting rod above, called DynaTrode, burns in mid-air with no ground connections. It eats into concrete an inch a minute. It is used with DC welding machines but its cables feed through rod to tip, where arc is created. Eutectic Welding Alloys Corp., Flushing, N.Y., makes it.
looking structure pictured above. Rotors up to 70 feet in diameter are given a dizzy whirl on the center tower.


## 1954

INSTRUMENT PANEL, closer to driver, has separate, dials. Radio speaker is at far right, glove compartment to its left.

T'EN horsepower and a high-performance transmission have been added to the 1954 De Soto V-8 to give the car more snap when the light turns green.

A little longer and wider, the De Soto now extracts 170 hp . from its hemisphericalhead cylinders. Compression ratio has been boosted from $7.1: 1$ to 7.5 . The optional
automatic transmission boasts the highest over-all torque multiplication in the industry -4.47:1.

Like other cars in the Chrysler Corp. line for '54, the De Soto has a new front suspension to cut down body roll on turns. The company continues to offer the 116hp . six-cylinder engine in five models.

## FACTS ON '54 DE SOTO

Model: convertible.
Engine: V-8 with overhead lateral valves; 170 hp . at 4,400 r.p.m.; compression ratio, 7.5:1; piston displacement, 276.1 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 1,410; bore and stroke, $3_{8 \prime \prime}^{3 / \prime}$ by $311 / 32$ "; crankshaft bearing surface, 43.8 sq. in.; torque, $255 \mathrm{lb} . \mathrm{ft}$. at $2,000 \mathrm{r} . \mathrm{p} . \mathrm{m}$.

Weight: $4,170 \mathrm{lb}$.; per hp., 24.5 lb .
Transmission: PowerFlite automatic (torque converter); rear-axle ratio, 3.54:1.

Steering ratio: 16.2:1 ( 25.8 without power steering); radius of turning circle, $20^{\prime}, 9^{1 / 2 \prime}$.

Effective brake-lining area: 201 sq. in.

Springs: front, coil; rear. semi-elliptic.
Outside dimensions: height (to top of windshield), $593 / 16^{\prime \prime}$; over-all length with bumpers and guards, $214 \frac{1}{2}$ "; width, $77 \mathrm{~s}^{\mathrm{s} "}$; wheelbase, $125 \frac{112}{\prime \prime}$; overhang, front 37 ", rear $52^{\prime \prime}$; tread, front $565 / 16^{\prime \prime}$, rear $59 \%$ ".

Inside dimensions: seat-cushion width, front $61^{1 / 2 "}$ ", rear $60^{1 / 8 \prime}$ "; leg room, front $44^{\prime \prime}$, rear 41\%/s"; seat height, front $147 \mathrm{~s}^{\prime \prime}$, rear $14 /{ }^{\prime \prime}$ "; vertical distance, steering wheel to seat cushion, with seat in mid-position, $5^{3 / \prime \prime}$; front-seat adjustment, horizontal, $5^{\prime \prime}$, vertical $1 \%{ }^{\prime \prime}$.

Tire size: 7.60 by 15 .

# P.S. <br> Last minute news \& notes... 

MORE OF THE LONG, LEAN EUROPEAN LOOK may be in store for U.S. cars, rumors Detroit. Surprisingly, the new contour is expected from the most conservative (in styling) of the Big Three. Chrysler Corp.'s new boss stylist is Virgil M. Exner, the man responsible for the ' 46 Studebaker. He says, "For 1955, it's . . . a more slender car." . . . The H-bomb isn't forgotten by Plymouth engineers. They will mark their '54 car radios with the Conelrad frequencies to which all stations will switch in the event of air attack. . . . Spare gasoline engines are being installed in some German trolley buses: they let the motorman leave the wire line temporarily to get out of a traffic snarl.

INDIA'S MOVIE INDUSTRY RANKS SECOND only to the U.S. in feature-film production, statistics from the United Nations reveal (see chart). Italy, source of many of the most famous postwar movies, is way down in seventh place in quantity.

| WHO MAKES THE MOST MOVIES? |  |
| :---: | :---: |
| COUNTRY | EACH SYMBOL REPRESENTS 200 LoNG FLMS |
| UNIED | (2) (2) (2) (2) (2) |
| states | (2) (2) (2) (2) (2) (2) |
| INOIA | (2) (2) (2) (2) (2) గ |
| JaPaN | (3) (2) (2) (2) |
| UNITED kINGDOM | (2) \%8)- |

CHEAPER COLOR TELEVISION is promised for both viewer and broadcaster by newly developed equipment. Columbia Broadcasting System has unveiled a new color viewing tube much simpler in construction than RCA's (PSM Nov. '53, pp. 122-3). At the first
press demonstration, however, the color picture produced on it was disappointing. For broadcasters, CBS showed how small, relatively cheap rotating-disk cameras could be used in the studios, their signals being converted in the control room to the NTSC color system. . . . An apparent record for long-distance TV reception has been set by a London fan, Charles W. Batley, who picked up Oklahoma City's WKY-TV.

WATCH YOUR AIM if you use one of those new tools employing blank cartridges to drive wall fasteners. One carpenter didn't, California police report. His nails missed the studding, went through the wall, killed a man who was working in an adjoining room.

VACCINES against two dreaded plagues --polio and TB--are closer to reality. The National Foundation for Infantile Paralysis will spend $\$ 7,500,000$ next year on production and test of the new polio vaccine. Gamma globulin-- $\$ 19,000,000$ worth --will also be used pending completion of the vaccine trials. The tuberculosis preventive was developed at the University of Michigan, has been tried successfully on animals but not on people. Antibiotic ice--flake ice containing a minute quantity of aureomycin-keeps fish fresh longer, report Canadian experimenters . . . And milk will stay sweeter longer if the cows are fed a little of a chemical called menadione, according to scientists at Florida State University.

WOMEN DRIVERS may deserve some of the things men say about them, concludes a New York University researcher who checked speeders by radar last summer. He found that 53 percent of all speeders he clocked were women, but reports that nearly everybody broke the traffic laws--even in front of a state-police barracks . . . A whole town in Long Island may be "punctureproof," for a while anyway. The Rubberseal Corp. plans to test its self-sealing tire compound by treating--free--every tire in the community . . . A new cold-weather oil promises easier starting even on 30 -below mornings. Gulf claims its product won't evaporate as readily as other light oils.


ALUMINUM STOCK that you'll find at hardware stores includes tubing, bar, angle, rod. sheet, decorative molding and special moldings for storm windows and screens. The sheet, in $3^{\prime}$-by- $\mathbf{3}^{\prime}$ squares, comes both plain and embossed to simulate leather. Long stock, in $5^{\prime}$, $6^{\prime}, 7^{\prime}$ and $8^{\prime}$ lengths, includes these sizes: tubing. $3^{\prime \prime}$ ", $1^{\prime \prime}, 1^{1 / 4 " ; ~ b a r, ~}{ }^{1 / 2}$ " by $3 / 4^{\prime \prime}$ $1 / 4$ " by $1^{\prime \prime}$ : angle, $1^{\prime \prime}$ by $1^{\prime \prime}$; rod, $3 / s^{\prime \prime}$. You'll also find aluminum screws and rivets.

# You Can Use Aluminum Like Wood 

Even the man who never worked with metals before can now make many useful projects.

## By Herb Pfister and Harry Walton

IF YOU think material other than wood is not for you, if you believe metal projects are bevond your skill, take a look at the shiny stock shown here. It's metal with a difference-handsome, strong and as easy to use as clear pine.

It's "do-it-yourself" aluminum, especially made for the householder and home mechanic. You cut. smooth. bore and shape it with the tools you already have-common, everyday woodworking tools.

It won't damage tools. Saw it with your pet crosscut saw. Plane it like wood. Bore it with your best auger bit. Let a

## Any Tool That Cuts Wood Cuts This Aluminum


circular saw sweep through it. Use a power jointer to straighten an edge or cut a flat through tubing. The tools will still have their original sharpness.

Finishing is no problem. The aluminum takes lacquer, paint or enamel beautifully, although it already has a permanent, nonrusting surface that you can buff as bright as silver or sand or wire-brush to a satin sheen.

At your hardware store. Right about now this aluminum, produced by the Reynolds Metals Co., should be appearing in your neighborhood hardware store in various shapes and sizes. You'll find two shapes designed for special jobs-a molding for making your own aluminum storm windows easily and economically, and a rolled shape for making window screens. Aluminum 160 popular science

## You Can Build Towel Holder

Embossed-sheet box holds paper roll, and bar below is for cloth towels.


SCRIBE PATTERN on sheet. Cut with scissors, bend with jigs (pp. 163, 166). Cut out hinge tabs with wood chisel (right). Use cut tabs to mark tabs on other piece. Fold around straight piece of wire. Hang towel roll on wood plugs hooked over ends.

rivets, self-tapping screws and machine screws for assembling your projects also will be available-in plastic bags.

Working tips. Although the metal does no harm to a circular-saw blade, bits of aluminum adhering to the teeth give a fuzzy finish to wood that is cut later. These bits can be cleaned off by rubbing a cloth on each side of the blade in the direction of the teeth points. Feed the metal slowly into power tools to prevent overheating and give chips a chance to clear. A piece of scrap wood placed over work being cut will minimize flying chips. Otherwise eye-protecting goggles are a good idea. But don't be carried away and try to cut just any aluminum alloy you happen to have with woodworking tools. It may be harder and damage the cutting edge.

Joining and fastening. Sheet aluminum crimped with a wooden jig can be interlocked along the edges for a permanent joint. Holes can be punched in moldings and sheet with a nail.

Aluminum is notoriously hard to solder, but some special soldering alloys come in
handy for small projects. One fluxless solder ${ }^{\circ}$ is simply rubbed on after the aluminum is brought up to $600^{\circ}$ with a small gas torch. The coating that results forms a base for making ordinary solder stick, or the alloy itself can be used to make the joint.

To try out this aluminum, Popular Science Monthly built a variety of projects. Notes on these follow.

Towel holder (above). The back and ends are bent from one piece. To form hinge tabs, chisel out between scissor slits. Roll the front after making $1 /{ }^{1 \prime \prime}$ folds on all sides. Join the folded edges and ends of the housing with aluminum rivets. Reinforce the holder by riveting a $3^{\prime \prime}$ iron angle bracket inside each rear corner.

Luggage rack (see page 162). The frame was made $3^{\prime}$ square to get the most out of $6^{\prime}$ lengths of angle. It is reinforced by an aluminum bar at each end, the bar protruding $4^{\prime \prime}$ on each side. Bent down to the roof contour, these protruding ends take the suction cups and drip-molding straps.

When bending the tubing, pack sand
inside to prevent kinkıng. 'The first bend must be correct. You can't straighten and bend it again.

Storm sash (see page 164). Aluminum screen bent over a thin wire frame can be used to replace the lower pane of glass, giving you an effective sash for both winter and summer. But to do this, you'll have to take the frame apart to substitute the screen for the glass.

Althoug ${ }_{11}$ cutting the miters with a bench saw is faster and assures more accuracy, you can do the job with a handsaw by working carefully.

Fireplace screen (see page 165). Since the panel area is larger than six sq. ft. (which calls for a cross brace in a window screen), take special pains to stretch the
wire or hold it flat with weights while driving in the plastic spline.

Modern railing (see page 166). Cement poured into $1^{\prime \prime}$ tubing gives rigidity to the supporting posts. Use a ready mix or mix one part cement to two of sand.

Holes can be made in concrete steps for the supporting posts by using a star drill or carbide-tipped masonry drill to make a series of small holes around a $1 \frac{1 / 2 \prime \prime}{}$ circle. Chip out the concrete inside the circle with a cold chisel and hammer.

Hardwood dowels forced into the ends of the tubing make assembly a wood-screw job. Uniform bevels on the ends of tubing over the steps can be cut on a bench saw, using the miter head set to the proper angle.

# Aluminum Car Rack Lightens the Load 

 Using tubing, angleand bar stock, you'II
find this luggage
carrier easy to build.


1 TO FORM SIDE RAILS, bend sand-filled tub1 ing around end of board cut to $5^{\prime \prime}$ radius. Wood strip nailed to bench holds tubing against bending board. Use husky bolt or pipe in tubing for extra leverage, ramming it tight against sand. Plug opposite end.

2PLUG SIDE-RAIL ENDS with hardwood dow2 els after shaking out sand and cutting off excess tubing. Join rail to frame by driving screws through bottom leg of frame angle into the dowels. Small screws through side of tubing keep dowels from twisting.



HOMEMADE BENDING BRAKE consists of two pieces of hardwood hinged on one edge near ends. Bevel hinged edge of one as in sketch. Clamp pieces together with cardboard between and screw on hinges. To use, slide in sheet aluminum until bend line lies along hinged edge. Place on wood block narrower than hinge spacing (left above), hold fast and fold over. Brake can be opened to remove bent stock (right above).


ROOF-HUGGING AND STURDY, rack can be installed in less than a minute after you have finished it. Suction cups and straps can be bought at auto-supply stores.

3 SHAPE MATING JOINT on top ends of cen3 ter braces by boring through tubing with wood bit of same diameter. If you have no drill press, use rattail file to shape end. Force $5^{\prime \prime}$ dowel into braces to receive screws driven through rail at top and angle at bottom.


TRIAL FITTING checks frame and fit of suction cups on top. Make frame of $1^{\prime \prime}-b y-1^{\prime \prime}$ angle and rivet it to heavier bar at each end. Rivets flatten easily between two hammers.

4 USE HARDWOOD SLATS, fitting them inside 4 frame and driving two screws into each end. Oak flooring is well suited to job of supporting heavy loads. Rip tongue and groove off each piece. Turn molded side up for best appearance. Varnish for weather protection.



Fuel-saving sash are made with extruded strip that bolts together, has groove for glass.

## Storm Windows and Screens



2 GROOVED BIT is cut away, leaving flat tab to be bolted or riveted to adjoining piece. Center rail is made up of two pieces, joined back to back, with grooved parts cut back.

Screen molding comes with preformed corner clips and plastic strip


TO MAKE A SCREEN, cut special lock-strip molding to fit in window casing. Measure along edge opposite the recess and cut $45^{\circ}$ miters. Recess must be on inside of cut, at short end of miter. Homemade miter box speeds the job.
I64 popular science

DEBURR cut ends and drive in corner clips. Clamp strip to bench top and hammer against a wood block. Join three sides, drive clips into ends of fourth, and hammer each end alternately into its adjacent side until frame comes together.

CUT SCREENING (preferably aluminum, to avoid electrolytic action) to size of frame. Snip off a corner just outside point where recesses meet. Using strip of wood that fits recess, drive screen in one side. Lay plastic welt on top.


CUT OUTSIDE PIECES to exact length to fit a window casing. Then make a $45^{\circ}$ miter cut through grooved section. Set saw fence as above to locate cut in relation to end.


3 ASSEMBLE AROUND GLASS, which should be double-strength grade. Bind glass edge all around with friction tape to fit groove snugly. Mount finished sash with screws or hangers.

## to hold wire.



NOW HAMMER IN locking welt firmly. Clip off corner as before and continue around frame. On fourth side, put in only $6^{\prime \prime}$ of wire at time and follow with welt. Sharp knife cuts off surplus.



## Aluminum Fire Screen

Simply add feet to panel made like window screen.


PLUG ENDS of $1^{\prime \prime}$ tubing with wood, file parallel flats, and bolt feet to stretcher. Two wood screws (left above) prevent twist. Attach leg with one screw into panel edge, one into face (right above). Clamp leg and frame at $90^{\circ}$ for affixing braces.

## Wood Jigs Shape Edges of Sheet Aluminum



NARROW BENDS, tabs or fold-overs are easy with a piece of hardwood run over the circular saw. Kerf depth governs width of bent flange. Bevel alongside kerf as above. To use, insert stock and fold past desired angle, as metal springs back a bit. For folded edge, bend as far as possible, remove from $\mathbf{j i g}$, press down with flat wood.


ROLLED EDGE is formed with a wooden dowel slightly smaller in diameter than desired roll. On the circular saw, cut a 3/16"-deep kerf along the dowel. Insert edge of sheet aluminum, and holding it firmly against a flat surface, roll or twist the dowel to wrap the metal around it, being sure to keep dowel straight.


## Modern Railing

Here, the light aluminum is put together for a finished job as sturdy as wrought iron.



FILL SUPPORTING POSTS with cement to add strength and eliminate springy feel (left). Use dowel to tamp cement down, leaving top $6^{\prime \prime}$ clear for dowel fastening plug. Set posts in 3 "-deep holes drilled or chiseled in steps and landing. Plumb each post and brace with
wood strips (center) to keep it vertical while you trowel cement around base. Leave braces until cement hardens. Screw top rail on posts, using rabbeted joint (right) to form corner. If steel screws are used, lacquer them to minimize galvanic action that pits aluminum.


MAKE SERIES OF PASSES over saw blade set to $1 / s^{\prime \prime}$ height to cut rabbet in aluminum bar. Hacksaw will do the job, but not as neatly. Smooth off kerf marks with wood chisel or file.

BRACE FOOT OF RAILING with bar attached to side of step with metal expansion plugs set in holes chiseled in concrete. Aluminum machine screw attaches top of bar to railing. Decorative feet, bent from stock used for lower rail, prevent sagging between posts.


INSTALL LOWER RAIL between posts. Bend one end, cut to length and fit angle to other end. This eliminates job of making two bends at accurate locations. Fit verticals between rails.

RIVET THIN STRIP MOLDING along top rail to conceal the heads of the screws that are used to attach vertical railing members. Miter molding ends at the corner. Use a drivescrew to hold the molding at the curved end of the rail.

END



SUPERCHARGER is shown above installed in a Ford. Diagram at right shows how variable drive works. Drive is pictured in highspeed position. When manifoldpressure switch signals for low speed, solenoid opens valve, admitting air to push piston to left. This squeezes inner pulley flange toward its mate, pushing drive belt farther away from center of shaft, driving it more slowly.

# New Blower Huffs and Puffs 

## Said to add 30 percent to a car's power, this new supercharger uses a two-speed drive to give your engine the air it needs.

THERE'S a new supercharger for your auto engine that blows hard when you need it, soft when you don't. An ingenious variable-speed drive does the trick. And thanks to the same device the blower gets the advantage of the low cost and adaptability of the centrifugal compressor without its inefficiency at low speeds.

The new supercharger-the McCulloch VS-57-has two gear ratios for its belt drive off the propeller shaft, giving it two speeds. Which speed is used depends on an electrical signal from a pressure switch in the intake manifold. The pressure there depends on the difference between the overriding pressure of the air-fuel mix rammed in by the supercharger and the vacuum from the suck of the cylinders.

This vacuum is high or low according to whether the engine is working easily or hard. When the load becomes heavy, the change in manifold pressure signals the supercharger to go into high speed to supply the air needed to handle it. When the load drops, another signal sends the device back to low speed. Thus the supercharger runs
at its more efficient speed when this is needed, regardless of engine speed.

In addition, a governor device keeps the supercharger from running dangerously fast. This shifts it to low speed when the impeller goes faster than 30,000 r.p.m. or the air pressure at the carburetor exceeds five pounds per square inch.

## New Blower-New Position

The new blower is installed ahead of the carburetor, instead of between carburetor and intake manifold, partly because of the low hood lines on current cars, partly to make installation easier.

The supercharger pressure is used to maintain fuel pressure by leading a line to the fuel pump. Another unusual feature is the planetary transmission that drives the impeller 4.4 times the speed of the pulley drive. This uses spring-loaded balls instead of gears, cutting noise and wear.

McCulloch Motors, the Los Angeles outfit that makes the new supercharger, says the price for a complete kit starts at $\$ 140$. Kits will be made for most U.S. cars.


Roughened Pin Jaws Won't Slip
Wood clothespins will hold better if the gripping surfaces are roughened. You can do this by placing a small round file in the jaws and clamping the pin in a vise. Use just enough pressure to force the file into the wood.-Ken Murray, Colon, Mich.

## Strap Holds Camera-Tripod Legs

A leather skate strap notched and fitted as shown will keep the legs of a tripod together while it's being carried. Looped around one leg, it won't be lost.-G. Wagner, Delmar, N. Y.



## Mirror Subs as Light Bulb

My dangling cellar bulb didn't light up the stoker bin so that I could see to fill it. Now the bulb does-with a mirror. I fastened the mirror to the ceiling and tipped it to reflect light into the bin.-Hallie $H$. Holt, Springfield, Ill.

## Typing Marks Ruler in Tenths

To calibrate a ruler in tenths of an inch, use a typewriter with pica type. Type a series of digits from 1 to 0 , then type an apostrophe over each number. Paste the strip of paper on the back of the ruler and cover with clear cellulose tape.-Harry Nelson Webster, Nutley, N.J.

## One-Legged Brunch Bar Fits Into a Kitchen Corner

Built against a low kitchen partition, this neat brunch bar saves space-and steps for the housewife. Construction is merely an $18^{\prime \prime}$-wide top with a cleat to which a
floor flange is screwed for the $1 \frac{112}{\prime \prime \prime}$-pipe leg. Cleats nailed to the wall support the other sides. Hide the exposed edges with an apron of 1"-by-2" stock.-Hi Sibley, Nuevo, Calif.



## Try This When Painting Walls

A simple device for keeping paint off the baseboard can be made by tacking weather stripping to the edge of a board about $3^{\prime}$ long and $10^{\prime \prime}$ wide. Let the stripping overhang on one side. Rest the overhang on the top of the baseboard and the bottom edge of the board on the dropcloth.-E. K. Harden, Cincinnati.


## Tongue Strips Cut Panel Waste

Problem: How to use some white-pine boards with plain edges for paneling without cutting a tongue and sacrificing part of the width. My solution is shown in the drawing above. After chamfering the edges of each piece at a $45^{\circ}$ angle on the jointer, I grooved the edges with a dado saw. Then I sawed narrow strirs from other material for splines. - R. S. Wilkes, Keuka Park, N. Y.


## Clothespin Is Electric Clamp

If you lack an alligator clamp for temporary connections in electrical circuits, drill a small hole through one jaw of a wooden clothespin, insert a metal thumbtack and solder a wire to the projecting point. Groove the tack head so it won't slip.-Ken Murray, Colon, Mich.

## Marking Parts Avoids Mix-Up

Ever take a small electrical part out of its carton-only to find later that the power rating and similar data were thrown out with the wrapper? You can avoid this headache by marking each part
 with waterproof India ink. Before marking the part, clean the label area with a piece of steel wool.


## Screwdriver Made from Wire

A screwdriver for small jobs can be made from coat-hanger wire. Form the handle with pliers and file the end of the wire on opposite sides to fit the desired screw slot.-John J. Rea, Urbana, Ill.

## KEEPING THE

 nempun wiHome

## SHIPSHAPE

Drawer pulls cut from a broomstick or dowel rod will make a stick or dowel rod will make a
metal office file look more at home in your home. Painting the case to
match other furniture will disguise in your home. Painting the case to
match other furniture will disguise it still more.


Weight that vase of heavy boughs and it will be less likely to tip. Fishing sinkers or bits of bar solder dropped in the bottom and covered with melted paraffin will help to keep the vase steady.


To keep a tree green longer, saw off the trunk on a slant. The longer cut will let it take up more water. Keep the butt dunked while the tree is stored, as well as when set up.

Scrap evergreen that you trim off your Christmas tree when shaping it can be put to good use as decoration for table or door. Just stuff it into a wicker mail basket or beribboned bread pan and glamorize with balls and


A plastic circle cut from one of those transparent boxes in which cheese wedges come packed makes a good temporary lens for a flashlight. Use the broken glass lens as a pattern.

More Home Tips


To make frothy-looking candles, melt new paraffin or old candle stubs over boiling water. Then beat the wax while it is still semiliquid.


To anchor wooden-knob pulls on cabinets and furniture so young children can't spin them off, drive a small finishing nail through the drawer front and into the knob as shown.


Squeaky floors in rooms over a basement can be hushed by driving wood wedges between the subflooring and the joists. A helper walking across the floor overhead will turn up noisy spots.


INDIVIDUALLY designed doors for your home can make the difference between that assembly-line look and an air of expensive custom construction. It is surprisingly easy to make the flush type-just a core of inexpensive lumber covered by plywood.

Plywood permits all kinds of decorative tricks. You can even make each side of the door different. The one I made has textured

## Unsulal Doors Are Easy to Make

## Decorated plywood over a core of softwood will add a custom note to your home.

plywood on the exterior to match the house siding and grooved plywood on the interior to match a paneled room.

Choose core stock and plywood so that total thickness of the three layers is $13 s^{3 \prime \prime}$ to $1 \frac{1}{2 \prime \prime}$ for interior doors, $1 \frac{1}{2 \prime \prime}$ to $13_{4}^{\prime \prime \prime}$ for exterior doors. It is best to use exterior-grade plywood and waterproof glue in outside doors. - Darrell Iluff, Sonoma, Calif.


CORE starts with mitered frame of sof wood sized to opening. Glue and corrugated fasteners hold joints, which need not be unusually strong (plywood face takes care of that).

PLYWOOD FACE, trimmed to door size, is nailed and glued to each side of frame. Set nails and fill holes. Door is now finished unless you want to add special decoration.


FIVE CROSS STRIPS are glued into frame. Four are narrow (about $2^{\prime \prime}$ ); fifth is wider to receive door lock. Place it so that it centers about 44 " from bottom of door.

TO MATCH PANELING of room walls, one face of this door was grooved by routing channels $1 / 4^{\prime \prime}$ wide and $1 / 16^{\prime \prime}$ deep at equal intervals. Many other interesting patterns are possible.


## New for the Handy Man

## 1. Pine Paneling Pre-

 finished. Nail up these knotty-pine boards and your paneled wall is completed. The $3_{4}^{3 \prime \prime}$ boards, textured by blasting and brushing, come already sanded, stained, lacquered, waxed and buffed. They are made with shiplap joints in five colors, $6^{\prime \prime}$ and $8^{\prime \prime}$ widths.
2. Lever Grips Tight Plugs. Appliance plugs that stick tight in wall outlets can be pulled out more easily with the Plug-Lever. A slotted plastic strip, it fits over the prongs to provide a thumb grip.
4. Rivets Hammered in. These lightweight rivets are used for decoration or for fastening cloth, leather, paper and plastic. You assemble the rivet through holes in the pieces to be fastened, then flatten it with a hammer. They come in several finishes and sizes, cost 15 cents a card.


3. Tube Fixes Loose Wallpaper. If your wallpaper comes loose along the edges, the flexible tip of the Paste-Bak tube gets fresh paste underneath where it's needed. The paste won't spot the paper.
5. Vent Attaches to Storm Sash. You can add these aluminum vents to wood or metal storm windows to provide the slight ventilation often needed in winter. The Slide-OVent has a sliding door that lets you open the vent holes any desired amount. The holes drilled in the sash are $7_{8}^{7 / \prime}$ in diameter, the vent is $2^{\prime \prime}$ by $8 \% z^{\prime \prime}$.



## 6. Glass Filters Heated Air. The dust

 often deposited by gravity warm-air furnaces can now be reduced by simple glassfiber filters installed under the registers. Glasfloss comes in rolls, is cut to size and fastened to the underside of the register grille.
7. Sandpaper Kit. You no longer need the lore of a cabinetmaker to choose the right sandpaper for refinishing furniture. A new kit contains $33^{2 \prime \prime}$-by- $9^{\prime \prime}$ sheets of the eight different types of abrasive needed for such a job-with a booklet explaining how to use them. It sells for less than $\$ 1$.

8. Ladder Folds. From a bundle less than four feet long, a collapsible ladder unfolds into a $14^{\prime} 8^{\prime \prime}$ utility ladder. It can also be used as a seven-foot stepladder (above) or scaffold. The 36-lb., wood-and-aluminum Porta-Fold can support $1,000 \mathrm{lb}$.

9. Paint Mixer Fits Can. You can leave this mixing paddle in the can while you paint. Its lid covers only ${ }^{\bullet}$ half the can and also provides a straight edge for wiping the brush. Called the Prop, it also has a hook for hanging up your brush.

[^8]
## Trouble Light Aims TV Antenna

A trouble light is almost as good as a pair of walkie-talkies when you're trying to aim a TV antenna at the transmitting stations. Extend the light out a window where it can be seen by the man on the roof. The man watching the screen image inside flashes the light fast if the antenna is way off, then slows the flashing to a stop as the correct orientation is reached.-Arthur $R$. Tanner, Cold Spring, N. Y.


## Ironed Tape Comes Unstuck

You can remove cellulose tape from paper or cardboard without tearing off a layer of the surface with it by first heating the tape with an electric iron. Set the iron at about the temperature for rayon or silk and run it over the tape several times. The heat will temporarily melt the sticky adhesive so that the tape can be peeled off easily. As the tape cools, most of its tackiness will return, enabling you to use it over again several times if necessary.-Ken Murray, Colon, Mich.


## How I Expanded My Garage

Two cars now fit between the walls where only one used to go.

a

3. RAFTERS WERE RAISED to a higher peak by spiking on excensions and new crossbeams were attached to old after wall was anchored. Extra studs were added at ends.

1. I STARTED WITH THIS onecar garage. First I laid a new foundation for the wall I planned to move. Next I removed doors, sheathing from ends and shingles from roof peak. Then I separated rafters at peak by hacksawing nails.
2. WALL WAS SHIFTED by wedring it up, laying sheets of greased iron plate across old and new foundations and prying it to new location.

3. I WOUND UP WITH THIS two-car garage. All the old siding was used, plus just enough new to finish. New floor was laid after old footing was knocked out. New door was largest item in $\$ 300$ materials bill. Counting two friends help in moving the wail. I estimate the job took 200 hours.-K. G. Byar, Cincinnati.


## Lamp on Board Keeps Oil Warm for Easier Starting

For cold nights, here's an easy way to keep your engine oil warm. Buy a 150 watt Pyrex-type bulb for outdoor use. On one end of a $48^{\prime \prime}$ board mount a tin can with a porcelain socket inside. The can will hold the bulb upright and help reflect heat. Connect armored cable to socket and attach plug to other end.-W. Gilman, Middletown Springs, Vt.

## Gus Rides

## On a storm-swept Christmas Eve, Gus digs deep into his bag of Irickis to save a cargo of holly-and an old man's faith.

## By Martin Bunn

WHEN Ḱnute IIansen drove his pickup trick to the pumps at Gus Wilson's Model Garage on that gray afternoon before Christmas Eve, Gus knew where he was bound.

It was near closing time. The sky was brooding and sullen. The very air was thick and heavy. Gus sniffed the weather as he filled the gas tank. Out of the corner of his eye, he studied the old man at the wheel.

Everyone knew Knute. Small, rheumatic, a mere wisp of a man, Knute made a meager
living doing odd jobs aromed town. Christmas time was his chief joy. It was then that he gathered holly, fashioned it into beribboned wreaths and bunches and sold it in the tiny town of Highland, high in the mountains.

Knute enjoyed a monopoly. No one in Highland would think of buying holly from anyone but him. And the holly was free to those who couldn't pay. Knute took an extra measure of pleasure in Highland. His daughter, her husband and three children lived there.

Gus screwed on the gas-tank cap, hung up the hose and walked up to the cab.


## with Santa Claus

"Merry Christmas, Knute," he greeted the old man. "Headed for a visit with your daughter, eh? Better take it easy. Weather looks bad."

Knute thrust his head out the window.
"Yah!" he said with satisfaction. "Every year I go home to my Frieda. Maybe this year, Gus, you like to go along?"

## Sky Looks Forbidding

"Go along!" Gus exclaimed. "I've got no folks in Highland."

He glanced again at the forbidding sky.
"That's yust it," Knute declared, his faded, blue eyes beaming with friendliness. "I bane vidower, so I go at yule time to my daughter. You bane bachelor man, so you go along with Knute and have one good time for yourself."
"But I've got to be in town tomorrow," reasoned Gus. A chilling gust of wind struck his face.
"That's all right," Knute told him. "You go to Highland with me for Christmas Eve. Tomorrow you drive my truck back. After New Year my daughter and son-in-law bring me back to town."

Gus rubbed a reflective hand over his chin. Knute could get himself in a peck of trouble. But to go on a drive to Highland on a night like this?
"Wait a minute, Knute," he said. "Be right back."

As Gus rang up the state police he thought of the old man, skidding around up in the mountains on dangerous roads, with a storm threatening.
"This is Gus Wilson, down at the Model

Using the tree trunk as a pry, Gus and Knute Hansen finally managed to hoist a rear wheel.

Garage," he said when the state police office answered the phone. "How's the road to Highland?"
"It's open over the pass," the answer came back, "but there's no guarantee on how long it'll stay open. There's snow up there already, and more might come at any time."
"Thanks." Gus said as he hung up. It was something over 40 miles to Highland, over a graveled road that was only fair in summer. What the heck, thought Gus. His decision was made. He told his helper, Stan Hicks, where he was going, and left him to close the shop. He climbed in beside Knute, noting that there were chains on the rear wheels of the pickup truck.
"Let's go," he said.
"Sure," Knute declared. "We have one fine time, by yimminy."

They rolled along at a good clip until they branched off into the winding, narrow road that led up into the mountains. The truck labored with its load of holly. Snow began to spit on the windshield and it seemed to Gus that the wind was building up. As they crawled into higher altitudes the vast, brooding hills became blanketed with snow that hadn't reached lower levels. There was six inches on the roadway, fluffing up with new fall. As they topped the summit the truck writhed in the old man's hand as the full force of the gale struck them broadside. It was a wild night for Christmas Eve.

As they moved down after topping the summit, Knute rode the brake pedal too much, not always shifting into lower gears when he should.

## Gus Thinks of Taking the Wheel

Darkness was fully down now. It was suowing harder, with a cross wind that drove the storm in gray, slanting sheets across the beam of the headlights. Looking out the window Gus saw a wild, uninhabited land. He thought of taking the wheel from the old fellow, but Knute knew the twisting, up-and-down turnings of this mountain road better than he did.

The oldster was riding his brake as the truck nosed steeply down into a pocket in the mountains. As it hit the bottom, facing
a rise, Gus suddenly smelled burning insulation. Almost as the strong scent hit his nostrils, the lights went out and the motor went dead. With one slap of his hand Gus heaved back on the emergency brake. They slid to a halt.
"By yimminy." Knute declared, winding down the window and spitting into the wind, "something goes wrong."
"How right you are, by jimminy, Knute," Gus said, hitting the ground.

Here they were in a dead truck in a night black as the inside of a hat, with six inches of snow on the ground and more coming down by the minute. There would be no traffic over this lonely pass to Highland for days. Highland folks were accustomed to being snowed in at times in midwinter. As far as Gus could figure, they were about 15 miles either way from civilization. Could they walk out? In a blizzard?

Feeling in his coveralls pocket Gus found the ever-present pencil light, pair of pliers, screwdriver, and roll of black tape.
"We should be able to locate the trouble and fix it, Knute," he said with a cheerfulness that was half counterfeit.
"We do," Knute said, and there was deep feeling in his voice, "or I carry my holly over these mountains on my back."

The words halted Gus with the hood halflifted. He stood there in the blackness and in the wild clamor of the stormy night suffused by a feeling that was greater than his worry. This simple, kindly soul, he observed to himself, is thinking only of carrying holly to Highland.

Gus played his pencil light back and forth over the engine. The light steadied on one of the battery straps. The heavy, leaden connection seemed to have sagged down in the center. Gus reached over and touched it. It was hot. The battery had been subjected to a dead short. It had been so heavy that it had practically melted the lead connecting the cells. The battery was dead.

Gus recalled the burned-insulation smell. He pulled up the floorboards. There was the trouble. The arm of the brake pedal
[Continued on page 238]


If an oil filter is not working properly you may find the reason or cure here. If the replaceable-cartridge type isn't cleaning the oil, remove the cartridge and make sure the sealing washers, top and bottom, haven't been omitted. Their job is to force oil through the element.

When an element is replaced, the small hole or holes in the hollow tube in the cen-
ter should be cleaned with a bent hairpin or wire. Clogged holes prevent filtering action. On cars where the oil line passes near the exhaust manifold, heat may weaken and break the line. Protect it with a piece of hose as shown. On some older Fords, oil returns from the filter through a hollow bolt. A mark filed in the bolt head will help line up the holes.


Reflecting tape attached to a piece of wood will give you an inexpensive warning signal for roadside breakdowns. A steel rod will support it.


Sponge-rubber weather strip cemented on the flat surface above an instrument panel provides a convenient storage place for maps, matches, cigarettes and other items.


A pair of old tires can be put to use as driveway guides. Since a car can hit them without damage, they can be placed closer to the driveway than other types. Put stones in the buried section of each tire for stability.


To warn of flat tires, install an extra curb-warning whisker. Bend down the end to ride about halfway between the pavement and the rim of the wheel. Then, the noise as the wire scrapes the ground will let you know the tire has gotten soft.


A wood shelf or "bench" built to fit your glove compartment will help keep the contents in order. Leave more space at the bottom than at the top so that bulky objects will have enough room. Maps and other papers will go on the top shelf.


For emergency repair of tire chains, make links from 16-penny nails. Clip off the head and bend the nail as shown, using two pairs of pliers. Leave the opening wide enough so the link can be slipped in place and then bent closed.


ALL MEMBERS OF THE FAMILY are strapped down, youngsters in the rear seat and parents in front, as the Lindsleys set out for a trip. The children like the idea, make believe they're riding in a plane. In addition to a belt across his lap, Pop straps on a shoulder harness for long journeys.


# Safety Belts Help You Drive 

## Strapped down, you're protected if a crash occurs. But that's not the only use for seat belts.

By E. F. Lindsley

DRIVING thrills are for those who like them, not me. Our two cars are just family transportation-to work, to schools, stores and visiting. We roll up about 25,000 miles each year, well over 800 hours in the driver's seat if you figure an average of 30 miles an hour. That's a lot of passing, a lot of quick stops, a lot of the close ones we all see and have in everyday driving.

When I take the kids out in our boat, I insist they wear life jackets. When I crawl to the top of a stepladder, I'm not too proud to ask someone to steady it. I wear

## Installing an Aircraft Belt

goggles when I run the workshop grinder, and I carry flares in case my car stalls on the highway at night. I also like my seat belts. If the big brave guys think that's silly, they can go right on doing so.

It has been proved time and again that seat belts pay off in a crash. Every time a Navy pilot sets a hot fighter plane on a carrier deck and fetches up against the arresting gear, he demonstrates that the human body can absorb a sudden stop easily enough -if snugly tied to the machinery instead of smacking around like a bird in a glass cage. The same goes for seat belts in cars.

Driving is easier, too. Most of us never discover until we use a seat belt that it gives the "seat-of-the-pants" feel that fliers rely on. You know instantly what the car is doing. An impending skid, excess speed on a curve, the gentle (at first) hint of a tire going soft, all are communicated to your senses in a way hard to describe but deeply satisfying as a driving experience. Inevitably, this results in better control of the car. Women accused of driving mechanically without really sensing the "feel" of the huge weight under their hands will find that a taut seat belt gives them a feeling of belonging to the car.

The driver is not alone in the added comfort. My wife noticed at once that she didn't have to grab for the handgrip when


AIRCRAFT BELT can be used in small car or accoss one section of divided seat in larger one. You could adapt angle-iron anchor that writer used on Crosley to almost any car.

I took a sharp corner. Another joy for the family driver is seeing the kids stay put.

They must be strong. Seat belts may be called on to take a terrific load. For this reason, more than casual thought should be given to the materials used and how you install them. The most economical approach is probably the one I used on my wife's Crosley. Here, by plunking down about $\$ 7$ at the local airport supply shop, I got a replacement seat belt of approved webbing with a quick-release latch, adjustment clips and terminal connection fittings. Such a belt will easily span the entire seat of a small car. On a conventional-size car, it would do fine for one side of the front seat.


SEAT-BELT KITS are available from several makers. Here, the writer is drilling edge of door to anchor belt he put on a Buick. Anchor there keeps door from flying open.


PLATED CLIP placed on door holds belt while not in use. Directions tell where to locate clip, but it's safer to probe with wire to be sure of hitting metal under fabric.


BOLTS with lock nuts or cotter pins are run through bottom panel and $1 / 8$ " reinforcing plate to secure anchor. Before drilling, check under floor for gas line or wires.


BELT TERMINAL is aircraft fitting made for the job and secured with best-quality bolt and nut. One belt across both seats is good idea for mother who takes child along.
anchor for the front seat and the rear anchors at each end of the rear seat are sturdy U bolts with back-up plates. On a four-door car, the rear belts are attached much like those in front. The kit gives instructions and templates for locating the holes you must drill.

A shoulder harness,too. Impressed by the seat belts, I decided to try a shoulder harness on the driver's side. Some authorities claim a harness is all-important for the driver in a severe crash because of the steering column in front of him. I hope I'm never called upon to test the theory. Right now, when I pop into the car to run downtown, I snap on the seat belt and let the harness


CENTER ANCHOR POINT for inner halves of belt is off-center to driver's side. Right-hand belt thus can snug down two persons if three ride in front. Anchor is sturdy U bolt.


BELT FOR REAR SEAT also is held by U bolts and reinforcing steel plate. These anchors should be placed as far to rear as possible. The rear belt extends across entire seat.

Installing Shoulder Harness


SHOULDER HARNESS can be made from old parachute pack. By ripping away the excess, you have two strips of webbing and plenty of fittings for an adjustable harness. No sewing
go. Out on the highway on a trip with the speedometer necdle swinging toward 65, the harness is on.

Nose around some of the stock-car races and you'll see a variety of harnesses and methods of anchoring.

Searching around a few airports brought to light an average back-pack parachute (minus silk) which the owner cheerfully umloaded for a couple of bucks. An hour with a sharp knife unsewing the mess brought me all the soft shoulder webbing I needed, plus a hatful of snaps and tightening keepers. Anyone wanting a shoulder hamess should make a quick circuit of the airports and war-surplus stores.

The installation was a snap. Two holes, a husky U bolt centered aft of the driver's seat with both ends of both straps clipped to it and I had a first-rate shoulder harness. I didn't do a thing to the snap and pad that go across the chest except cut off the ripcord housing. The snap slides up or down as you like it and keeps the straps comfortably across your shoulders where they belong.

Disadvantages. The greatest disadvantage of seat belts and a narness is inconvenience. They can't help you if you don't put them on. They help most if they are reasonably snug. When they are snug it's hard to fish your tobaceo pouch or wallet out of your hip pocket. If you let them get dusty you may wind up with a stripe across

i. required. Kipcord housing should be cut off and the padded front clasp used without change. The snaps for leg straps are used for attaching harness to anchor behind seat.


TWO STRAPS run over and under the folding back rest, ends attaching to $U$ bolt in floor. On a four-door car, the fabric at seat fold would have to be pierced for straps.
your trousers. Also, the kind of guy that laughs at a drunken driver and smokes while pouring gas in an outboard may needle you about being a scared Willy. But I don't care. Seat belts make sense to me. END


1. Traction Clips Put Themselves On. If you're stuck in snow, you can put on these emergency traction clips without moving the car or jacking it up. The spring-wire clips are pressed against the tire (above), and slight rocking or spinning of the wheels will draw them tightly on (right).

2. PumpHeats Parked Car. You can park your car, stop the engine and still keep warm with this auxiliary electric pump. Connected in the heater's water line, the pump will circulate stored-up heat after the engine is shut off until the water temperature falls below $85^{\circ} \mathrm{F}$. Then a thermostatic switch turns the pump off.

## 3. Washers to Stop Battery Corrosion.

 Slipped over the terminais of a car battery. these chemically impregnated washers are said to eliminate corrosion that stcals power and shortens battery life. The washers last for about a year. They are color-coded.

## More News from Auto Row


5. Tools Clip to Rack. You can make up any arrangement of tools you want on this clip-on rack and have them within easy reach when working in tight places. The tools are held in spring clips that can be screwed into holes anywhere on the perforated sides of the rack.


## Ice Scraper Is Squeegee

Cement a rubber strip to your plastic windshield scraper. Then after you get the ice off you can turn the blade over and squeegee away the slush. Cut the rubber strip from an old inner tube and cement it with weatherstrip adhesive.-Ken Murray, Colon, Mich.

6. Kit Adds Power Brakes. Almost any car made since the war can have power brakes with this accessory kit. It consists of a vacuum-operated booster unit (above) that hooks to the regular hydraulic braking system. Adapters fit most cars.
 side of the casing. The tool's frame gives a $10^{\prime \prime}$-square open working area. A safety catch keeps it from accidentally springing closed.


## By cutting interlocking rings from a flat board, you can draw them out_-like a drinking cup-into many fancy shapes.

By Edwin M. Love

YOU can change a single flat board into a shapely bowl by sawing it in pieces. Sounds like magic, maybe, but the only trick about it is in the way that you do the cutting.

You jigsaw the board into a series of
concentric rings, but instead of cutting vertically, which would let the rings fall through each other, you tilt the saw table so that the blade makes a slanting cut, tapering the edges. Each ring then falls only part way through, wedging itself tightly inside the next-larger one. Draw the rings out and they literally balloon into a rigid,

HOW SAW AND WOOD LET YOU VARY THE LIFTS


JIGSAWING AT ANGLE produces tapered plug that wedges in tapered hole, projecting part way through (right). Angle of cut, width of kerf and wood thickness determine amount plug (or lift ring) will protrude (sketch). Thin stock is impractical because kerf lets ring fall through, whatever angle of cut. A good thickness is $34^{\prime \prime}$. Trial cuts will show tilt for desired projection-usually half wood's thickness.
three-dimensional object that can have any shape you want to give it.

The technique, called lift sawing, can be used to form bowls, vases, ship hulls, relief maps-any shape that can be built up in tiers. The tiers can then be turned down on a lathe, forming a single, smooth-flowing
contour, or left exposed for a stepped effect. Because the rings are all cut from the same board, they save wood. Careful work also assures a perfect matching fit, providing accurate contours. And because they're hollow, they automatically form a hollowed-out shape that saves hours of finishing work.

USE LIFT SAWING FOR MODEL-BOAT HULLS



BOAT HULLS are ideal lift projects since rings automatically form lightweight, hollow hulls that need no further chiseling out. Lifts are made as shown in the above plan, which can be scaled up or down to any desired size. Cardboard templates cut to fit various stations along hull will insure, accurate shaping of both sides. Use waterproof glue in putting lifts together.

## SINGLE BOARDS BALLOON INTO BOWLS AND VASES



3/8 Squares

TURNED
BLOCK


VASE AND BOWL you can make are shown laid out on $3 / 8^{\prime \prime}$ squares. Radiuses for rings are found by measuring distance between centerline and point where the middle of each lift
thickness intersects the profile line. Vase needs one set of lifts for body, another for neck. At right, finished vase has drinking glass that fits inside neek to hold flowers.


CIRCLES ARE LAID OUT with compass after radiuses of rings have been determined from scaled profile. Radius line, intersecting circles, provides register points so rings can later be assembled in same positions they were sawed.


DRILL STARTING HOLES for jigsaw blade at same angle as for sawing. Make several holes in row, then punch out waste with knife to form slot for wide saber blade. Small nail clipped off square makes handy drill that won't drift.


VASE IS TURNED at slow speed, using lift joints as guides for shaping contours. Remove waste down to each glue line and desired shape will result. Solid top lift engages lathe, is cut out later.

## STEPPED PROJECTS ARE EASIEST TO MAKE

STEPPED PROJECTS like this bowl and candlestick are easy to make by simply allowing lifts to remain exposed instead of turning them down on lathe. Tray has a double, reversed lift-bottom is recessed while endpieces are raised to make handholds underneath. Edges of all lifts should be slightly rounded and sanded smooth. END


# Box-Camera Wizard Snaps Famous People 

> John J. Loughlin won't touch anything more complicated than a flash Brownie —but his pictures rival the pros'.

## By Dave Stanley

SOME of the nation's most professionallooking flash pictures are being taken today by a mild-mannered amateur photographer who gets extraordinarily fine results with an ordinary box camera. His name is John J. Loughlin, and with his trusty one-bulb flash and an inexpensive $\$ 11.95$ Brownie he's won the gold-spangled accolades of the photography world. His two-and-a-half-room apartment in Manhattan is as crowded as a well-stocked camera store with prizes, citations, merit awards and mementos of exhibitions.

Loughlin revels in his camera equipment. Since the day almost 30 years ago when he bought a one-buck box in Troy, N. Y., his only concession to change was in 1946 when he discovered flash. Then he bought himself another box camera with flash synchronization. Now he's surprising the experts with striking candids, night outdoor shots, and "at home" scenes. Particularly outstanding are his portraits of celebrities, including Presidents of the United States, top scientists, Pulitzer Prize winners, sports idols, diplomats, Broadway and TV stars-all shot on the run.

Loughlin is one of the hundreds of thousands of homeloving hobbyists whose hearts have been captured by the tiny flash bulbs. Once almost the exclusive tool of news photographers who wanted to capture spot news, today they are used everywhere. Reason? "Flash is sunlight at your beck and call. You can shoot indoors without expensive and bulky equipment," says Loughlin. "And without pushing the furniture. You just click the clicker and that's all."'

The New York box-camera enthusiast swears by flash, which has revolutionized photography as 3-D has Hollywood. Flash was introduced in 1930, but sold poorly. Today, according to U. S. Department of Commerce figures, photoflash-bulb production is a whopping big business with more than $339,000,000$ units (worth 49 million dollars) produced in 1952. Not only that, flash-designed cameras are leading the popularity polls. Sixteen million were sold in 1952-more than 85 percent of all cameras sold that year. Eastman Kodak recently announced: "Practically all cameras produced by us at the present time are designed for use with flash."

No, Mr. Loughlin is not alone. But what's his special camera magic? You might say


## Here Are Some of Loughlin's Celebrities HOW MANY DO YOU KNOW?

(See their names at the bottom of the page.)

that he knows the capabilities of flash, the reaction of flash to different lights, shadows and textures. But he says simply: "Seven years of practice."

Take the national pastime: shooting babies with flash. Loughlin clucks sadly at the way many photographers make the mistake of shooting babies dressed in white. "When flash hits all that white," he says, "you get distortion and you lose the baby's features. Best thing to do is to use color in the baby's dress and blankets. This brings forward the baby's features."

On dog pictures, he warns: "Shooting a good portrait of your favorite dog requires a lot of care. No matter how much the dog loves you, chances are that he'll let you take only one flash picture. So make your first picture count."

A dazzling array of flash techniquesmultiple flash, flash with extension cord, flash as back lighthave been developed. Loughlin takes the unorthodox, simplest, low-cost road. He shoots with one He shoots with one his box camera. That's all. Not finicky, he shoots his celebrity portraits very quickly. "I shoot and am away while most of the photographers are still fussing around."

## Celebrities Are His Specialty

When the box-camera enthusiast is on the trail of a celebrity, he is as relentless as a Georgia police dog. He uses the phone, letters, intermediaries-even surprise. He's caught President Eisenhower at a private New York dinner, Adlai Stevenson in the lobby of the Hotel Roosevelt, Ben Hogan at a bulb-popping press conference at the U.S. Golf Assn., Pearl Buck in her car, Supreme Court Justice William O. Douglas outside New York's Community Church, Harold Lloyd on the ramp of the Hotel Commodore, Mme. Pandit of India at a party at the Waldorf-Astoria, and Bernard Baruch-where else?-on a bench one Sunday morning in Central Park.

The FBI even helped him get one of his best pictures, a portrait of Jimmy Durante. Through a friend he ambushed

Durante, who was entertaining at a private FBI dinner. Loughlin got a wonderful shot of Durante's mug, but the portrait got as much circulation as a lie detector at a liars' convention. The picture got onto the front page of probably the world's most secretive house organ, the G men's own Grape-Vine.

## They Autograph in Advance

Loughlin is always on the alert to add to his portrait collection, which now numbers 72. Not long ago, he got wind that Carl Sandburg, the Pulitzer Prize-winning biographer of Lincoln, would be in New York. He was especially interested in shooting Sandburg, for Loughlin has a fine collection of photographic Lincolniana. After much phoning, he finally got to Sandburg at his publishers' offices. "I took one picture of Mr. Sandburg at a desk, and another of him looking at one of my Lincoln photographs, and in two minutes I was out," Loughlin recalled. One of Loughlin's best portraits, it caught the author's peculiar down-the-middle part, the short cowlick.

The "Wizard of the Box Camera"-as he was once tagged at a show-gets the celebrities to autograph the portraits with a neat trick. "When I'm going to take a picture, I carry along an empty picture mounting, and they sign on the bottom."

Though an unpaid press agent for the box camera, Loughlin is not blind to its limitations. "You can't shoot fast action because of the box camera's shutter speed of $1 / 25$ or $1 / 50$ second," he says.
"One of my best shots made with flash and box camera was taken outside Child's about seven o'clock in the evening. There was a girl doing a chef-in-the-window thing, making flapjacks. Well, I studied her for a while and watched her toss them in the air. I figured out the exact point when her arm started to come up. Then I shot, and got a wonderful picture of her flipping the golden brown flapjacks in mid-air! I shot the picture, of course, through the window. What a shot! I still get hungry every time I look at it."


1. Threaded Rods Clamp

Frames. Entire frames or boxes can be clampea square in this four-cornered gluing rig. Aluminum corner blocks are drawn up tight by thumb nuts on long threaded rods. Holes in the blocks permit nailing. Four sizes give maximum openings of $8^{\prime \prime}$, $12^{\prime \prime}, 18^{\prime \prime}$ and $24^{\prime \prime}$.

2. Pliers' Do Four Jobs. The tips of these wireworking pliers crimp soideriess iugs on wire with a single squeeze (above). Behind the tips are five threaded holes into which machine screws can be turned, then sheared off without damage to the threads. Along the handle are a wire cutter and six slots for stripping insulation.

4. Holder Speeds Nailing. You hit the nail and not your fingers with this holder. It has a grooved magnet at the tip. The holder alone is a tack hammer.

3. Ratchet Locks Pipe Vise. You don't have to tighten any screws in setting up this chain-type pipe vise. Once the handle has pulled the chain tight, a sliding ratchet is simply slid along the handle until it wedges it down, locking the chain. Two models are available. one for pipe up to $2 \frac{1}{2}{ }^{\prime \prime}$, the other for sizes to $4^{\prime \prime}$.

5. Drill Kit Hangs Up. Just knock out removable inserts in the back of this drill kit and you can hang the entire metal cabinet on the workshop wall.

Further information can be obtnined from: 1. Cincinnati Tool Co., Cincinnati; 2. Aircraft Machine Products, Harrisburg. Pa.; 3. Springlond Mfg. Corp., У S. Clinton, Ciicago; 4. Hunter Tool Co., Box 7395, Lugo Stution, Los Angeles; 5. Black \& Decker Mfg. Co., Touson, Md.

# Two Work Supports for Your Power Saw 

One has wood rollers, the other ball bearings to carry the stock. Build the one of your choice.

WHEN you're sawing unwieldy stock, outboard work supports are better than people. They won't ever tire, move the work unexpectedly, or leave when most needed.
Roller stand. The husky support on the facing page will handie long planks, wide boards or plywood panels with equal ease. The rollers can be gang-turned on a wood lathe. Centerdrill them $5 / 16^{\prime \prime}$. Sand $5 / 16^{\prime \prime}$ dowel to an easy fit in the holes, cut $2 a^{\prime \prime \prime}$ pieces, and dip in hot paraffin.

Tack the four rails together and drill holes (a tight fit for the dowels) through all of them at once. Pull the rails apart and assemble with the legs as spacers, cutting


WORK ROLLS on ball bearings (marbles) in this crosscutting support. Here a 12 hardmaple two-by-four is heing trimmed square. Top of sfide is set level with saw table.
these $1 / 2 \prime \prime$ shorter than the height of your saw table above the floor. Screw iron angle braces inside the stretcher and end blocks.Stanley Ro'erts, Los Angeles

Ball-bearing support. Useful chiefly for crosscutting, the stand betow will enable you to square long, heavy boards easily.

The work rolls on $5_{8}^{\prime \prime \prime}$ glass marbles that serve as ball bearings. These are placed in a trough made of standard cove molding. Tack two lengths to an $18^{\prime \prime}$ one-by-two and close the trough with a block at each end.

Cut a smooth-bottomed groove in a $9^{\prime \prime}$ piece of one-by-three to make the slide, or build it up by nailing two pieces to a third. Use 12 to 15 marbles of uniform size.

Make the base upright $8^{\prime \prime}$ shorter than saw-table height. A small lag screw below the clamping bolt prevents the head from turning.-Frank M. Butrick Jr., Alma, Mich.


## 



为



ROLLERS SUPPORT STOCK its full length for ripping. With the stand located directly behind the saw table, overhanging work rolls smoothly and has no tendency to tilt or slide away from the fence.

TURN DOWN $2^{\prime \prime}$ oak or maple $1^{7} \mathrm{~S}^{\prime \prime}$ diameter, mark at $7 / \mathrm{s}^{\prime \prime}$ intervals and turn all the rollers at once. Saw apart to $13 / 16^{\prime \prime}$ thickness. Mount a scrap block on lathe faceplate. Bore to a push fit for rollers. Insert each and rum throngh a $516^{\prime \prime}$ drill held in the tailstock chuck.


## Eaves Ventilate Roof

A quick-and-Easy way to provide undereaves vents-needed in many homes to cool the roof or prevent condensation-was worked out by J. D. Johnson, Tallahassee, Fla., contractor. He stapled screening directly to the traming and then simply covered the screening with perforated panels of告" Peg-Board Masonite. This takes less time, he reports, than setting in the usual framedscreen vents.


## Push Bution Controls Toy Train and Stops It Automatically

Here's an easy way to make sure small fry don't dash off leaving an electric train running. Connect an ordinary push button in series with the feeder wire to the track. It not only saves current and wear and tear on the trains, but prevents a dangerous short from going unnoticed in an unattended closed circuit.

Several buttons in parallel will provide controls at different points around the track. -Karl Greif, Vestal, N. Y.

## Hinge Pin Flares Tubing



A ball-end hinge pin borrowed from a house door serves nicely when you have to flare the ends of a few pieces of copper tubing. Clamp the tubing in vise-grip pliers, place the pliers over the open jaws of a bench vise and tap the ball end of the hinge pin into the end of the piece of tub-ing.-Albert $P$. Zanelli, Tampa, Fla.

for ice
and sleet. Ice and sleet are just as likely to cause accidents in the South, where their occurrence is rare and people are not accustomed to them, as in the North.

NORTH OR SOUTH, the person who survives is the one who notices and is prepared to meet winter conditions. Try to clean the snow off walks and steps before the snow freezes to the surface or turns to ice. Put sand, ashes or salt on ice. Be sure to watch your step. If icicles form on your roof overhang, knock them cff before they get big enough to fall and hurt passersby. When driving, keep your windshield clear, use chains or snow tires, and stay well behind the car ahead. Always remember to turn into a skid. Brake by pumping the pedal. But most important of all in driving: go slow.


# How to Make aSnow Mash 

## Using a trick borrowed from the Eskimos, you can quickly cut a cardboard eye shield.

IF YOU engage in winter sports that leave you exposed to sunlight on snow or ice for long periods -beware of sun glare. Your eyes may be damaged if they are not protected. This emergency eye mask, an idea borrowed from the Eskimos, can be quickly made from a piece of cardboard. Narrow slits block out dangerous light rays coming from below.


1 CUT A 10"-BY-4" PIECE of fairly pliable cardboard. Draw mask outline, making nose channel a bit shallow so that it can be trimmed to bring eye slits into position.

3PUNCH HOLES at each end of the mask. Through one hole tie a piece of string long enough to go around your head so that it can be fastened at other end for a snug fit.

2 A HUNTING KNIFE is excellent for cutting 2 out the mask. Try to work on something flat, especially for the slits. Make these about $1 / 16^{\prime \prime}$ wide and as long as your eye.

4 DARKEN THE INSIDE around the slits. A 4 pencil, piece of charcoal or burned stick will do the job. This prevents light from bouncing from cardboard back into eyes.


## Wordless Workshop



200 popular science


See PSM next month for another Wordless Workshop. december 1953201

By Winthrop Pratt Jr.


# Worid's Fastest umpuer Ship 

## Famous plans by a master modelmaker show you the easy, step-by-step construction of this fascinating model.

AHUNDRED years ago, the world's fastest clipper ship, Sovereign of the Seas, dashed out of Honolulu, bound homeward to New York on a breath-taking journey that was to set a new speed record for sailing ships. On one stretch of that voyage, she raced 3,562 miles in just 11 days. No sailing ship has since equaled that record, and none now ever will.

You can build a scale model of this ship that will be a family treasure for the next 100 years. The project calls for a scale of $1 / 12^{\prime \prime}$ to the foot, converting the Sovereign's 318' from bowsprit to stern rail into a gleaming $26^{1 / 2 \prime \prime}$ miniature. The plans shown here are one-third actual size. All dimensions can be obtained by simply measuring the plans and multiplying by three. For the templates and hull contours, you can either have the plans enlarged photographically or scale them up yourself on squared paper. In either case, the full-size plans are then traced directly onto the wood, using typewriting carbon paper, to give you the outlines for sawing.

Building up the hull. To speed construction, the hull is left solid. It consists
of six layers or "lifts" of pine. each $31 / 2$ " wide, $20^{\prime \prime}$ long and $5 / 12^{\prime \prime}$ thick, built up like a sandwich as shown below. Since the $5 / 12^{\prime \prime}$ dimension is the usual thickness of ordinary planed $1 / 2^{\prime \prime}$ stock, you have only to

buy the pieces, trace on the proper contour for each lift, and jigsaw the parts to shape. Then, starting with lift F, turned upside down, glue on each succeeding lift, aligning them carefully and inserting small brads to keep the layers from shifting when you apply the clamps.

When the glue is dry, it's time to cut the deck curve, called the sheer, that runs from forecastle to stern. Use a flat chisel or spokeshave, at the same time shaping in a slight camber or downward curve from the center line to the sides. Sand the deck smooth and pencil in the planking lines- 10 to the inch.

The forecastle and poop blocks are giued

MEN who have been reading Popular Science Monthly for 30 years or more fondly recall the late Capt. E. Armitage McCann's articles on model-ship building. One of today's outstanding builders of model ships is Winthrop Pratt Jr. of Dorchester, Mass. This past summer, Mr. Pratt built a model of one of the world's most famous ships. To do so, he used the plans published in Popular Science Monthly in 1926 by Captatin McCann. The issues in which Captain McCann's articles first appeared are now out of print. But many enthusiasts still consult them in libraries which have bound volumes of this magazine. For the benefit of others who do not have access to the original work, the editors asked Mr. Pratt to prepare this article. The plans shown are those of Captain McGann; the photographs are the work of Mr. Pratt.

on next. The forecastle block is $3_{4}^{\prime \prime \prime}$ thick at the bow, $\frac{1 / 11}{\prime \prime \prime}$ thick at its aft end. The poop block is cut out to receive the cabin house and overhangs at the stern.

Shaping the contours. You're now ready to cut the crusts off your sandwich, shaping it down to the sleek hull lines that sent the Sovereign smashing one speed record after another.

From the body plan below, shown onethird actual size, scale up a full-size drawing


MAKING A YARD. Stock is first split out to insure straight grain, squared up and tapered at ends. Then piece is planed to eight-sided shape and finally sanded round and smooth.
and cut out 13 templates, transferring their outlines to stiff cardboard with carbon paper. These templates show the hull contour at each corresponding station marked on the full-length sheer plan.

Pad the jaws of your vise to protect the wood and clamp in the hull on its side. With a curved chisel, spokeshave or half-round rasp, gradually shave away the excess wood, trying the templates frequently, until the curve of the hull exactly matches the template at each station. Start at the midship line and work toward each end, then turn the hull over and shape the other side in the same way. Trim the bow and stern to fit the $1 / 8 \prime$-thick stempost and sternpost and sand the entire hull smooth.

Adding hull detail. The bulwarks are $3 / 32^{\prime \prime}$ pine, $3^{\prime \prime}$ wide and $13^{\prime \prime}$ long. Cut rabbets $3 / 32^{\prime \prime}$ deep and $3 / 16^{\prime \prime}$ down from the deck line, as shown in the sketch, and glue and nail the pieces in place.
[Continued on page 232]


MASTS ARE MADE in same way as yards, but with single taper toward top. Tops, caps and crosstrees are cut from thin wood, fiber or plastic and glued on to join mast sections.


FORECASTLE VIEW shows lower foremast, fife rail, bitts and ship's bell. Pencil lines on deck simulate wood planking. Bell, blocks, other fittings can be bought at hobby shops.


CLOSE-UP OF MIZZENMAST shows top and cap that join topmast to lower mast. Lower shrouds pass through slots in top; topmast shrouds are threaded through holes in top.


$\frac{\text { SIDE }}{\text { SIDE }}$

## 

## 

AFTER HATCH-R
苜


APK Birts $x$ \%-3SnOH yDEA

FORECASILE DECK WINDIASS BITISFF MAIN HATCH-S

GALLEY MM O- OHSE

 BATS.CC FOREMAST. RONS CATHEAD N
WHIE IEITE
CIOTH OR COO WHTE LETIERS OV BLACK
CIOTH OR COURT PLASTER NAME PLATES - NN Cintiln 37 OH lirdsmog
O GALLEY FUNNEL
MM SIDE $\mid$ PINS

## 5 y

a

r-7va GVaH-atisvozalat

$\frac{20}{\frac{20}{20}}$


STEERING
WHEEL


END 国
TORR $\square$
BINNACLE-Y
XiII xill

STEERING GEAR - W
A1 Scy3a

YPad dood
SL-IIT ONIMOHS - MEIA NYTd
SNIT M A




MODEL MAKERS can render small wooden sections so flexible they can be knotted (left above). Plastic, when steamed, can be bent.

## Extra Uses <br> for a Bottle Warmer

These electric gadgets boil water and generate steam so quickly that you can use them for many jobs.


COOKS can use a bottle warmer to boil eggs or to prepare individual servings of baked potatoes or other vegetables.

DISTILLED WATER is made when steam condenses on glass of cold water and drips into lower glass. Partly cover warmer with cardboard.

PAINTBRUSH can be reshaped if youlet steam soften bristles. While steaming. hold bristles loosely together with rubber band.

LABELS on bottles that you want to re-use can be removed in seconds. You can also remove stamps from envelopes in this way.



## Brad Locks Caster

A typewhiter table that rolls around on its casters while you're pounding away can be mighty annoying. Here is an easy way to lock the casters. Take off the two front casters and drill small holes through the rollers and bodies, as shown above. A brad slipped through the two holes will keep the roller from turning.


## Nail Can Carried to the Job

$W_{\text {Iti }}$ containers like those pictured above, you will never have to sort nails to find the right ones for the job at hand. Glenn Mann. Carthage, Ind., made one of the buckets for every size nail he keeps in his shop. They are gallon cans cut down and fitted with dowel handles. The buckets are carried to the job.-George Laycock, Batavia, Ohio.

## Resurfacing Workbench

A workbesci top that has become scarred and unsightly can be renewed simply by nailing on a panel of tempered hardboard. This material will withstand long, rough use.


## Vise Plays All the Angles

Marry a small vise to a camera-tripod head and you can swing your work to any direction. The vise is mounted by first attaching it to a bottom block of $1 / \frac{11}{4}$ hardboard or aluminum in which a hole has been drilled and tapped for a 1 screw. The head is fastened to the bench by a $1 / 4 \prime \prime 20$ bolt.-Walter E. Burton, Akron.


## Rack Helps Keep House Neat

Tiie novelty of a boot-and-mitten rack all their own may induce the youngsters to hang up wet gear. This one is one-by-twos with $7^{\prime \prime}$ lengths of $1 / 2 \prime \prime$ dowel driven into angled holes 5" apart.-K. Greif, Vestal, N.Y.

# Radio Helmet for Space Fans 


#### Abstract

Mounted on a plastic eye shield, this real radio takes your kid out of this world-and it will make him captain of the crew.


" OVER 'n' out . . . over 'n' out" will really mean something to the bor who wears this radio helmet. The voice from the magnetic earphones may just be telling him the time, what to use on his hair or how to bake a cake. But to an imaginative modern lad it will be the control tower at the space academy giving vital instructions for coming in from outer space. Like the crystal sets of the early twentieth century, the outfit is self-contained and needs no batteries.

The miniature receiving station is built on a plastic eye shield-the type used by grinders or servicemen handling TV tubes. Heart of the set is a tiny germanium diode, type IN34, connected between a coil and a brass handgrip, which serves as a ground by utilizing the body capacity of the wearer. A telescoping auto antenna brings in the signal, preferably from the strongest radio station in the locality. The coil shown is wound for 660 kc . ( 660 on a radio dial). Removing turns will bring the local station in stronger if it is transmitting above 660 kc .-Elbert Robberson, Port Washington, N.I.



Easy-to-use materials for printing picturesideally suited for beginners. Kodacraft Printing Kit, \$4.95.


For simultaneous development of two rolls of 828 or 135 film. Kodacraft Miniature RollFilm Tank, \$2.53.


For accurate darkroom temperature control. You have choice of four Kodak Thermometers, from \$.55.


Includes three cups for darkroom work with both papers and films. Brownie Darkroom Lamp Kit, \$1.75.


Cool, circline fluorescent lamp, integratingsphere lamphouse are prominent features in each enlarger. Kodak Hobbyist Enlarger (left), $\$ 57.50$, complete with $\mathbf{f / 6 . 3}$ lens. Kodak Flurelite Enlarger (right), $\mathbf{\$ 9 9 . 5 0}$ (lens extra).


Essentials for developing and printing pictures, including roll-film tank. Kodacraft PhotoLab Outfit, \$9.75.


For efficient print drying. Stops tendency of prints to curl. Use it over and over. Kodak Blotter Roll, \$2.88.


Easy to use. Simple to load in dark. Takes 620 120 and 127 roll films. Kodacraft Roll-Film Tank, \$2.53.

## Save time-Shop here for the photo fans on your Christmas list

These two pages give you some idea of the many useful and inexpensive gift ideas at your Kodak dealer's. Visit him soon. He'll be glad to help you choose just the right gift for every photo fan on your shopping list.


Tilting base, minute and split-second hands, large dial. Intervals up to 60 minutes. Kodak Timer, \$7.95.


For wall, shelf, bench. Includes switch, cord, safelight filter. Kodak Adiustable Safelight Lamp, \$8.75.


For accurate masking of enlargements with any vertical enlarger. Kodak Masking Easel, $11 \times 14 . \$ 15.00$.

Chemical-resistant plastic housing protects all working parts. Kodak Chemical Scales, \$14.50.


For determining correct printing time - saves both paper and time. KodakProiection Print Scale, \$1.15.


View-type camera-permits one-to-one closeups. Kodak Flurolite Camera Combination, $\$ 69.50$ (less lens).


Converts tray to efficient, trouble-free washer for prints or films. Kodak Automatic Tray Siphon, \$4.50.


Can be used either from a drop cord or in a wall plug. Includes safelight filter. Kodak Darkroom Lamp, \$5.75.


Lenses for the Flurolite Enlarger range from 50 mm . f/4.5"Ekfanon" to 4 -inch $f / 4.5$ Ekfar." From \$15.00.


Expertly made Kodak Field Cases make cameras easy to carry, offer sound protection together with smart appearance. Include fine-quality leather cases (left), and durable simulated leather (right). Kodak Field Cases, from $\mathbf{\$ 2 . 6 5}$.


For quick, easy multiple lighting, with Lumaclad reflector. Kodak Flasholder Extension Unit, Model I, \$11.00.


Permits close-range picture taking with most fixed-focus cameras. Kodak Close-up Attachment, \$1.63.


Two compartments hold 4 filters, adapter ring, lens hood. Kodak Combination Filter Cases, \$4.25, \$4.95.


Projector, screen, changer in one unit. Kodaslide Table Viewer, Model A, $\mathbf{\$ 9 7 . 5 0}$.


Condenser-type power for dependable "flash." Kodak B-C Flashpack, $\$ 2.95$ (without 221/2. volt battery).


Now, a filter designed for inexpensive box cameras-emphasizes clouds. Kodak Cloud Filter, \$1.85.


New-type slide-feeding mechanism, cool operation, elevating device. Kodaslide Merit Projector, \$26.10.


Compartments for 240 cardboard or 96 glass slides. Kodaslide Compartment File, \$3.94.


Automatically trips shutter, permits photographer to get into picture. Kodak Auto-Release, \$3.86.


Sensational new bat. tery-condenser flash system. Kodak Ektalux Flasholder (Standard Bracket), \$29.75.


It's easy to get extreme close-ups with both still and movie cameras with Kodak Portra Lenses, from $\$ 2.65$.


Two superb new slide projectors. Kodaslide Highlux III Projector (left), 300-watt; quiet fan; blower, carry case, $\$ 56.50$. Highlux II (right) gives brilliant 200-watt projection. Converts to Highlux III. $\mathbf{\$ 3 6 . 5 0}$. Carry case, $\$ 7.50$.


Materials for mounting 50 color transparencies in glass. Kodak Slide Kit, \$3.63. Flasholder, \$8.25.


Holds your camera and flash extension unit on most flat or tubular surfaces Kodak Flexiclamp, \$4.95.


Shades camera lens and reduces sky flare-attaches to adapter ring. Kodak Lens Hood, from \$1.75.



Provides dependable B-C (battery-condenser) "flash" for most inter- flash insures longer batnally synchronized cam- tery life, sure synch. eras. Kodak Standard Kodak B-C Flasholder,

For use with new Brownie Hawkeye Camera. Flash Model. Very easy to attach. Kodalite Flasholder, \$4.00.


Popular yellow (K2), red (A), and green (XI) filters to fit most cameras. Kodak Wratten Filters. From \$1.75.

$2 \times 2$ projector and screen in a single unit. Usable in fully lighted room. Kodaslide Table Viewer 4X, \$37.50.

Prices include Federal Tax where applicable and are subject to change without notice.

 for Christmas

DOLLHOUSE PACKAGE at right is prefabricated in parts to be stored or mailed, quickly assembled Christmas morning, as shown above, with screws and brads. Parts can be fastened with glue later.


212 popular science

## Prefab a Modern Dollhouse

Picture windows not only give up-to-the-minute styling but let the young owner see inside without taking off the roof.

## By Darrell Huff

THIS dollhouse will delight any little girl because it is so modern-with a big picture window for her to show off to all how handsome it is inside.

And its modern simplicity means that it is easy to build. All the tools needed are a
hammer, screwdriver, drill, coping saw and all-purpose saw.

Materials needed include a $4^{\prime}$-by- $4^{\prime}$
 $30^{\prime \prime}$ length of one-by-two ( $3_{4}^{\prime \prime \prime}$ by $1^{5 / 8 \prime \prime}$ ), a $2^{\prime \prime}$-by- $6^{\prime \prime}-$ by- $9^{\prime \prime}$ wood block (for chimney), and clear sheet plastic to make the windows and bathroom partition.


1. HERE ARE MAJOR PARTS. From plywood also cut $3^{\prime \prime}$-by- $6^{\prime \prime}$ door, $53 / 4^{\prime \prime}$-by- $53 /$ " $^{\prime \prime}$ bathroom wall, cabinet and storage wall. Squares give effect of tiled terrace.

2. CLEATS cut from $3 / 4^{\prime \prime}-b y-3 / 4^{\prime \prime}$ wood are located $1 / 4^{\prime \prime}$ from lower edge of sides and back so these three members can butt down over edge of floor. Glue and nail them.

3. NOTCHES cut $1^{\prime \prime}$ deep in lower edge of the crossbeam for the door posts will give a stronger construction. Screw major assemblies together so they can be taken apart.

4. KITCHEN COUNTER is cut and assembled like this. There are two shelves back to back. Round corners of counter, partition and shelves. Assemble with glue and nails.

5. AFTER BUILDING STORAGE WALL locate it under front beam to form bedroom-living room partition. Locate it to leave space $53 /{ }^{\prime \prime}$ wide for the bedroom window.

6. TINY BOX HINGES hang the plywood door and the door knobs are thumbtacks. Dimensions given allow $1 / 16^{\prime \prime}$ clearance all around door. This can be reduced a bit if desired.
7. CUT PLASTIC to suit three window openings and a $53 / 4^{\prime \prime}$-by- $6^{\prime \prime}$ piece for bath partition. Tape in place for temporary use. Sanding will make bath partition opaque.

8. ROO: PANEL has hole for chimney, located so as to give symmetrical overhang of roof. Short cleats under roof hold it in place. Finish can be Firzite plus lacquer or paint.

9. THE YOUNG LADY will want to choose her own furnishings from the ingenious plastic miniature pieces that are available in many stores at Christmas time.

# is no better than its weakest spark plug!"  

"The finest automobile engine in the world
"I've been around automobiles for a long time and have road-tested practically every make of hack put together on these shores or across the pond. You learn a lot about any engine when you start dishing out the punishment. But there's one thing you discover quickly -the finest engine in the world is no better than its weakest spark plug.
"Spark plugs may look small and unimportant but, brother, if you want that mill of yours to unleash all its horses make sure you have the best spark plugs money can buy. That's where Champions take the spotlight. I've had stock Champions go on delivering the mail in car tests that were downright brutal.

Furthermore, I've watched Champion-equipped cars cream everything in sight in the world's great speed, endurance and reliability runs -from Indianapolis " 500 " to the LeMans 24-Hours.
"So take a tip from your Uncle Tom, and get set for winter driving by putting dependable Champion Spark Plugs in your car. They're your best assurance of positive starting and worry-free motoring when, 'the north wind doth blow and we shall have snow'."


station or garage displaying this poster!

for Christmas


CONTROL PANEL is lodged in neat case fitted with carrying handle. Train transformer is set into center, fastened to it with small machine screws through the corners of the face plate.

# Control Panel Eases Christmas Light Problems 

## You're a boss electrician with five individually controlled outlets, plus a special rig for the train transformer.

$\mathrm{A}^{\mathrm{T}}$T CHRISTMAS time you dream of a whole wall covered with electrical out-lets-there never seem to be enough. This control board centralizes your Christmasdisplay lighting, and toggle switches permit individual control of everything, including the electric trains. During the rest of the year it will provide your shop more bench outlets than you'll ever need. If you can leave the train transformer on the board it will also give a wide range of low voltages for testing.

Cabinet. To grace the living room, the cabinet sould be : ore than a box. The one shown was built from scraps of plywood.

Wiring. The drawing on the next page illustrates the wiring arrangement as seen with the hinged back open. From this, you can trace and duplicate the wiring. Line voltage is picked up from a wall outlet and fed to the box by a heavy-duty extension cord.

This plugs onto a male plug fitted to the side of the box. Current is then carried to the neon pilot light and toggle switches through radio hookup wire. A five-pin tube base on the opposite side of the box carries current to four triple outlets built into half a plastic food-storage box. A five-conductor cable, long enough to meet your needs, links the outlet box to the control panel. Each
circuit is protected by a five-ampere fuse in a light socket.

Train transformer. This is turned on by a toggle switch on the panel and is also guarded by a fuse. Extensions wired to


CASE for control panel is built of plywood covered with blond-mahogany plastic veneer on face, dark strip mahogany elsewhere. Back is hinged for easy access to wiring.

phono jacks carry variable low voltage to the tracks and fixed low voltage to the buildings and other scenic accessories.

Many interesting effects can be obtained
by running separate circuits of tree lights of different colors to the control board and lighting them in combinations.-James $T$. Raymond, Emporium, Pa.

## Tunnel for Trains Supports Christmas Tree

This four-portal tunnel adds scenic beauty to your Christmas train layout and supports the tree as well.

Backbone of the tunnel is the heavy cardboard tubing rugs are rolled on. Two pieces $20^{\prime \prime}$ long are cut and joined to form a double through way that covers a $90^{\circ}$ track crossover. This permits trains to run in and out of
the tunnel in a figure-eight layout. A commercial tree stand mounted on a separate base is then screwed to the tubes. The entire structure is covered with chicken wire and plastered over, adding weight.

A coat of canned artificial snow completes the winter setting for the tunnel.N. A. and B. M. Coomer, Jackson. Mich.



## Toy Copter Will Light, Up Your Youngster's Bedtime

A night light that is also a toy helicopter will gladden a young boy's heart. It can be made from scrap wood.

Both the main rotor, fastened with a machine screw and nuts, and the screwed -on tail rotor turn. Shape the fuselage cutout to suit the socket used. A blue or green bulb gives a pleasant light.-Robert H. Hawkins, Morton, Ill.


## Solder Makes Doll Chairs



If your daughter insists that her dollhouse would be more attractive with modern wrought-iron furnitare, it can be quickly made from solid wire solder. Available in $1 / 16^{\prime \prime}$ and $1 /{ }^{\prime \prime}$ diameters, the solder bends easily into any shape. Cellulose tape and household cement make the joints. Cemented -on scraps of fabric provide realistic-looking up-holstery.-Richard J. Decker, Brooklyn.

## Plastic Pipes Light to Trim Table Tree



The tiny "lights" that sparkle brilliant color all around this unusual table tree aren't real bulbs at all. They are bits of acrylic plastic rod (Lucite or Plexiglas) which pipe light from an ordinary 40 -watt bulb hidden inside the "tree"-a cardboard cone covered with tinsel. The light stays inside the plastic rods, as though in pipes, until it reaches the pointed, roughened ends. Then it emerges, visible, to make the plastic points gleam like tiny bulbs.

The socket for the 40 -watt bulb can be mounted on a base improvised from wood scraps. Be sure to provide ventilation holes.-L. Carpenter, Los Angeles.



1. GLUED-UP TOP has corrugated fasteners at joints on both sides. Legs are shallow boxes made of rabbeted pieces glued and screwed together. Corners are then rounded.

## Road Map

## By Darrell Huff

EVER poked around frantically for a mislaid map while friends wait for you to show them the route? Sure. Chances are some of the people on your Christmas list have, too. Here's a simple, neatly designed table that keeps the map where it can't be lost, right on the table top. And it makes a novel Christmas gift.

The map comes free from a service station. As shown in the pictures at left, you have to vary the shape of the table to fit the shape of the state you want to use. The photographs below show how to build a table for California, Michigan, Massachusetts, Florida or Louisiana, but tables for other states are made in the same way. Any lumber of $1^{\prime \prime}$ to $1^{1 / 4^{\prime \prime}}$ actual thickness will serve.

Redwood or pine will cost you as little as $\$ 2$. You can turn out several tables for friends in a few evenings.

# Tops Gift Table 

There's no hunting for a map when it's fixed to the table top. Two dollars will build this project—and friends will like, it.
 for Christmas


Finished table is handsome enough for the living room, but tough enough to use outdoors.

2. LEGS ARE FASTENED to top with waterresistant glue and screws. For this table, one leg box is $3^{\prime \prime}$ by $163^{\prime \prime}$ " by $14 \frac{1}{2} 2^{\prime \prime}$; the other is $2^{\prime \prime}$ by $123 / 4^{\prime \prime}$ by $14 \frac{1}{2}$ ".

3. MAP IS TRIMMED to outline, glued to top. After glue dries, clean map with sandpaper and feather edge to blend into table top. Clear lacquer finishes table, map and all.

## for Christmos.

## Wood Fish Makes Snack Plate

CANDWICHES and cookies are the specialty of this turned-and-carved plate. You need a hardwood blocksolid or glued up-1" by $11^{\prime \prime}$ by $11^{\prime \prime}$, which is turned to make the dish and then sawed to the fish outline. A $4^{\prime \prime}$-square block glued to the back will eliminate faceplate screw holos in the finished job and can be chiseled off later.

The head, fin and tail grooves can be routed or carved with a jackknife. Sand carefully and apply several coats of lacquer.-Vern Forsberg, Seattle.



# NEW! ALUMINUM STORM WINDOWS EaSIER TO MAKE THAN WOODEN ONES! 

Make and repair countless other things around your home with amazing new

## REYNOLDS Dolt-1-Yourself ALUMINUM

No Special Tools... No Special Skills Required!
This amazing new kind of material opens up a brand new field for the home owner and hobbyist. It has the beauty and strength of regular aluminum. But Reynolds Do-It-Yourself Aluminum, made by the makers of Reynolds Wrap, is specially engineered for amazing workability. You can cut it with scissors, drill it, bend it, shape it and plane it, using ordinary hand or power tools. And it's so easy to use that even an amateur can become an expert overnight !


END TABLES like this, made easily and quickly with new Reynolds Do-It-Yourself Aluminum, are smart, modern... cost very little.


FISHING NET and light, strong fishing rod cases are simple projects with Reynolds Do-It-Yourself Aluminum, make fine Xmas gifts.


WALL PROTECTOR made in an hour using Reynolds Do-It-Yourself Embossed Aluminum Sheets is just as handsome as it is practical.


HOUSE NUMBERS add an expert decorator's touch to any house, are easy to make with Reynolds Do-ItYourself Aluminum.



Wally Cox, TV's Mister Peepers (Sunday nights, NBCTV) shows one of the aluminum storm windows you can make with Reynolds Do-It-Yourself Aluminum. These storm windows . . . so much easier to make than wooden ones . . . are permanent, rustproof, attractive, can be made with either glass or plastic panes.

## ORDINARY HAND OR POWER TOOLS WORK FINE ON THIS FABULOUS NEW MATERIAL



CAUTION: Regular aluminum may harm tools... use only Reynolds Do-lt-Yourself Aluminum. Each piece has Seal attached.

## Look for this Self-Service rack containing

 REYNOLDS Yourself ALUMINUM at hardware and lumber supply dealers everywhereTubes - rods - bars - plain sheets e embossed sheets angles - fasteners - screen and storm window sections window hardware - plastic sheet - trim moulding

## APPROVED BY:

Atlas - Delta • Disston - DeWalt Black \& Decker - Stanley Skil Corporation and other Leading Tool Makers



CANDLE WARMER. All you need is a trivet, three short pieces of copper tubing and a block of wood. Bore holes in wood for tubes, spacing them to suit feet on the trivet.

SNACK TABLE. This store-easy table has legs that pull out. Triangular plywood top is fitted with corner blocks that are drilled at $5^{\circ}$ angle to take dowel-rod legs.


COOKBOOK HOLDER.
This is two pieces of hardboard witha length of one-by-two sandwiched between. Fasten hardboard to narrow edges of wood strip with screws.

JEWELRY TRAY. Make it from a wood knife box. Wood dividers nailed in one section form compartments, and two pairs of dowel rods placed together make earring rack.
for Christmas
Knickknacks for the Ladies



You get these packages for the same total price as the complete deltasenap

The DELTASHOP is a complete home-workshop that does $95 \%$ of home do-it-yourself projects, occupies only a 3 -foot square, and pays for itself quickly by savings on home repairs and improvements. Keep it anywhere, move it anywhere, use it anywhere, indoors or out.
Make it a "must" to see this remarkable tool demonstrated-at your local Delta dealer, department store, or your nearby IRHA hardware store.

Also send for catalog of famous Delta "How to do it" books. Delta Power Tool Division, Rockwell Manufacturing Company, 504M North Lexington Avenue - Pittsburgh 8, Pennsylvania.

Prices slightly higher west of the Rockies

1) ATA QUALITY POWER TOOLS Another Product of Dactiver

Easy-to-Build Footstool Will Let Pop Take a Load Off His Feet

so that they will be exactly alike. The scroll on the bottom will have to be done on the jigsaw. To saw out the mortises for the stretcher, drill starting holes, then tilt the jigsaw $83^{\circ}$. Drill holes for the pegs, squaring them with a chisel. Cut and attach the $1 / 2^{\prime \prime}$ cross strips with glue and screws. Two coats of orange shellac, each rubbed down with fine steel wool, will give a natural finish.

Cover the top with a $13^{\prime \prime}$-by- $21^{\prime \prime}$ piece of leatherette over a $1 \frac{1 / 2 \prime \prime}{\prime \prime}$ layer of upholsterer's cotton. Tack the plastic to the underside with carpet tacks, then add decorator's tacks around the edge.

## Old Steam Traction Engine Tells Which Way the Wind Is Blowing

Steam traction engines once plowed the soil and threshed our grain, clanking from farm to farm between jobs. This weather vane brings back memories of those awkward but fascinating machines.

Transfer the pattern by means of a grid to a sheet of fairly stiff copper, aluminum or galvanized iron. Cut to shape with shears, a metalcutting coping saw, or hammer and chisel.

Solder or clamp the vane on a bearing tube as shown in the drawing. Grease and slip the tube onto a firmly mounted shaft, with a steel ball as a thrust bearing. Compass points can be bent from wire or cut out from a piece of sheet stock if desired.


CLAMP



## ""IShop deas

Sanding Spindle. A strip of abrasive cloth about $5 / 16^{\prime \prime}$ wide wrapped around this drill-press attachment forms a sanding spindle for inside curves. The strip is started by wrapping it over itself at the shank end, completed and secured at the bottom under a washer held tight by a machine screw. The strip must be wrapped from right to left so that it won't unravel in use. Removable sleeves can be made by gluing strips over heavy paper.

Paint Lines Compressor Tank. Condensation is your compressor tank's worst enemy. It settles at the bottom and slowly rusts the tank away from the inside. Once the rust has started there's little you can do about it, but if your outfit is fairly new, you can protect it by pouring good enamel or thinned red lead in the tank, sloshing it around to coat the inside and draining it.William Schlucter, North College Hill, O.


Bench Drawer Goes to Job. A small handle built into the center of your workbench drawers permits you to haul them out and carry them to jobs outside the shop.

Spaghetti Extends Oil Spout. To oil hard-to-reach working parts of shop machinery, extend the spout of your squirt oilcan by slipping on a length of insulating spaghetti. This plastic tubing is available at radio-supply and hardware stores. Pick a size to fit the oilcan spout.

## MORE SHOP TIPS



Gauge Measures Holes. Thin flat steel cut to a taper of $2^{\prime \prime}$ to the foot (about $9 \%{ }^{\circ}{ }^{\circ}$ included angle) makes a gauge for checking the diameter of holes. After cutting the blank, measure the various widths of the taper and mark it off by eighths or sixteenths. Less taper increases accuracy.-Fedcrico Strasser, Santiago, Chile.


Saw Blades Cuit Wide Slots. Three hacksaw blades side by side will cut a neat slot想" wide. Light filing smooths the bottom. Other widths can be obtained by joining two, four or more blades.-William $H$. Eichhorn Jr., Highland, N. Y.


Frozen Rubber Machines Easily. Sawing, cutting or machining soft rubber to form small parts usually results in a hacked-out job. Your troubles are over, however, if you freeze the rubber in a home freezer. It will then be hard enough to be drilled-even turned-without difficulty, and the finished product has the appearance of a molded part.-Burns Hansen, Salt Lake City.


Tissue Holder Stores Emery Strips. Compact storage and easy selection of the grit needed for a job are the chief advantages of mounting rolls of abrasive strips on a toilet-tissue holder. You can pull out and tear off the length you need.

Two-Piece Lock Is Tamperproof. The usual tool-chest lock is easy prey for a heavy screwdriver. This two-piece arrangement cut from 1/2" steel is attached from inside with machine screws. A husky padlock slipped through the mating holes provides real security.G. W. Hall, Brooklyn.


# Why pay move? 

You can install a guaranteed

## KENTILE FLOOR

## like this for only $\$ 27 \mathbf{5 0}^{*}$



A KENTILE FLOOR LIKE THIS COSTS \$9 to \$22 LESS THAN TILE FLOORS OF MANY OTHER MATERIALS... YET KENTILE IS GUARANTEED!


You can't imagine how easy it is to install your own Kentile Floor until you've actually done it. Mix or match your choice of the 25 "lovely-to-livewith" colors. Kentile resists soil and stains. And, after parties or just fam-ily-fun, Kentile is casy to mop clean.

It's casy to keep glistening like now with an occasional no-rub waxing, too. These modern colors can't get dull or wear off . . . they go clear through the rugged, durable tile. That's why more people buy Kentile . . . because Kentile gives more value.

Only KENTILE DEALERS have these money-saving buys in GUARANTEED FLOORS



BLOCK OF WOOD, wedged lightly between chuck and lathe bed acts as brake to eliminate backlash. Indicator must be set at zero on first cut to utilize full $.250^{\prime \prime}$ of stem travel, otherwise it must be reset to finish job.

## Dial Indicator Graduates Collars in Lathe

Even if your lathe has provision for indexing (and many lathes do not), cutting fine graduations on a collar or dial can be a mean job. Here's a setup that skips the indexing and lets a dial indicator relieve you of the eyestrain.

Clamp the dial indicator to the lathe bed and set the lead-screw gears to feed the carriage four threads per inch. This gear train will advance the carriage $1 /{ }^{\prime \prime}\left(.250^{\prime \prime}\right)$ with each revolution of the spindle. The $.250^{\prime \prime}$ of carriage travel can then be accurately indexed with the readings on the dial indicator.

If, for example, you're making a dial for use with an 8 -t.p.i. screw, 125 graduations are needed. As each $.001^{\prime \prime}$ on the indicator is equal to $1 / 250$ of a full spindle turn, cutting a mark at each $.002^{\prime \prime}$ will produce 125 graduations on your homemade collar.

Cut the marks by advancing the compound to move a V-shaped cutter clamped on its side across the surface of the collar. Back it off, rotate the spindle to the next $.002^{\prime \prime}$ and advance the compound for the next cut. Depth of cut is established by the cross-feed. Chalk the work and scribe two light lines to limit the length of the marks; every fifth one made longer. Stamp appropriate numbers over each of the longer graduations.

The most common feed-screw-and-collar combinations are:

Screw 40 t.p.i., collar 25 graduations, used on American micrometer; screw 10


HERE'S A TYPICAL COLLAR cut with dial-indicator indexing setup. Graduations are cut about $.005^{\prime \prime}$ deep and every fifth one is longer. Numbers are stamped beside long marks.


INDICATOR BRACKET is cut from block of red fiber; hardwood or brass could be used. Stem of indicator is clamped in slotted hole running parallel with lathe bed. Dial at right is $11 / 2^{\prime \prime}$ diameter, with 125 graduations.
t.p.i., collar 100 graduations, used on lathe cross-feed and compound; screw 8 t.p.i., collar 125 graduations, used on millingmachine feeds.-Bernard J. Corey, Thorold, Ont.

## Photo Labels Can't Smear

Labels on jugs of photo chemicals won't become messy and illegible if you cut the labels off the cans the chemicals came in and fasten the metal strips around the necks of the jugs.-R. C. Blomberg, St. Paul.

# What every Automobile man should know about 

The fastest-growing innovation in automotive history is Power Steering-and the leader in Power Steering is SAGINAW, world's largest producer of steering gears. Saginaw Power Steering is now available on all General Motors cars and three other well-kniown makes. Nearly 600.000 new cars have been equipped with it-more than all other types combined. So naturally, many people wonder:

## 6. HOW DOES SAGINAW POWER STEERING OPERATE?

Basically, it is simply a highly efficient recirculating Ball Nut Steering Gear with a built-in hydraulic assist. This consists of a pump which delivers oil at 750 pounds per square inch, a reservoir, a double-acting hydraulic cylinder, and an ingenious spool-type control valve, as shown in simplified Diagram 1.
The spool valve, part of the steering shaft, is a grooved cylinder machined to a sliding fit within the grooved valve housing. The spool revolves with the steering shaft, can slide forward or backward about $.060^{\circ}$ and still retain the high-pressure oil. Whenever less than three pounds pull on the steering wheel is needed, the valve remains in "neutral" position, as shown in Diagram 1, and the circulating oil by-passes the power cylinder. No hydraulic force whatever is applied to the steering mechanism, and the car remains completely under manual control.


This assures the "feel of the road" SAFETY ZONE which distinguishes Saginaw Power Steering from ordinary types.
However, as soon as more than three pounds pull is needed, the resistance of the wheels causes the ball-nut and screw assembly to act as a jack. If the turn is to the left, this forces the whole steering shaft. including the valve spool, imperceptibly toward the driver, as shown in Diagram 2. This changes the course of the oil, so it now flows to the front of the power cylinder and forces the piston backward. Power assistance is thus applied to the pitman arm, to help turn the wheels to the left. At the same time, oil pressure on the valve plungers tends to move the steering shaft and spool back to neutral position, which cuts off the flow of oil to the power cylinder.
When the steering wheel is turned to the right, the spool moves slightly away from the driver. The oil flows to the opposite end of the power cylinder and forces the piston to assist in turning the front wheels to the right.
The whole system also acts in reverse to resist any force, such as a blowout, which tends to twist the wheel from the driver's hands. When a road shock is transmitted through the pitman arm, the resulting movement of the valve spool admits oil to the proper side of the power cylinder to counteract the shock. Note, too, that a by-pass valve is provided which opens in case of pump failure, so there is no resistance to manual steering.

IF YOU'D LIKE TO LEARN MORE-we'll be delighted to send you "THE FACTS ABOUT POWER STEERING."


Diagram 1


POMER


NAME
ADDRESS
CITY $\qquad$ ZONE $\qquad$ STATE


The poop rail is cut from $1 / 8_{1 \prime \prime}^{\prime \prime}$ pine and the forecastlehead rail from $3 / 16^{\prime \prime}$ pine. Both are glued on oversize and then sanded down to the proper flare. The poop handrail is a slim strip of rattan cane with beads for posts glued onto straight pins at $3_{4}^{3 \prime \prime}$ intervals.

The keel, stempost and sternpost are $\frac{1 / 8 \prime \prime}{\prime \prime \prime}$

hardwood and are glued on next. The two moldings that encircle the ship at the upper and lower edges of the bulwarks are halfround rattan sanded down to about $1 / 32^{\prime \prime}$ thick after ther are glued on the hull.

Bowsprit and bumpkins. The bowsprit fits into a ${ }^{\prime \prime}$ hole drilled in the bow. The figurehead that goes below it can be a wood carving or simply a wood curl, called a billethead, as shown at left below.

The catheads and
 bumpkins are $\prime_{s \prime \prime}^{\prime \prime}$ square hardwood. Drill holes in the rails for them, file the edges square, and nail the pieces to the deck. Bore $3 / 16^{\prime \prime}$ holes for the hawsepipes, and nail on the rudder, thimning it slightly from肾" at the stempost toward the after edge. Bore the four $3 / 32^{\prime \prime}$ holes in the bulwarks, and glue on the $1_{k \prime \prime}^{\prime \prime}-b y-3 / 16^{\prime \prime}$ channels. The mizzen chamnels are $1_{8 / \prime \prime}^{7 / 1}$ long, the others $2^{1 / 2 "}$.

Painting the hull. Give the decks two coats of sheilac, rubbed down with steel wool and then waxed. The inside of rails, bulwarks and ends of forecastle and poop are white, the hawsepipes red.

Before painting the outside of the hull, drill all holes for masts, bitts, capstan and other deck fittings, and insert deck staples, made of bent pins with their heads cut off.

Prime the hull first with flat white, sand smooth and mark on the water line. Then paint the bottom copper, with a flat gravishgreen stippled or wiped on over it. Above the water line is dull black, with a white bowsurit and figurehead.

Deck fittings. Deck houses, skylights, hatches, companionways and binnacle are all blocks of wood with tops glued on and painted white. Their size and window arrangements are shown on the deck plan.

The wheelbox and top of the binnacle are mahogany. Doors and windows are painted on in reddish brown. Bitts, fife rails, boats and skids are white, windlass bitts white or natural, capstan and galley funnel black. and ladders matural. The rigging for the life-
 boats is shown at left, and the boats are painted white.

The anchors, capstan, brass bell, wheel, tackle blocks and rigging cord can all be bought at hobby shops. The chain used should be 32- or :36-link. mainted black.

Masts and yards. Make the masts of birch or maple and the yards of black walnut or other dark wood, as the Sovereign's yards were black. You can use dowels, sanded to a taper. or shape the pieces as shown in the photos.

The heads of the lower masts and heels of the upper masts are all squared off to fit in the tops, caps and crosstrees that splice the mast sections together. Cut the tops, caps and crosstrees from $1 / 16^{\prime \prime}$ plastic or hardwood veneer, drilling all holes for masts, shrouds, lower-yard trusses, futtocks, halyards and lifts. The delicate caps should be made oversize, then drilled before trimming to final shape.

Starting the rigging. Begin at the bowsprit, mounting tae chain bobstays and shrouds first, then the martingale, as shown on the full rigging plan. The jib-boom guys are black button thread. The head stays are mounted after the foremast is in place. Give the outer end of the jib boom a coat of orange shellac.

You're now ready to set up the masts. Start at the lower masts, gluing them in place, then slip on the tops and fit the topmasts into these. The lower masts are
[Continued on page 234]


If you want him to have America's finest 6" jointer-planer, get him an ATLAS 6001. Greater capacity and accuracy. Solid steel cutter-head-spindle (weighs 10 lbs.) Easily removable for resharpening blades without disturbing blade settings. Grey-iron tables, $42^{\prime \prime}$ overall, precision ground to .005 tolerance. Sealed-for-life ball bearings. Many exclusive superiorities. Also available in $4^{\prime \prime}$ ball bearing and $4^{\prime \prime}$ bronze bearing models. Use coupon for FREE literature and name of nearest franchised ATLAS dealer.

> ATLAS makes machine tools for America's leading industries. This same precision goes into ATLAS woodworking power tools. Your assurance of plus-quality in circular, band and ig saws, drill presses, lathes, sanders, shapers is the ATLAS name. Write for illustrated catalog.

## ATLAS PRESS COMPANY

1225 N. Pitcher St., Kalamazoo, Mich.

## Please send selections I have checked:

## $\square$ Woodworking Power Tool Catalog. FREE

20-PLAN BOOK 50c $\square$ 18-PLAN BOOK 50c ( 65 c outside U.S.A.)

## Name

Address
City and State
"DO-IT-YOURSELF"
WITH THESE LOW-COST, PRACTICAL

## FRE:

CATALOG
WRITE
TODAY

1. 20-PLAN BOOK - original furniture designs by noted authority. 50c
2. 18-PLAN BOOK - outdoor equipment woodworking

PLAN BOOKS projects. 50c

SOLD ONLY THROUGH FRANGHISED ATLAS DEALERS

# Hobbyist's Delight 



Nicholson X.F. Swiss Pattern Needle Files

Greatest little tools for making things fit-work -look the part of expert craftsmanship! Whether it's a mechanical toy, metal decorative piece, clock repair, or model of your inventive brainchild, these ingenious hand instruments are just the thing for taking "bugs" out and putting neatness or operating smoothness in.

Nicholson X.F. (meaning Extra Fine) Swiss Pattern Needle Files come in 12 assorted shapes for performing most any delicate filing operation. They're as accurately made as many of the fine instruments themselves that professionals turn out.

Have you thought about an unusual Christmas gift-for Junior, say, or for yourself? Ask your hardware or industrial supply store for this neat orange-and-black plastic-cased kit.

For very helpful 48-page FREE BOOK, "File Filosophy," write to us.
NICHOLSON FILE CO. 19 Acorn St., Providence 1, R.I. (In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)


## World's Fastest Clipper Ship

 [Continued jram page 232]painted white to the caps, and the topmasts orange shellac from the caps up.

Setting up the shrouds. These are black cord about $1 / 32^{\prime \prime}$ in diameter for the foremast and mainmast and a bit smaller for the mizzenmast. The shrouds are made in pairs. Run a length of cord from below the channels on one side, up through the top and around the mast, then back down on the same side. The next pair goes on the opposite side, and so on until there are three pairs on each side. The ends of these are tightly secured to tiny pins driven into the hull below the channels. The backstays run through the same channels and are fastened to similar pins.

The ratlines that form the footholds for climbing the rigging are No. 50 mercerized cotton, woven in and out across the shrouds and spaced about $\frac{1 / 1 "}{}$ apart. Put a spot of glue at each end shroud to hold the ratlines in place and snip the excess cord off close.

When all lower shrouds are on, slip on the topmast yards, mount the crosstrees and begin rigging the topmast shrouds. These are of slightly lighter cord than the lower shrouds and are threaded on as a single piece. Start at the head of the topmast and run the cord down between the crosstrees, through the first hole in the top, through the hole in the lower mast, up through the hole in the other side of the top, back up to the crosstrees and down again to the second hole in the top, and so on until you have three shrouds on each side of the mast.

Now repeat the process for the topgallant masts, fitting their heels into the crosstrees, slipping on the upper yards and setting up the shrouds in the same way. The spreaders for the backstays are 1 la" needles tied to the stays with their points pushed under the shroud loops on the crosstrees.

Running rigging. These lines are ecru instead of black. Use No. 60 crochet cotton for the lower and topsails, No. 50 thread for the upper yards.

The topsail halyards have a $1 /{ }^{\prime \prime \prime}$ double block at the top and a single one at the bottom with a hook. The following sketch shows how the blocks are rigged. The topgallant halyards are similar except that they have a single block at the top and are anchored to the opposite side of the deck. The royal halyards have a single block at the top and none at the deck staple. The
[Continued on page 236]

# It's easy to finish walls smoothly with Gold Bond Tape Joint Kit! 

Conceal wallboard joints for a better decorating job. Do it yourself !


1. Apply Cement. Smooth flowing channels formed by special tapered edged Gold Bond Gypsum Wallboard permit easy, uniform application.

2. Embed Tape. Gold Bond Perforated Tape combined with joint cement binds panels together...adds strength to finished wall.

3. Sand Smooth. Gold Bond Joint Cement dries quickly and evenly... needs only light pressure to level smoothly with wall.

4. Ready to Decorate. Seamless walls provide a "perfect" decorating job with either paint, wallpaper or textured finish.


Whether you're remodeling or building, the best way to get smooth, handsome new interior walls is to make the job $100 \%$ Gold Bond! Use sturdy, fireproof panels of Gold Bond Gypsum Wallboard. Finish joints and nailheads with the Gold Bond Tape Joint Kit... available in small, regular and large size packages at your local Gold Bond dealer.

NATIONAL GYPSUM COMPANY - BUFFALO 2, N. Y.
Fireproof Wallboards, Decorative Insulation Boards, Lath, Plaster, Lime, Sheathing, Roofing, Siding, Wall Paint, Textures, Rock Wool Insulation, Metal Lath and Sound Control Products.

## MAIL THIS COUPON TODAY!

NATIONAL GYPSUM COMPANY, Dept. PS-123; Buffalo 2; N. Y.
Please send me a free copy of Gypsum Wallboard
Application Instruction Folder.

Name
Address
City
Zone
State


WITH

## DISPOSABLE FUEL TANK

Here is a really fine tool of exceptional quality ... one that you'll find handy, clean, ready and easy to use for soldering, light brazing, hobbycraft work, dozens of do-ityourself jobs around the house! Never requires filling . . . you just replace entire fuel tank (they're available at your dealer) as needed. Has all-brass burner and fittings, I.C.C. approved heavy-gauge largediameter tank, pressure relief valve, wide-range positive-control flame adjustment. Tank measures 2-7/8" diameter x 9.9/16" high; fits conveniently in tool box or pocket. Tell your favorite Santa Claus now - that you want this Turner LP Torch. Remember, too, it's a wonderful gift item for you to give a friend. Visit your dealer today ...
LOOK...SPECIAL ACCESSORIES, TOO


THE TURNER BRASS WORKS

skysail halyards have no blocks at all and come directly to staples in the bulwarks.

The lifts, used to keep the yards level, run from holes in the ends of each yard to the mast. The upper ones go directly to the mast, while the topsail lifts run over the lower cap.

Rigging the braces. These are the tackle that turn the
 sails to catch the wind. The lower braces run from the yards to points on the bulwarks or fife rail, as shown below. The other braces run through blocks on the masts before reaching the deck and are shown in dotted lines on the rigging plan. All braces have $7 / 8^{\prime \prime}$ single blocks, and the lower braces have $2^{\prime \prime}$-long chain pendants leading from the yards.

The spanker-boom sheets and topping lifts have two single blocks each. The lower sheet blocks are fastened to staples in the deck and the topping-lift blocks to the after

edge of the mizzen top. The throat halyards have two single blocks, the peak halyard a double block on the cap and a single one on the gaff.

Lash your anchors to your bows, hoist your colors, and your completed Sovereign is ready to set sail.

END

D. C. GENERATORS ITEM \#91 rated $\quad 300$
Amps.
volts. Mfd.
 Costs380.00. Shpg. wt. 55 lbs . Dimensions $16^{\prime \prime} \mathrm{x}$ Chicago
35.00

Item \#90-Type P-1, rated 200 Amps. -28 Volts. 2500 RPM. Mfd. by General Electric, Ford, DelcoRemy and westinghouse. Gov't. Acq. Cost
lbs. Dimensions $15 " \times 9^{\prime \prime}$
x6". 22.50

## CENIRIFUGAL PUMP

## Brand

 Bew ALLISON200 GALIONS per minute

- For Draining Basements Fire Irigation Fuel Transfer Pools Simming water Systems - Dowatering For high volume commercial ard and industriad inlet, twin $11 / 4^{\prime \prime}$ pipe thread outlets. Ball bearing supported $3 / 1^{\prime \prime}$ shaft. clockwise facing shaft. Gov't. acq. cost $\$ 145.00$. Complete with full instructions. Ship. wt. Chicago
Will deliver 200 gals. per min. against 63 foot head using 5.2 H.P. at 3500 R.P.M


## EXTRA HEAVY DUTY DOUBLE ACTION HYDRAULIC CYLINDER

## No

 Item $=224.31 / 4^{\prime \prime}$ bore, $24^{\prime \prime}$ stroke, wine pressure. $1 / 2^{\prime \prime}$ pipe thread ports line pressure. $1 / g^{\prime \prime}$ pipe thread ports$-13 / /^{\prime \prime}$ stress-proof ground, polished \& plated solld steel shaft. Overall length closed $36^{\prime \prime}$. $1 / 4^{\prime \prime}$ steel wall cylinder barrel clevis mounting at base and shaft. Features-Tie Rod

construction. Honed barrel. Ship. | wt. 50 lbs. |
| :--- |
| F. B. Chicago . . . . . |
| 9.60 |

 $\$ 250.00$ VALUE 350 WATT A. C. (PORTABLE ELECTRIC LIGHT PLANT,
Compact Electric Plant suited for small homes, cabins, campers, hunting and fishing camps, trailers costs: About 5e per hour. Runs exceedingly quiet. Sturdily constructed for dependable service. Net weight only 88 lbs . Can be carried from place to
place, or transported in place, or trank of car.
trunk
350 Watt- 110 Volt- $60 \mathrm{Cy}-\{$ cle-A.C. Model-M.S. 35-3. Made by Midco Mfg. Co. ${ }^{1}$ complete with muffier, starting rope and oil bath air 350 Watt Generator with voltage control rheostat and twin outlets. Engine speed 1800 R.P.M. COMMERCIAL LIST PRICE $\$ 250: 00$
NOW ONLY NOW ONLY

PORTABLE POWER CABLES
Manufactured By General Electric \& Western Electric item $=193$ -
power tools, battery chargers, eqectric generator sets, search lights flexible jumpers and general power supply. Individually Neoprene covered flexible
Neoprene covered flexible-2 conductor. $1 / 0$ wire size. Each cable is 75 feet long, and equipped with 1 -male and 1 -female Hubbell
plug. Conforms to requirements of Flug. Conforms to requirements of Mines and
I.P.C.E.A. specifications.
Regular price $\$ 135.00$
Per 75 feet .50 Chicago

ELECTRIC POWER
For Your Home or Farm Ample current for both 10 volt ap-
pliances such as oil burners, refrip erators, deep treeze, lights and 220
 Edison ${ }^{\text {3-wire circuits. }}$
7.5 . A.C.-Single Phase. Master Electric
Company kenerator powered by cylinder air cooled. Wisconsin a v.4
zas engine. magneto ignition. crank start. $19.5 \mathrm{HP} @ 1800$ R.P.M. Con
tra
Formerly $\$ 895.00$
SLAS:IED TO ht 825 lbs .


 USE FOR: R Reamer Drives : Midget Cars Feed Milis © Cathes - Milling Machines - Motor Boats - Cream Separators Garden Tractors OUTPUT Pumps
SHAFT from of to input speeds from 0 to input speed
available by moving con available by moving con-
trol handte. Locking handle maintains setting. Use input
power of $1 / 4$ to $11 / 2$ H.P. This power of $1 / 4$ to $11 / 2$ H.P. This
Westinghouse.On Gear Unit consists of a variable displacement
hydraulic pump feeding a fixed displacement pump feeding
Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent re-
verse control allows full output power and speed selection in elther direction of rotation. Shafts measure $\mathrm{s}^{\circ} \mathrm{s}^{\prime \prime}$ diam.. Include keyway. Input rotation is counter-clockwise facing shaft. Rec-
ommended input speed not to exceed 750 R.P.M. Over-all dimens. wt. $31^{1 / 2} \mathrm{bs}$, Cimple Shpg. wt. 31 lbs. Complete with 2 qts. of oil and 54.50
full instructions. F.O.B. Chicago.

ITEM \# 160
shaft. Guaranteed
Ship. wt


TO PRACE PAO
D.C. ARC WELDER NEW MODEL 353


Welds Anything From Auto Fenders To Tractor Frames

- Dial Type Rheostat Control
${ }^{-}$Use $1 / 16^{\prime \prime}$ to $1 / 4^{\prime \prime}$ Rod
- Generator-type Welder
- Reactor Coil for Smooth Even Arc Use $71 / 2$ H.P. Electric Motor or 10 H.P. Gasoline Engine
- Run at 2500 R.P.M.
- Available with Either Flat Belt or Double V Pulley
- Complete Operating Instructions Shlpping wt. $107 \mathrm{lbs} . \$ 350.00$ Value. Standard Model F.o.B, Chicago

99.50 Deluxe Model-with ' Magle Terml| nal, for low amperage range weld- |
| :--- |
| ing. (Between $30-100 \quad 119.50$ | amps.) F.O.B.Chicago 119.50

## FOUR-WAY, OPEN CENTER CONTROL VALVE

## Fith built-in adjustable relief valve.

 Factory set at 1000 P.S.I., spring loadednentral position, for use with one double acting cylinder. In
neutral position neutral position cylin-
der is locked and der is locked and
pump unloaded. Fully balanced plunger type.
bmean smooth, positive, easy
operation Can be operation. Can be used
as singie unit or
mount as single unit or
mounted in series of
any combinations any combinations de-
sired. Has $3 / 4^{\prime \prime}$ pipe thread inlet and ooutlet. $1 / 2^{\prime \prime}$ pipe thread
 manufactured to our specifications. Ship. wt. $81 / 4{ }^{\text {1bs. An outstanding }} \mathbf{2 1 . 5 0}$
buy! F.o.B. Chicago........ Brand New-DOUBLE ACTION HYDRAULIC CYLINDER ITEM $=355-21 / 2^{\prime \prime}$ bore and $71,2^{\prime \prime}$ stroke.
$11 / 2^{\prime \prime}$ stainless steet piston rod Lift ca1/2 stainness steel piston rod, Lift ca-
pacity 5000 lbs. using 1000 ibs. pump
presure pressure. Manufactured hy Delco-Remy
Division of General Motors Corporation Clevis mounting on base and piston rod for $7 / 16^{\prime \prime}$ bolt. Overall length closed 21 ". Distance between centers $19^{" \prime}$. Sunplied
with fittings to $3 \kappa^{\prime \prime}$ pipe hread. Brand
riginal carton
16.00

## ITEM

Same unit, but Same unit, but
supplied with built in spring to provide
ushion effect on power f.o.b. Chicago 17.00 CONTINENTAL "RED SEAL" 11/2 H.P. ENGINE
garden tractors, pumps, generators, com: garden tractors, pumps, gencrators, com-
pressors,
tillers,
rakes, plows, feed
minls, miling
machines and


## MILLING ATTACHMENTS

 BENCH DRILL PRESS VISE


ORDER NOW! SEND COUPON TODAY!

## CHICAGO TOOL \& ENGINEERING CO., <br> 8336 South Chicago Ave., Chicago 17, III.

Enclosed find for items checked below. $\square$ PALMGREN "Hobb-E" ANGLE VISE. $\square$ PALMGREN "Hobb-E" ANGLE PLATE ROTARY PABLE PALMGREN "Hobb-E' ROTARY TABLE. $\square$ PALMGREN MILLING ATTACHMENT $\square$ PALMGREN "Hobb-E" BENCH DRILL PRESS VISE. Send Circular No. 201 S

NAME
ADDRESS
rown
ZONE
STATE

## Gus Rides with Santa Claus

[Gontinued from page 180]
had been rubbing for a long time against the main battery lead to the starter button. Finally, under Knute's heavy braking, it had been worn through to the bare copper, producing a dead short.

The battery might or might not be capable of taking and holding a charge now. The plates might be too buckled for service. Gus taped the wire, shoved it clear of the brake-pedal arm.

## Gus Chews on the Problem

He straightened, fumbled out his pipe with fingers that were stiff with cold, absentmindedly poured in tobacco that was swept away by the wind, while his mind chewed on the problem. The truck would run on the generator if they could get it rolling fast enough for a husky charge. But the vehicle sat at the bottom of a steep grade, facing a steep upgrade.
"Here," Knute's voice came out of the blackness of the night, "I have a better light than your little one, Gus."

A broad beam emanated from Knute's hands as he spoke, and Gus saw that he had one of those camp lights that are powered with two telephone batteries. Hmm, thought Gus, here were four volts. Would a six-volt ignition system start an engine on four? A car battery with one dead cell would start an engine if it was cranked by hand, even when too weak to turn the starter.

Quickly Gus stripped wire from the taillight lead and tied the two telephone batteries into the primary ignition circuit, while Knute held the pencil light on the work.
"Now, Knute," he said, "we'll turn her over."

## Knute's Crank Is 100 Miles Away

"By yimminy, Gus," Knute said sadly, "I ain't got no crank. Feller next door borrows my crank and my yack-he goes for yuletide a hundred mile." And as if in explanation of the loan, he added, "What poor, raggedy tires that feller had."
"Oh, Lord," Gus groaned. To himself he muttered, "Better start carrying holly, Knute."

Knute's thin, weather-seamed features were centered in the beam of Gus's pencil light. Looking into the faded, blue eyes,
[Continued on page 240]

## She'll love this "YOURS and HERS" wardrobe $\angle$

## It's easy to make with NOVOPLY ${ }^{\circ}$

Handsome . . . functional . . . yet all materials cost less than $1 / 2$ price of ready-made Cabinet. This rich looking wardrobe made of California Redwood Novoply is the modern way to keep clothes neat. Has loads of hanger space behind sliding door, pull-out tie rack and 5 see-in drawers. Send for Easi-Bild* Pattern No. 139 (\$.60) which lists materials needed. Simplified step-by-step directions for cutting and assembling. Build It Yourself Patterns take the mystery out of building.

## *t. m. reg. easi-bild pattern co. <br>  <br> Novoply by Weldwood <br> UNITED STATES PLYWOOD CORPORATION

World's Largest Plywood Organization Weldwood Building, 55 West 44th St., New York 36, N.Y. U. S.-MENGEL PLYWOODS, INC.

Louisville, Ky.


## United States Plywood Corporation <br> PS-12-53 Pattern Department, P.O. Box 215 Pleasantville, New York

Enclosed please find 60 dor pattern No. 139.
Enclosed please find 35 dor 32 -page pattern catalog illustrating over 200 different projects.

NAME.
ADDRESS
CITY .STATE.

## Keeping a gouge sharp

## is easy...

with a

## NORTON INDIA Gouge Slip

The gouge has a curved edge and requires a stone formed to fit the curve. Rotate the gouge from side to side as illustrated. Then turn the stone over and using the narrow end give the inside of the gouge a few deburring strokes, keeping the inside face flat on the stone. Get FS-76 at your hardware store or direct, $\$ 2.25$.
Are the rest of your tools sharp? If not, send 10\& for the "How to Sharpen" Book to Behr-Manning Corp., Troy, N. Y., Dept. PS-12. C-6


This is a Syncro Electric Jig Saw It's a Complete Unit in Itself. You can carry it home under your arm, set it on a table or workbench, plug it in, and proceed to work on it.

Now this blade gives you 14,400 emonth swekes per minute, just about 5 times as fast as the ordinary jig saw blade. It is especially well suited to delicate fret saw work and it always cuts that smooth edge that requires no sanding. This last feature alone will save you many hours of time which you would ordinarily spend sanding such things as what-not shelves, magazine racks, fern stands and the many other things that you will like to make.
You will find that all the forests of the world are right at your elbow to provide you with rare and beautiful materials for your handicraft. But even with that. you are not limited to wood. Plastic materials are now appearing in a large varicty of colot's


For instance, catalin, a molded plastic. It is comparatively easy to work on this jig saw and takes a beautiful polish. Not quite so easy to work. nowever, as bakelite. Bakelite, for a cast plastic, is hard and brittle and the ordinary saw cuts kind of a splintered or split edge on it. But the high speed and the fine teetli in these Syncro blades always insure a clean cut. You will find that these various plastic materials are particularly nice for working out such things as monogram pins, belt buckles, picture frames and wall lamps.
Now comes the best news of all. Parents especially are glad to know that here is a power jig saw that is safe also for boys and girls to use. Accidental injuries on this machine. even the slightest cuts, are very rare. Serious injuries are impossible. Now that may seem strange to you but the reason is very simple ..., the Syncro blade does not "pull" the "work" or finger towards it as belt-
 driven jig saw blades do.


If you happen to have seen a Boy Scout Troop doing handicraft metal work. you will always find a jig saw one of their main tools. Perhaps you have various ideas that you would like to work out in metal: a name plate out of aluminum, a shadow lamp out of copper, or book ends out of brass. You can do all these things on this same machine using the same one blade to cut all those different types of metal, as well as wood, cardboard. ete And remember that you can do all these things without a great deal of expensive equipment. Actually with only one machine-one jig saw and one blade-one saw you can carry home under your arm, plug it in and
 go to work on it.
 It comes complete with 6 blades and there is nothing else to buy. No belt, no pulley, no motor, or anything else. It is all complete (including built-in motor) in this one unit. The built-in power unit is also guaranteed against burn-out all during your ownership or is replaced free. Syncro is a precision-built. UL-Approved, durable tool, and will last a lifetime. Syncro electrical precision products have been made for 30 years. Your hardware dealer should have one on display.
However, if he is out of stock or no store is near you, send only $\$ 24.95$ direct to Syncro Corporation. Dept. G-123, Oxford, Michigan, and your Syncro Jig Saw No. 201 will be shipped to you postpaid. Use it 10 days, then if it does not please you $100^{\circ} \%$ return saw postpaid to Syncro and your money will be promptly refunded. Or send postcard for Free Circular of Syncro Saw and Syncro Sanders.

## Gus Rides with Santa Claus [Continued from page 238]

Gus saw a mans faith in him die. Knute Hansen had never expected to see a stalled vehicle that Gus Wilson couldn't start.

The wind was howling now. Snow stung their faces. Gus's tiny light was reflected from the blade of an axe, thrust in the side of the pickup, beside the holly.
"Wait, Knute," he cried. "You've got an axe and you're handier with it than a grease monkey."
"By yimminy, Gus," Knute complained, "you been running a yoke on old Knute. I know all along you start my truck easy."

It wasn't easy. It was hard, cold work, up there among the snow-laden trees in the darkness, cutting down a tree that Gus had selected and trimming it of branches. Together they got it down to the pickup truck. Using the tree trunk as a pry, they finally managed to hoist a rear wheel.

## Gus Turns the Motor Over

With the motor in gear, Knute in the cab manipulating gas and choke, Gus turned the engine over by spinning the wheel. Gus was cold. His hands were half frozen. Would those four volts be enough?

Never in his life before had the sound of a starting, sputtering engine sounded so good to Gus. He catapulted into the cab, shoving Knute aside. He slapped the truck out of gear, keeping the engine turning over fast enough to throw a full output on the generator. They sat there a long time, while the heater brought them warmth. Then the truck started crawling through the snow, over the mountain.

When, at long last, they drove down the short, single street of Highland, it seemed to Gus that every door in the town burst open in greeting. Folks gathered about the trlack, heedless of the storm, women with sr ow-sprinkled shawls about their heads, b arded men grinning.
"Merry Christmas, Knute!" they chorused. A id it seemed to Gus that the time-honored g eeting took on a new and deeper meaning.

END

## On Their Own

gang of road repairmen had forgotten their ovels and phoned their foreman.
He replied: "I'll send the shovels out on ano her truck. Just lean on each other until they gt there."-Fircman's Fund Record.

## Tell her you want

## MILLERS FALLS TOOLS

Cuts most anything - most anywhere. Steel, wood, plastics, BX, etc. No. 725 "Nest of Saws". \$ $\$ 2.95$
for Christmas

Clean-cutting and beautifully
balanced planes.

$\begin{array}{ll}\text { No. } 9 \text { Smooth Plane ( } \mathbf{c}^{\prime \prime} \text { ) } & \$ 8.25 \\ \text { No. } 14 \text { Jack Plane ( } 14^{\prime \prime} \text { ) } & \$ 9.00\end{array}$ $\begin{array}{ll}\text { No. } 14 \text { Jack Plane (14") } & \mathbf{\$ 9 . 0 0} \\ \text { No. } 75 \text { Block Plane } & \$ 3.00\end{array}$


Sand and polish with any $1 / 4$ " electric drill. No. 2120 Buffing and Sanding Attachment with 5" rubber pad, 5" lamb's wool bonnet and two 5" sanding discs.

## 0

Power-full help on countless jobs. Drills, sands, grinds, polishes, buffs, efc. No. 1814 1/4" Electric Drill. $\$ 22.35$
 to work in corners, Makes it easy corners, between studs, in ord-fo-get-at places. No. 2130 . $\$ 4.95$

No. 106 Carving Tool Sef. 6 razorkeen tools in most useful cutting shapes.
$\$ 4.80$

## MILLERS FALLS

 TDOLS SINCE 1868The eNark of ehperiontity

MILLERS FALLS COMPANY, Greenfield, Mass.


In gift-wrap boxes dealer's
at your hardware deal at any angle. Jaws open to $21 /{ }^{\prime \prime}$. Clamps to benches up to $2^{\prime \prime}$ thick. No. 18 Swival hick.
Vise.


## Babco 5-to-1 Speed Reducer Fits $1 / 4^{\prime \prime}$ Drills

Convert your $1 / 4^{\prime \prime}$ electric drill to electric screwdriverdrill holes to $11 / 4^{\prime \prime}$ in wood, $1 / 2^{\prime \prime}$ in masonry. Planetary gear system gives tremendous torque increase. Adapters furnished to use $1 / 4^{\prime \prime}$ or $1 / 2^{\prime \prime}$ chuck. Instant starting, stopping with hand clutch control. To operate tool grip reducer, release to stop. $\$ 9.95 \mathrm{ppd}$.


Babco Right Angle Drive for $1 / 4^{\prime \prime}$ Drills
Close coupled, fits on drill spindle. Remove chuck, attach to angle drive. Twice drill speed for sanding or half for polishing. Easy to drill in close spaces. $\$ 4.95$ ppd. Heavyduty angle drive for $1 / 2^{\prime \prime}$ elec. drills $\$ 19.95 \mathrm{ppd}$. At hdw. stores and tool dealers or from Babcock Mitg. Co., 6259 Claremont Ave., Oakland 18, California.


5 BIG POWER TOOLS IN ONE FACTORY TO YOU \$79.95
Only SUPERSHOP can offer you a complete precision-built workshop for $\$ 16$ per tool. $100 \%$ Ball Bearing. Lifetime accuracy. Rugged frame of heavy steel tubing. Handles big jobs. 8" saw. Sold direct from factory to save you $\$ 65.05$. FREE trial. Easy pay plan. Free Catalog.


Write for free Catalog


## Quit driving an oil-burnerget new piston rings !

Oil pumping is just the start of expense and troublethe first danger signal from worn-out piston rings. The longer you let those old rings stay in, the more oil you'll use, the more power you'll lose, and the bigger your repair bill will be!

As your engine gets older, it runs hotter because of accumulations in the cooling system. The cylinders wear tapered and out-of-round-need more oil on the walls.
It requires a special type of piston rings-replacement rings-to deliver this extra oil, under full control, without waste.

Hastings makes replacement rings exclusively, devotes all its research on the highways and in the laboratory, to the particular replacement problems of each make and type of engine.
That's why Hastings Rings stop oil-pumping, check cylinder wear, restore engine performance-in re-ring, re-bore and re-sleeve installations.

So go to your motor specialist at the first sign of oil-pumping or performance drop-off. If rings are the trouble, ask him to install a Hastings Steel-Vent replacement set. Truly the best money you can spend on your car! Hastings Manufacturing Company, Hastings, Michigan; Hastings Ltd., Toronto; Piston Rings, Spark Plugs, Oil Filters, Casite, Drout.

## HASTINGS

steel-vent piston rings

## Regular or Chrome

## Fastest Freight Train

## [Continued from page 143]

Argentine's icer is the mightiest of them all. It is a giant called "Rube Goldberg" by Santa Fe employees. It runs on its own ground-level tracks, takes orders by wireless radio and radio-telephone signals sent through its main power lines, and can ice an empty 65-car train in as many minutes.

Its armlike chutes have already started gesturing over our dusty steel cars. High up on the machine's control platform, its operator presses a button and turns a pointer. Ice by the ton crashes down into the first car's head bunker.

The wheel crew is also hard at work, and soon a black-and-white switcher growls in and starts rearranging 62.

The one reefer bound for St. Louis has to be set out and shunted over to the Wabash line. Since it is 11 cars up from the caboose, that means a little maneuvering. But that's all right, because the entire train has to be taken apart and re-formed for delivery into Chicago. The 19 cars to be taken over by Indiana Harbor Belt and delivered to the various eastern railroads must be at the rear of the train. The four others, bound for Chicago, will be immediately behind the engine.

## Cars Rearranged in Seven Moves

In seven switches, the little yard engine has the job done. Meanwhile our new power has rolled up. Its 4,400horsepower combination revs up, sings a little and moves in reverse to pick up its work for the night.

In a few minutes we're on the Kansas City Terminal right of way. We gain a little speed, clack and rattle across the maze of switches and frogs behind Union Terminal. The station's main control tower has cleared us across its boards of winking colored lights.

At 5:35 the next morning, the Mississippi, gray and cold, slides under us. Only the prairies and long hills of Illinois lie between us and our destination. We hit 60 and stay there.
[Continued on page 244]

## CAREFREE LIVING?

## sure is - in our <br> Mew Mlaon



From its plane stress chassis to its weathertight roof, a New Moon home is tops in built-in comfort. Its thick blanket of insulation, the piano hinges on its doors, the triple trapped enclosed plumbing, its custom cabinet work with mortise and tennoned joining - these are but a few of the many features that make living in a New Moon "carefree." Write for your copy of "Adventures In Living" and learn other advantages.


## New Moon Homes, One.

## FORMERLY REDMAN TRAILER CO., ALMA 38, MICHIGAN

SELECTED AS AMERICA'S OUTSTANDING MOBILE APARTMENT HOME to be featured in

Starring
Stars of Philip Morris Hit TV Show "I LOVE LUCY"

LUCILLE BALL AND DESI ARNAZ In "THE LONG, LONG TRAILER"

M-G-M's
New Technicolor Hit! (TO BE RELEASED SOON)


## The World's Most USEFUL Hand Tool!

$\sum$
What a budget-priced MAN'S gift - the handiest tool he can own! A squeeze of the hand locks jaws onto work with Ton-Grip! Won't slip. Bends, pulls, turns, twists, ratchets, HOLDS. A whole tool kit in one trim tool! $7^{\prime \prime}$ and $10^{\prime \prime}$, with or without cutter, only $\$ 1.85$ to $\$ 2.60$, at your hardware dealer

FREE "HANDYMAN'S GUIDE"-Write for this handy, fully-illustrated guide to easier, faster fixin'.

PETERSEN MFG. CO., Dept. P-12, DeWitt, Nebr.

For work-free masonry drilling


## Even drills concrete like wood!

Now . . . rotary drill any masonry in your home with ease! New Carboloy "Live-Spiral" Masonry Drills bite cleanly through brick, slate, tile, concrete or cast stone. Won't stick, stall, bind.

Super-hard carbide tip gives extra-long use. Lets you drill holes at any angle .... to bolt down washer, dryer, tubs . . . fasten hooks, screens, awnings, trellises . . . attach bath, kitchen fixtures, partitions, furring strips, etc.

Get "Handy-Man" Kit today. Contains 3 "Live-Spiral" Drills; $1 / 4$ ", $3 / \mathbf{a}^{\prime \prime}$, $1 / 2$ ". Fit $1 / 4$ " chucks. $\$ 6.65$ per kit. Send coupon, or see your hardware dealer.
"Carboloy"' and " $\dot{\text { Live-Spiral' }}$, are registered trademarks of




## WeEk-End DECORATORS!



Why try to paint over a cracked, checked or broken finish . . . when it's so easy to "peel it off" with Klean-Strip? This modern remover leaves the surface clean, smooth and dry - ready for a better, longerlasting paint job. Non-inflammable Klean-Strip works fast on all type finishes. Needs no afterwash or neutralizing . . . saves labor and materials. Buy it when and where you buy paint.

Made by The Klean-Strip Co., Inc. 2340 S. Lauderdale, Memphis 6, Tenn. KLEAN-STRIP TAKES OFF ANY FINISH

## Fastest Freight Train

[Continued from page 242]
But then something is unexpectedly moving. Like a small sun, far behind us, an amber disk seems to be jerking around the bends we've already passed. Then on a long straightaway it grows larger.

Our conductor says it's the Chief, famed Santa Fe streamliner, and in a moment it leaps past us, going at least 90 miles an hour. It will beat us into Chicago by an hour and a half.

Automatic Train Control is now helping run 62. Above and to the left of the engineer's head, with a glass window facing him, is a metal box about a foot high and three inches square. One just like it faces the fireman. This is the ATC signal, and it gives primary control of trains not to their engineers but to the ATC system.

## Gives Speed Warnings

When an engineer is rolling his train along, he may have nothing but green semaphores ahead, but if he should inch over the speed limit that ATC is set for, he will get red boards, colored warning symbols on the ATC signal, and blasts from a warning whistle in the cab.

From here on in, we get a whole series of warning signals and keep having to damper our speed.
"Something ahead's sure poking along," grumbles the engineer.

Santa Fe could bring this train through several hours faster, but they leave plenty of slack toward the end because emergencies and delays like these frequently crop up.

Soon, though, we are able to slow for good, wheels grinding as we enter the long Chicago yards on a bright Sunday at noon, $2,195.6$ miles from our starting point.

END

## Perfect Record

"How many successful parachute jumps does a man have to make before he graduates?" asked the recruit.
"All of 'em," the sergeant replied.-The Wyatt Way!.


## 

SO CONVENIENT IN HOME, SHOP, OFFICE
 ALL METAL

 | 16 drawers |
| :--- | :--- |
| $(48$ compartments $)$ |
| $73 / 4.2123$ |



Drawers - $11 / 4$ in. $\times 23 / 4$ in. $\times 5 / / 8$ in.
Just the cabinet to store those hundreds of small items such as nails, screws, nuts, stamps, hobby needs, fishing lures and flies, assembly components, etc. Ideal for gifts, too. Gray baked enamel finish, welded steel, aluminum drawers, rubber feet. Shipped postage prepaid-32 drawer unit, $\$ 9.95$; 16 drawer unit, $\$ 5.95$. Satisfaction or your money back. Add 3\% sales tax for Ohio orders. Checks or money orders-no C. O. D.'s, please.
manuacture PERKINS PRODUCTS, INC.
170 E. MARKET STREET
ALLIANCE, OHIO



## You Can Depend on This



To give your car CARTER dependability, see your nearby CARTER dealer. His address is listed in the yellow pages of your phone book.

[^9]
## Games Disclose Secrets of Success <br> [Continued from page 128]

have heard to the contrary, top-ranking mathematicians say that there is no system that can safely be applied to any of the games of pure chance.

But where skill also is involved, the sort of calculation that students of the subject have worked out produces solutions to problems like this:
Two men have agreed to fight a duel with revolvers; each is to have three shots. They are to stand 100 paces apart and at a signal start walking toward each other. Each man can start firing whenever he pleases. The problem for you, if you were one of these duelists, is: how far shall I walk before I start shooting? If you start too soon, your bullets are likely to go wild. If you start too late, your opponent may have shot you before you have pulled the trigger.

Students of the science of games are able to answer this question, provided they know how good is the marksmanship of each duelist.

## Jet Fighters Get Electronic Advice

This may seem like a waste of time, since not many people fight duels any longer. But in fact it has great and immediate importance. American jet fighters now approach the enemy in the sky at about the speed of sound, which means that the two planes come toward each other at approximately 1,400 miles an hour. The question when to start shooting is a life-and-death matter. Since at such speeds the human brain can hardly arrive at the proper decision, calculations of the Von Neumann type are fed into an electronic computer in the plane, which comes up with approximately the right answer in a fraction of a second.

END

## As the Twig Is Bent

Children are
What parents mold them;
Small wonder then
That parents scold them.
-The Right Hand.


## KING MIDGET AUTO

Operate it for 75 c per week. Amazing performance. Surprising com fort. All steel construction. Ready to run or assemble it yourself with our bolt together parts. Rider Agents wanted. Send 25 f for detalled literature or $\$ 1$ (refunded first order) for actual assembly book MIDGET MOTORS MFG. CO., ATHENS, OHIO


Model 6-12P
$\$ 16.50$ Poospaid
QUICK
pay postage.
. $\$ 16.50$ Postpaid 13 Riverside Corning, N.Y.

## Easier Metal Repairs

FREE Illustrated Booklet, "Soldering Simplified." 16 pages of how-to-do-it! Get your copy.


Kester
Solder Company
4254 Wrightwood Avenue, Chicago 39, Illinois

# these Startett Tools BELONG IN EVERY KIT 

Starrett gives you perfect design and finish plus exclusive features you just don't find in other makes. Buy the best - buy Starrett.


## STARRETT SCRIBERS

## ©8

No. 70 Pocket type with reversible point, non-roll hex head.

## No. 800 NAIL SETS

Easy to hold, easy to hit, won't roll. Five point sizes from $1 / 32$ to $5 / 32^{\prime \prime}$.


## DRIVE PIN PUNCHES

No. 248 Extra long for deep holes. Five sizes from $1 / 8$ to $3 / 8^{\prime \prime}$. Short types for heavy work.

SEND FOR IT - ONLY $10 \$$ Starrett "Tools and Rules" Book 50 page booklet shows the right tools for any precision measuring job. 100 pictures plus helpful reference tables. Send only one dime. Address Dept. PS.


THE L. S. STARRETT COMPANY•ATHOL. MASS., U.S.A.

mechanics' hand measuring tools and precision instruments dIal indicators - SteEl tapes - precision ground flat stock HACKSAWS, BAND SAWS and BAND KNIVES


"Suburban" Set No. 981Knotty pine chest holds 34 toolsfor handyman or hobbyist. $\mathbf{\$ 9 9 . 5 0}$. Other chests and sets from \$25.75.
stand to ple signed to please experts, yet are priced for the handyman. Only a few of the wide selection are shown here.


THE TOOL BOX OF THE WORLD

HARDWARE EECCTRIC TOOLS STEEL STRAPPING
STEEL

## Infrared Rays Clarify Bible Texts [Continued from page 90]

against Rome, and the date of that revolt was 132-135 A.D.

By far the richest find, however, was made by the Bedouins in a cave not more than half a mile away from the one they stumbled upon in 1947. American scholars are inclined to agree with Harding that this find is more important than even the spectacular one of six years ago, even though the manuscripts are not nearly so well preserved.

## Scrolls Contain Old Testament Books

For one thing, the new cave has given up many more scrolls or parts of scrolls. So far at least 70 have been identifiedamong them the Old Testament books of Genesis, Exodus, Leviticus, Numbers, Deuteronomy, Joshua, Ruth, Samuel, Kings, Psalms, Ecclesiastes, Song of Songs, Isaiah, Jeremiah, Lamentations and Ezekiel.

Some of these look older than even the famed Isaiah scroll from the first cave: they may carry us back to the third century B.C., whereas most of the Hebrew texts we now use go back only to about 900 A.D.

This doesn't mean that the new finds are likely to require any great changes in the Bible. In fact, there is every reason to believe that the text of the Old Testament has been handed down, century after century, with amazing accuracy.

## Ancient Version Agrees with Modern

For example, the Isaiah scroll from the first cave is a thousand years older than the Hebrew text commonly used, yet the scholars responsible for the Revised Standard Version of the Bible, published last year, found that it was more accurate at only a dozen points, all of them minor. Nevertheless, the only Hebrew texts we have had up to now do contain a number of obscure passages whose meaning translators have had to guess at. Study of the older texts may clarify these points.
[Continued on page 250]


| SURPLUS SALE <br> $\$ 39.50$ NEGULAR PRRICE SR125.00 1-6 H. P. MOTOR TAKES WHEELS UP TO $1 / 2^{\prime \prime} 4^{\prime \prime}$ <br> EXTEA OUIL EXTEMAL O IWTEANAL SMOSC <br> MOMEY BACK gUAEAMTEE <br> EDFARD J. NOLAN, PULASXI, NEW YORK |
| :---: |
|  |  |

LOOKING FOR THE BEST PLIER TO BUY?
GET


CHAMPION DeARMENT TOOL CO., MEADVILLE, PA.


SO EASY: With this new filing jig and jointer anyone can now sharpen finished and EXACTLY SAME HEIGHT hardened steel rollers teeth are and smooth. Jig and instructions $\mathbf{\$ 2 . 9 5}$ postpaid. Free ifterature.


SHARPEN YOUR CIRCULAR SAWS
The RIGHT WAY on your own saw table, Sharpens rip, cutor, hollow ground and combination blades- $6^{\prime \prime}$ to $10^{\prime \prime}$. Saws stay ound with correct bevel. Precision made, easy to use. GUARANTEED. Only $\$ 8.95$.
Includes $\$ 3.00$ Grinding wheel. Includes S3,00, Grinding wheel sets teeth at $10^{\circ}$ saw set automatically or more $\$ 2.95$.
or
AT DEALERS
OR POSTPAID
A. D. McBURNEY, 5908 Hollywood Blvd., Hollywood 28, Cal., Dept. S-36

SELF-CONTROL STARTS HERE


AND TO RESTORE CAR PERFORMANCE

## OIL-CONTROL STARTS HERE

To stop oil-pumping, replace worn engine connecting rod bearings

The pleasure of car driving can be thoroughly dampened when worn engine bearings cause oil pumping. Worn engine bearings let excess oil reach combustion chambers, burn to performance-stealing carbon on spark plugs, valves, pistons and piston rings. Performance goes $u p$ in smoke!
Don't blame the piston rings for oil pumping caused by worn engine bearings. Give the rings a chancecheck for worn engine bearings on every overhaul. Replace with genuine Federal-Mogul bearings, engineered for the job of oil control. They'll restore power and perform-ance-ask your mechanic!

## FEDERAL-MOGUL SERVICE

(Division of Federal-Mogul Corporation)


## New Low Cost HOBART Air Cooled Arc Welder




AC Generator Only for building your own comb. welderpower plant.


For General Repair, Anywhere You can do profitable general shop and outside repair work at a low investment with the "Husky Boy" 200 amp. arc welder. It's compact, lightweight, is easily portable and has an air-cooled gas engine drive. For inside use, easily attachable wheels and handles are available at a slight extra charge.
AC Welding and AC Power
"Build Your Own" combination arc welder and power unit using this AC-AC generator. Makes a big saving in first cost. Comes complete, ready to hook-up to your gasoline engine, tractor or truck.

## Be Your Own Boss!

Cash in on the demand for dependable weldors-start your own business with the Hobart 300 amp . electric drive welder. No other welder on the market can match it for completeness of equipment, economy of operation and welding range. It's a real all-purpose machine. Hobart Bros. Co., Box P-123, Troy, Ohio "One of the world's largest' builders of arc welders and equipment'*


## Infrared Rays Clarify Bible Texts <br> [Continued from page 248]

Scholars are excited, too, because some of the manuscripts are written not in Hebrew but in a related language called Aramaic. This language was used in some of the later books of the Old Testament. It was also the language spoken by Jesus, and some authorities think that Aramaic, instead of Greek, was used in the original version of parts of the New Testament. Since only a few ancient documents in Aramaic have been found, the new ones are counted on to serve as a sort of textbook leading to a better understanding of the works originally written in that tongue.

## Essenes Were Community-Minded

In the Manual of Discipline, found in the 1947 cave, the sect that owned the scrolls referred to itself as serek hayahad, which Dr. Millar Burrows, Yale professor and for many years president of the American School of Oriental Research, translates as the Order of Unity. Sects similar to this were known to several ancient, non-Biblical writers as the Essenes, and Pliny the Elder reported that their chief settlement was along the Dead Sea, north of En-Gedi, which is now 'Ain Jidi.
Harding thinks this points fairly certainly to the settlement recently excavated near the scroll caves.

The Essenes gave everything they earned to the community fund. They despised luxury; dressed simply, in white; spent considerable time in prayer and study and in helping others; condemned slavery; and swore to "forever hate the unjust and fight the battle of the just."

## Sect May Figure in Old Testament

Is there a relationship between this pious sect and some of the events and teachings recorded in the New Testament? Some Bible scholars have long thought so. They point out that John the Baptist "grew and became strong in spirit," in the words of the Bible, "and
[Continued on page 252]


Wipe glass clean with clean rag. Get rid of all dirt or film which prevents the glass cutter from making a uniform cut.

Lubricate the wheel of your Red Devil glass cutter using any household oil. This supplies oil to cutter wheel and reduces friction between glass and edge of wheel.

Always make an even, continuous stroke across the whole surface and off the edge of the glass. Never cut twice. Practice cutting scrap glass, first.

To break glass, hold firmly on opposite sides of cut line. Give quick bending motion away from cut, keep fingers close to cut. Break right after cutting so cut does not get cold.

EASY as this, if you have the right tools

 Sut full details by getting your hres copy of had Devi's booktet "How Io Cut Ghas" from poor dealer or mail caupas todey! Remenber-we mat Rut Devil levls-


Please send me "How To Cut Glass"
Name
Address
City


State $\qquad$ 3035

## PM FREECATADOG



Snap-on Tools Corporation

## America's Foremost

 money-making MECHANICS' TOOLSIt's easy to own the same "pay-off" tools used and endorsed by America's topearning mechanics throughout the automotive, aviation and industrial fields! Snap-on tools help you handle every repair job faster, easier, better. And they LAST ... pay for themselves over and over again! Start building your own tool set now with basic own tool set now with basic
Snap-on units-add others any time. Genuine Snap-on tools are never sold in stores -direct to users only. Mail coupon for free catalog.
Sreap-GHe cods 8060 L 28th Ave., Kenosha, Wis.
Send me tree catalog. Occupation $\qquad$
$\qquad$
Name
Address
City $\qquad$ Zone $\qquad$ State


For those 101 jobs around the house, the auto and the yard, good tools get the job done faster and easier.

Utica ${ }^{(1)}$ pliers and adjustable wrenches are good tools, skillfully forged for rugged strength. And Utica's own process extrahardens to tools at points of extreme wear.

Ask your dealer for Utica ${ }^{(1)}$ pliers and adjustable wrenches. It will pay you to remem-


## Infrared Rays Clarify Bible Texts <br> [Continued from page 250]

he was in the wilderness till the day of his manifestation to Israel."

The Essenes, too, lived in "the wilderness." Furthermore, some of them, abstaining from marriage, brought adopted children into the order; and it is known that they practiced a rite similar to baptism.

In any event, the next we hear about John, he is baptizing in the Jordan River, which runs not far from the ancient settlement at Qumran, and meeting Jesus nearby.

## Scholars Employ Scientific Methods

The newest manuscript finds will take a long time to translate, but the staff of the École Biblique, aided by the staff of the American School of Oriental Research, are going about it imperturbably -placing the hardened bits of leather and parchment in humidors to soften, flattening them on glass, photographing them with infrared light (an expensive process paid for by John D. Rockefeller Jr.), and then matching the photographs.

## Scraps Are Treated Gently

They go about it gently, too, for these are precious scraps-and the scrolls they formed may once have been held by men acquainted at first hand with some of the events that took place after "there went out a decree from Caesar Augustus, that all the world should be taxed . . . and Joseph also went up from Galilee, out of the city of Nazareth, into Judaea, unto the city of David, which is called Bethlehem . . ."

END

## Up in the Air

A small boy, left inside the automobile while his mother went shopping, was wildly twisting the steering wheel and uttering roaring, motorlike sounds. An amused passerby smiled on the lad, watched for a while and then advised:
"Sonny, you'd better stick your arm out when you go around corners or you'll get into trouble."

The boy looked up scornfully. "Look," he said, "you stick your arm out of a spaceship and you'll get it ripped off!"-C \& O Tracks.
 Heres a heavy-duty sander built for the
industrial woodworker and professional craftsman, and priced for the home handyman! The new Dremel " 53 ", Straight-Line Action Sander has 25 sq. in. ( $35 / 8^{\prime \prime} \mathrm{x}$ $7^{\prime \prime}$ ) sanding surface, weighs only $5^{1 / 4} \mathrm{lbs} .$. is driven by a powerful rotary motor ( 110 V . 60 cycle AC) ... 6,900 strokes per minute... has no gears, belts, brushes or commutator to wear out and replace. Dremel Straight-Line Action guarantees satin-smooth finishes you'll be proud to show. Detachable paper holder speeds up paper changes. Use it for WET or DRY, coarse, medium or fine sanding . . . the Dremel " 53 ", is positively the most versatile ... the greatest sander value in today's market.


LIFETIME SEALED BALL BEARINGS

EASY ON!
EASY OFF!
Unique paper holder is detachable. Grits can be switched quickly without bothersome paper change.

Here's Why Craftsmen Approve . . . Use . . . Only Straight-Line Action Sanding! Wood fibers lie with-the-grain . . . are directional. sanding eross-grain is much like brushing a suede jacket against the nap. It leares marks or "scratches.' Sanding with-the-grain is like brushing the suede with the nap . . leaving a velvet-smooth surface, entirely scratch-free. Shown below are four common types of sanding actions. Only Dremel "Straight-Line Action" sands $100 \%$ with the grain . Only Dremel can guarantee $100 \%$ scratch-free finishes.

| ROTARY (crossgrain) Action | OREITAL (crossgrain) Action |  | DREMEL STRAIGHTLINE (with-thegrain) Action |
| :---: | :---: | :---: | :---: |
|  |  |  |  |

SEE YOUR FAVORITE DEALER: Dremel Tools are sold at better dealers everywhere. If your dealer can't supply, order direct on a five-day trial, money-back guarantee. Remit in full, and we will ship postpaid. Or, send only $\$ 2.00$ now, pay postman balance plus postage and C.O.D. fee.

THERE'S A DREMEL SANDER FOR EVERY USE


DREMEL MODEL " 2000 " SANDER-POLISHER
Perfcet for small shop use, home repair, and workshop projects, Choice of craftsmen for fine finishing operations. Features Dremel strokes per min.; 5 1b, wt., 21 sq. in. $\left(31 / / 2 "^{\prime \prime} \times 7^{\prime \prime}\right)$ sanding surface. 39 . Model "2000", Sander-Polisher. 25 asst'd. abrasives. $\$ 9180.50$
1 polish pad in sturdy 1 polish pad in sturdy
steel carrying case.

## Give the Best...WISS!



## WISS Metal Master Compound Action Snips

\# M-3 Easily cuts 18 gauge sheet metal. Cuts curves and circles as well as straight. Ideal for the home workshop. $\$ 4.25$. Rubber grips recommended, $60 c$ extra.

## WISS "Hy-Power" Pruners

\# 908 Pruning shears cut easily and cleanly. Non-pinching pistol grip handles. Soft anvil keeps knife blade sharp indefinitely. Choice of professionals. 22.50


## WISS Combination Snips

\#V-13 Solid steel. with gray japanned handles. Cuts curves and irregular shapes with ease. Handy pocket size. 7" long. Accurately tempered jaws and strong bolts. $\$ 1.85$.

J. WISS \& SONS CO. - NEWARK 7, N.J.


## Fryall Your Guide to Speedy Accurate LEVELING

Send for your free copy of "ON THE LEVEL," booklet that tells you how to handle every type of leveling job speedily, easily, accurately and economically with the new, amazing LEVELALL.

Learn how LEVELALL operates on the principle that "water seeks its own level.". . . how you can level points all alone. . . how easy it is to handle and use the transparent plastic tube, shut-off valves and mounting brackets . . . why LEVELALL is better and quicker than a transit . . . how LEVELALL pays for itself quickly by saving time and costs . . . and how satisfied customers praise this precision instrument. Send for the booklet and get the facts. . then you'll want a Deluxe LEVELALL . . . only $\$ 12.95$. Better yet, take advantage of our money-back guarantee and order your LEVELALL now. Dealer inquiries welcome.


LEVELALL, 81-N Webster St., Rockland, Mass.
$\square$ Please senu tree booklet, "On the Level." $\square$ Mail me Deluxe LEVELALL (a) $\$ 12.95 \square$ Regular $50^{\prime}$ model at $\$ 9.95 \square$ Ship postpaid full price enclosed. $\square$ Ship C.O.D.
Name $\qquad$
Street $\qquad$
City $\qquad$ Zone $\qquad$ State
[In Canada, prices slightly higher; write LEVELALL, INC., 5465 Decarie Blvd., Montreal, Que.]


## English Get Four-Door Bantam

The Standard Eight above is the cheapest four-door sedan made in England. Stripped of nonessentials-like hub caps and bumper braces-it sells abroad for about $\$ 1,350$. The trunk is reached from inside the car and the rear seat folds forward when not in use, for more storage space. A fourcylinder engine drives car up to 62 m.p.h.


## How Good Is Your Insulation?

Heating engineers can now measure the effectiveness of insulation with a new heatflow meter in much the same way photographers measure light intensity with an exposure meter. The meter has a foot-square plate of thermocouples that indicate electrically the rate of heat flow into or out of a wall or ceiling. Shown in use at the Zonolite Co.'s laboratory, it was developed by R. G. Huebscher, L. F. Schutrum and G. V. Parmelee of the American Society of Heating and Ventiating Engineers.



KNIVES • TOOLS handicraft kits

NO. 77 VIZI-DOME WOODCARVING SET \$3.60 X-ACTO, INC 48-41 Van Dam St. Long Island City, N. Y. Send 20 s for 28 -page Catalog



- Designed to meet exacting requirements of tool experts in every phase of automothe, Unmatched for hatnes. strength beauty durability See them at your hardware dealer now or write for free catalog.

WATERLOO VALVE SPRING
COMPRESSOR CO., WATERLOO, IOWA

| VATAESES |  |
| :---: | :---: |
|  | It has Infinite Speeds 0 to 550 Reverse Torque up to 180 inch pounds, $5 / 8^{\prime \prime}$ Input and Output Shaftis. It will handle $1 / 4$ to $11 / 2$ H.P. Motor. Case measures $71 / 2^{\prime \prime}$ long $7^{\prime \prime}$ high $61 / 2^{\prime \prime}$ wide. Valde over $\$ 300$. <br> Shipping wh. $25 \#$. On only $\$ 54.50$ <br> C.O.D. Orders we require Fob. Chicago i $10 \approx$ Deposit. |
| DIRZIUS MACHI | SHOP "U'' 1423-25 52nd Ave., Cicero 50, III. |



TEST Circuits,
Fuses, Outlets easily, quickly, safely. Shockproof. Pull fuses 10 to 100 Amp.
$\$ 1.50$ add'l for 2 ft . order direct from u
STARFPUSE CO., 237 Canal St., New York 13, N. Y.


## BRONZE FOUNDRY

Schools and Home Workshops Make your own castings of aluminum. copper, bronze. silver. Foundry sets are available in three sizes including 2 boo Deg. F. blast Furnaces. $\$ 22.50$; $\$ 29.50:$ and $\$ 12.00$ f.o.b. Kansas City. Free Circular.
KANSAS CITY SPECIALTES CO. P. o. Box 6022, Dept. s.12
KANSAS city. mo.


> SMOOTH DOWELRODS introductory offer
 Postpaid To Your Door. No Stamps or C. O. D.'s. 91.98
$1 / \mathbf{P}^{\prime \prime}$ to $1^{\prime \prime}$ Diameter-All $12^{\prime \prime}$ long- 100 Pieces of Assorted Diameters-All Hardwouc .. ..end Che:k or Money Order. Other sizes and lengths available
DONELCRAFT, ${ }^{1202}$ Gurton S. E. Dept. $s$

Take The "PAIN" Out of PAINTING


Uasements $A$ MECKEIE C $\dot{D}$ SDTA MUN Take It Anywhere! No Compressor . . . No Electric Cords Needed. Sprays: Paints, Oil, Varnishes Insecticides, etc.
Men! Women! Here's the easy way to lick those tough, tedious, tiresome paint jobs. Becker Spray Gun is fun to use, requires no electricity or compressors-pressurized by low-
cost Co-2 cartridges each sprays up to 21 oz . containerful. Used 5 years successfully in industry. SEE YOUR DEALER! If he cannot supply, order direct for pstpd.
shpt. Extra cartridges 10 for $\$ 1$. SULLIVAN-BECKER CO.

with box cartridges

## SHEET METALERAKES

 Angles, flanges, Pittsburgh locks. 24 G. steel, heavler aluon bench, truck or floor stand. Truss braced-steel. Express IrOM BENDER CO 1 bollect. $30^{\prime \prime} .65$
 ¢f IRON BENDER form hooks, angien. evelets. etc. Ca-
pacity $1 / 4^{\prime \prime} \times 2^{\prime \prime} .5 / 16^{\prime \prime} \times 12^{\prime \prime}$. All stee........ $\$ 9.50$ 30 CURVE FORMER. Forms straight and taperini: limes $2^{\prime \prime}$ to 2 ft . in diameter. 20 gauge, express collect. $\mathbf{\$ 9 . 5 0}$ (lmmediate delivery. Order cash or C.O.D., or sewd for folder) VYKE BRAKECO.. S-243915 St.. Denver 11, Colo.

SAWMILL
LOW
. 5 2oim $F 958$
3007 W Portable Sawmill right to the trees-turn out valuber tor home and arm - seil to local yards - make lasts a lifetime. No crew needed. Power with tractor or auto engine. Beginners get excellent results. Send today for FREE BOOK, "HOW TO MAKE LUMBER" BELSAW MACHINERYCO 8465 Field Bidg. Kansas City 11, Missouri

## SUID CR BUY; ARCたWELDER <br> DUNBAR'S Build-Ur-Own PLANS show Weld how to build a 300 amp. DC Generator Our Big FREE Catalog listing over 1500 items also lists 3 -lowpriced DC Welder KITS you can assemble in few minutes time. Send 25 c

 PLANS. catalog included. Or, send for the FRFE Catalog.DUNBAR MFG., 10318-C2 Aurora Ave., Seattle 33, Washington


ERWOOD, INC. 1774 W. Berteau Ave., Chicago 13, III.

## Last Year's Profit

 $\$ 3,0001$

## with a FOLEY automatic SAW FILER

"Last year's profit amounted to $\$ 3.000$. Not so bad for a one-man outfit"-from Chas. C. Hough. dames B. Williams wrote us--"I made $\$ 765$ last year tiling saws, and it sure comes in handy. I do this work in my spare time." Men in communities of all sizes make up to $\$ 3$ or $\$ 4$ an hour with the Foley Saw Filer working full time or part time. That extra money comes in mighty handy in these days of high prices.
It's no trick to take care of the saw tiling for your neightmorhood hartware or iumber dealer-plus loosing after the salw for farmers. townspeople. manual training departments and factories. The Foley hles all hath salws, also band and cross-cut circular saws. It's a cash business, no canvassing, no eyestrain and no experience needed.

## FREE BOOK

## SHOWS HOW TO START

 "MONEY MAKING FACTS" shows just how you can start at home in your spare tíme working in your basement or garage. It's an immediate cash business that can develop into a full-time repair shop. Send coupon today-no salesmen will call.
## Send for FREE BOOK



FOLEY MFG. CO., 1219-3 Foley Bldg. Minneapolis 18, Minn.
Send me free book "MONEY MAKING FACTS"
$\qquad$
Address

| WHRSURPIUTS G7Rathe save up ro 90\% |
| :---: |
| NEW IMPROVED MODEL |
|  |
| OLTAGE CIRCUIT TESTER Ordinance to rigld specification. bevice makes complete \& rapic uhou- batery ators. aircuit inct any circuit $\qquad$ s. Every set theekers. oont in our $\qquad$ |
| D. C. GENERATORS—\$14.95 <br> C. <br> Generatorst (Used) Pl. Perrect condition. <br>  <br>  inty. Rated 300 Amps. 30 Volts.s. wt. 60 lws OWN ARC WELDER complete make.up <br>  <br>  |
| SENSITIVE ALTIMETER in 10 FT. increments <br>  perrect. Ready to install. $\$ 15.95 \mathrm{ppd}$ |
|  |
|  |

## SNEWI Every Electric Drill A Powerful PORTABLE JIG SAW <br> "ARCO JIG-SAW" <br> HAS SAME CAPACITY CUTS AS FAST AS SAWS COSTING \$50 \& UP! DOES THE WORK OF ALL THESE SAWS: JIG, KEYHOLE, COPING. RIP, <br> CROSSCUT, BAND HACKSAW. <br> HAS EXCLUSIVE BUILT-IN AUTOMATIC AIR BLOWER. <br> Here for the first time anywhere is a Portable Jig Saw that at taches in ONE MINUTE to any <br> 

sAW" will handle any project from the smallest to the largest. In minutes it cuts intricate patterns, circles, etc. in plywood, wallminute it cuts intricate pattern jumber up to $2 \times 4$ 's It cuts openboard, plastics, metals even cuts lumber up to $2 \times 4$ s. It cuts open-Built-in AUTOMATIC BLOWER keeps cutting line free of sowdust "ARCO JIG-SAW" is a powerful. lightweight tool that is easy to handle because of its Right Angle Drive. Strong Safety-Yoke \& Worm Drive Clamp make it a vibration-free unit. Extra large Shoe-Plate assures accurate and square cuts. Blades are changed in seconds with screwdriver. Converts to Table Model with No. 505 -Six extra Blades for wood, metals, etc.

## 90-DAY FACTORY GUARANTEE

BUY THE BEST-see your hardware dealer now! If not avallable,

DEALERS
Write for
nearest jobber
arest jobber. BACK OUARANTEE ${ }^{\prime}$ on our 10-DAY M BACK GUARANTEE. Send us check or M.O
(Postpaid). C.O.D.'s- postage extra
ARROW METAL PRODUCTS CO.
Dept. PS-12, 140 WEST BROADWAY, NEW YORK 13, N. Y.


ROTARY PLANER
Planes - Rabbets
Tenons - Panels
Routs - Bevels
0 nly $\$ 8.50$

## Drill Press Tools

## BARRON TOOL CO. INC.

366 Architects Bldg., Detroit 1, Mich.

## MAKE MORE MONEY! Dealers or Representatives Needed for nationally advertised line of Spark Plugs - Oil Filters - Auto Specialties - Liberal Proposition Full or Part Time - Experience Not Necessary - Write Today ENGINE PRODUCTS MFG. CO. <br> 5801 E.

FOR-WORKSHOPAND INDUSTRIALUSES...
Over 40 precision built woodworking tools and accessories . . . Hi-Speed Router BitsRotary Surface Sanders \& Drum Sanders -Safety Shaper Cutters-Dovetail CuttersLarge Auxiliary Metal Tables-All Metal Shaper Fences - Spindle Adapters - Handy Bench Vises. Many other items indispensable for accurate, useful, versatile workshop use. Every tool sold on complete satisfaction or your money back. See your Barron Dealer. Ask for special folder - " 24

-

Send for 80 page Illustrated Catalog cram full of War Surplus Bargains in New Tools and accessories for home, workshop, hobbies and factory ... exceptional values. Send 25 c to cover handling charges to
COASTAL ABRASIVE \& TOOL CO. NEW YOWARD ST. Y.



258 POPULAR SCIENCE

## GET "New Car" POWER!

 A small amount of Fisher's Compression SEAL in each cylinder bore grives you the economies of smooth, gives you the economies or smmooth and reduced oil consumption. Old tired engines may not need expensive overhauling. Only takes minutes to apply-yet gives you 10,000 more miles of low-cost driving pleasure.Satisfaction Guaranteed! Full purchase price refunded immediately, if not completely satis fied. No solvent baths necessary Order today! Sorry, no COD's. Free
FISHER'S 4756 S. CENTRAL, DEPT. PS- 12 LOS ANGELES I1, CALIF.


## NEW, IMPROVED CALCULATOR

 FOR WOODWORKERS only 25c Instantly gives information on lumber, nails, concrete mixes, painting materials, etc. Convenient, simple to read. Just set dial for nail specifications, to conver linear to board feet, find bit sizes for screws, compare characteristics of woods. $6^{\prime \prime}$ diameter heavily varnished cardboard. Send $25 \mathrm{c}, 00 \mathrm{stamps}$, please to Greenlee Tool Co., Columbia Avenue, Rockford, Illinois.USE AIRCRAFT GENERATOR 75-300 AMPS. D.C.
35c BUILD YOUR OWN WE SHOW YOU HOW easy it is to build this Powerful Welder. ses most any surplus aircraft generator. Requires no rewinding or special changes. Do your own welaing-save many dol Wite for Write ior FREE War Surplus Catalog.

LEJAY MFG. CO
1223 Le Jay Bldg., Minneapolis, Minn.


# FREE CATALOG ALLKINDS OF WAR SURPLUS 

PRACTICAL ENGINEERING CO. $707 S$ NORTH SHERIDAN

TULSA, OKLA.


FULLER TOOL CO., Inc. 3522 Webster Ave., N. Y. 67 Export Sales Dept., John H. Graham Co., 105 Duane St. • New York. U. S. A.


THE HEAD CAN'T FLY OFF. No more bother with loose or splintered handles. Estwing "Unbreakable" tools are forged in one-piece from tough tool steel. Grip is genuine leather, most comfortable and durable. Individually packed in colorful gift boxes. Axe $\$ 4.50$, hammer $\$ 3.65$. At all leading hardware stores. Write for FREE catalog.

ESTWING MFG. CO., Depf. M, Rockford, Illinois


Better in every way . . . larger work tables sturdier frames . . . newest mechanical improvements. Darra-James engineering department is constantly working to give you more for your money.

## Gree Catalos

## TOOLKRAFT CORPORATION

900 PLAINFIELD ST. . SPRINGFIELD, MASS.


## 

## NEW CONTINUOUS DUTY 1/20 HP MOTOR

110-V. 60 Cy . 1750 RPM. Bronze bush bearings, $1 / 4^{\prime \prime}$ shaft. For fans, other long.
running uses. Shipped postpaid. runnin.

## HIGH SPEED

1/2" SHANK DRILL SETS $\begin{array}{ll}5 \mathrm{pc} . \operatorname{Set} \$ 1 \boldsymbol{5 0} \\ \mathrm{No.} 32 & 10 \mathrm{pc.} \text { Set } \$ 1750 \\ \mathrm{No.} 33\end{array} \boldsymbol{5}$
 Highest tungsten content. sharp and ready to go. Reconditioned-all have at least 70 of original flute length. Fit any $1 / 2^{\prime \prime}$ drill, drill
press or chuck. Shipped postpaid. press or chuck. Shipped postpaid

WRITE FOR OUR FREE CATALOG
 S40 A DAY BUSINESS


## in your spare time

ANDY PHILLIPS SAYS:
"My Belsaw Sharp Smith gives me big profits at low expense - I can run 35 to 40 Circular Saws in an 8-hour day - that makes me \$40 cash."
'I also get BIG EXTRA PROFITS . . . up to $\$ 4$ an hour... by grinding planer and jointer knives - there's always a demand for this kind of work.

You can start this REPEAT CASH business in your own home or garage while you are working at your regular job. Easy to operate, no experience needed. "My BELSAW paid for itself the first month."-H. J. Opie

For as little as \$15 down payment, you can get your BELSAW SHARP SMITH rushed to you.

## FREE book tells how

$\qquad$ YOU can start making money the very day your BELSAW SHARP SMITH arrives. Hundreds of jobs in your own IIf: This SHARP SMITH arrives. Hundreds of jobs in your own GS(IDRII neighborhood. Send for Free book "Life-Time Security.' BELSAW MACHINERY CO
4406 Field Building
Kansas City 11, Mo.

## NEW TAPERED REAMER hUNDREDS OF USES AT HOME, WORK!

OPEN UNDERSIZE HOLES quickly, easily. Here's the tool you always need and never have. A "must" for every craftsman. Why risk breaking expensive drils opening undersize holes? A few turns with this new tapered reamer two holes to be bolted or screwed together. Reams undersize holes from $1 / \mathrm{s}^{\circ}$ to $0^{5} / \mathrm{i}_{6}^{\circ}$


## HANDY WORKBENCH

FOR CARPENTER, CABINET MAKER, ELECTRICIAN, RADIO SERVICE OR DARK ROOM PHOTO DEVEL.
Sturdily made with $2 \times 4$ legs, extra heavy plywood top, large center drawer and $5^{\prime \prime}$ backboard \& tool rack. Shipped knock down Overall dimensions $24^{\prime \prime}$ wide $48^{\prime \prime}$ long $\mathbf{3 6}^{\prime \prime}$ high. Can be assembled in 30 minutes.

FREE DELIVERY Within 300 mi .
when chk. or M. O. with order.
WILLOW GROVE CABINET CO. 600 N. York Road, Dept. 2-B Send Check or money Order. C.O.D. orders require $\$ 5$ deposit.


Complete with everything. Ready to plug in. 110 volts AC. $15-30 \mathrm{Amps}$; 3 heats. $1 / 16^{\prime \prime}$ to ${ }^{\prime \prime}$ from $16^{\prime \prime}$ to $1 / 4$ usiag teed unconditionally, 10 -day trial. No C.O.D. Does everything welders costing up to $\$ 75.00$ do. Buy direct and save.
ESSAY MFG. CO., INC., Dept. 47, Quincy 69, Mass.


GOLD-SILVER-COINS
Easily located with new Lightweight M-Scope Detector. Superior performance, lowest price, monthly payment plan.

FREE LITERATURE
FISHER RESEARCH LAB., INC.
PALO ALTO
CALIF.


## FOAM RUBBER

SAVE ${ }^{\text {UP }} 85 \%$ on WAR SURPIUS
FROM WORLD FAMOUS 'GAOCETEERS''HEAVEN

Relax in comfort after a rough day outdoors. Sleep on Foam Rubber Ideal for sleeping bag pads, mattes es, chair or auto seat cushions. SLAB STOCK
 $\begin{array}{lrl}1^{\prime \prime} & \$ 1.00 & 3^{\prime \prime} \\ 1.1 / 2^{\prime \prime} & 1.50 & 4: \\ 2^{\prime \prime} & 1.90 & \end{array}$ 2.60
3.00

FOAM RUBBER BUNK BED MATTRESS - Top Quality Soft and very restful.
Size: $30^{\prime \prime}$ wide, $76^{\prime \prime}$ long and $41 / z^{\prime \prime}$ thick. mattress $\$ 4.95$ TICKING-for above NAVY Sealed Beam LAMP U.S.Novy Portable search spot light. Has pistol grip \& aiming sight. Makes on idea Search, Spot or Emergency 12 Volt light $-4^{\prime \prime}$ lens 12 Volt light $-5^{\prime \prime}$ l lens ...... $\$ 4.29$ 24 Volt light $-5^{\prime \prime}$ lens $\$ 4.29$ Set of 3 filters: red, green, amber $\$ 4.79$ for $5^{\prime \prime}$ size ONLY

GOOSENECK LAMP A Real Surplus Buy!! For the Home or Workshop. An craftsman. Has flexib shaft, socket, cord \& 125 switch. 110 V . AC. 25
(cosec resection LAMP开
Has black bakelite case with a 13 inch tubular metal extension. ${ }^{\prime \prime}$ of the externdeal for reaching into remote places with plenty of light for inspection, etc. Takes ordinary flashlight batter es \& comes with l extra bulb

## 4-WAY SWIVEL LAMP

 work bench, chart table, engine coom, etc. May be used on $6-12$24 or 110 volt 24 or 110 volt current by simply 3 foot shaft with four able joints

$11 / 2$SWISS PATTERNED NEEDLE FILES

Rods from 0 to 1 inch in 001 . Hes ratchet stop and lock nut. Decimal chart on frame. One of the finest quality, imported, precision tools on the market. Case 8 wrench
secluded of this low price.
$\$ 12.50$ VALUE NOW NOW set of 12 assorted shapes 95


Here at Palley's we carry the WORLD'S LARGEST supply of special Hydraulic Equipment. Our huge stocks of Hydraulic Cylinders alone feature over 20,000
or repair your own guns -
here is o set of files that will do that precise job. file steel, specially hardened and accurately machined for precision work - 95

## HYDRAULIC CYLINDERS

 No. 29-Double Action Cylinder No. 29 - Double Action Cylinder 1500 PSI line pressure, or will give 40,000 lbs. thrust on an intermittent 3000 lb . line pressure. Has a $4^{\prime \prime}$ bore, $1-1 / 2^{\prime \prime}$ diameter piston shaft. 18 inch stroke. $30-1 / 2^{\prime \prime}$ length. Ideal for presses, rood, form and 9095 shop equip. Cost Gov't $\$ 390$.129 No. 3 - Double Action Cylinder - Bore is $1^{\prime \prime}$, Shaft $1 / 2^{\prime \prime}$, Stroke adjustable from $2 \cdot 1 / 2^{\prime \prime}$ to $4^{\prime \prime}$ with internal sleeve stops. Length overall $8-1 / 2^{\prime \prime}$. Will take
1500 lbs. continuous -3000 lbs 1500 lbs. continuous -3000 lbs. 55 intermittent. Will lift or push up $\qquad$ to 1100 pounds.
No. 66 - Double Action Cylinder. Length 13 -1/4"' LiAs 6000 Length $13-1 / 4^{\prime \prime}$. Lifts 6000 No. 53 - Double Action Cylinder Bore is $2-3 / 8^{\prime \prime}$, shot $1^{1} 4^{\prime \prime}$, stroke $151 / 2$, length $26^{\prime \prime}$. Gives 6645 lbs . lift with $\mathbf{2 0 5 0}$
$1500^{\text {lbs. line pressure. . . . . }} \mathbf{2 0}$

## WYO. HAND PUMP

Capacity of 15 pressure of 2000 PSI

PR P
 Mount plate has 4 speed bearings. center to center. Has spline shat one side, key slotted $1 / 2^{\prime \prime}$ shaft $1 \bigcirc 50$ on other side.
P-IA PESTO GEAR PUMP Capacity, 11/4 GPM at 1500
RPM at 1500 PSI. Pressure PM at 1500 PSI. Pressure
imit is 1500 PSI continuous, with intermittent maximum
of 1875 PSI for 15 seconds. Normal operating speed is 3750 RPM with 4500 RPM. Rotates Now $\$ 95$ -(IE NEW: PUMP S FOOT MOUNT

Carry in the car for an emergency snow shovel. Has 20" wood handle. Blade folds to make a shovel or pick axe. An ideal unit for motor inst, camper, 7 A,

USAF THROAT
MICROPHONE
Genuine USAF type T-30-0
Gives distinct voice repro
duction
radio broadcasting. Consists of two micro-
phones, mounted on rubber neckpiece copies piston hydraulic motor, Has H.P. Also . Automatic pressure dash pop 10 1/3 input RPM in bor alput RPM on mittens. Ideal for Lathes, Dupicator setup on Mills, Convey ors, Small Cars, Drives, etc. 4250 $4^{\prime \prime}$ SPLINE SHAFTS for input and power take-off on above. Pair $\mathbf{\$ 2 . 5 0}$ INPUT \& TAKE-OFF PLATE ASSEM. To adapt above to pulley drive. Has $1 / 2^{\prime \prime}$ keyway shaft. 2 first-line, shield ed high speed bearings in each unit.

## 1954 Edition of WORLD'S MOST AWMAING BAREAI CATALOEI

## 320 PAGES - FULLY ILLUSTRATED

Larger than ever before. Packed with SENSA. TIONAL VALUES in WAR SURPLUS, FACTORY CLOSE-OUTS and GENERAL MERCHANDISE! Included are thousands of items in Hand \& Power Tools; Hydraulic Cylinders, Pumps, Motors, etc.; Hardware; Industrial Tools; Cameras and Photo Supplies; Outdoor and Sporting Equipment; Microscopes, Binoculars, Telescopes, etc. Foam Rubber, Aircraft Parts, Electrical Motors, Blowers, etc. Gadgets plus many, many more hard-to-find items.


Order Your Copy Today! We refund your T| $11 \mid$ ", $\$ 1.00$ or more.

2263 E. VERNON AVE., DEPT. PS -12 IOS ANGELES 58, CALIF.

Order From This Ad. Pay by M.O. or check. P.O.'s accepted. from D\&B
firms. $1 / 2$ deposit
with c.O.D.s. All
elastic neck nard. Operates
between 100 \& 300 ohms...

## SIGNAL CORPS

TEL. KEY
4 it The new model J5A with dol type, flame-proo!, metal key. perfectly balanced to permit positive conoct with minimum effort. An ideal 189 ion al use. A BUY at NEW

3

## RADIO ANTENNA REEL <br> For tuning beam antenna

cred by $1 / 8 \mathrm{HP}, 24 \mathrm{~V}, \mathrm{GE}$ motor, engaged to gear eduction only when electrical contact is made. Operated - in either direction. Ideal RPM at take-off. Used for 55 A tremendous value. NEW (TIV UNIVESAL JOINT
Rotates with full flexibility from 90 to 180 degree angle. Body is solid bronze. Drive shaft ocker type. Ideal for use on 595 IT RIGHT ANGLE ORIVE Has direct 1 to I ratio through off shafts ass. Drive \& takeGears are self-lubricating hiss peed steel. Ideal for use Size: $31 / 1^{\prime \prime} \times 2^{3 / 1} 1^{\prime} \times 1^{1 / 4}$ ', Many other types Gear Boxes and flexable Drive Shafts in stock. See Catalog!
proving effective against germs able to withstand either medicine alone.

Some derivatives of hydrazine apparently reduce high blood pressure and clear up urinary-tract infections. Others are being used in the preparation of certain kinds of vitamins, sulfa drugs and hormones.

## Helps Coat Metals

This versatile stuff reacts so readily with oxygen that it is highly useful as a reducing or deoxidizing agent. Copper, nickel, silver, gold, platinum and other metals can all be separated in pure form from various compounds through the use of hydrazine. With hydrazine's help, thin coatings of metal can be applied to glass and plastics. Used as a soldering flux for copper and brass, hydrazine hydrobromide leaves no corrosive residue. A little hydrazine added to the water of steam boilers takes out dissolved oxygen and thus fights corrosion.

Chemists have hardly more than begun to develop the commercial possibilities of this versatile building block. They know that it can lead to new dyes, disinfectants, detergents; to wrinkle-resistant coatings for textiles; to stronger, more elastic, yet finer synthetic fibers; to new and improved plastics.

## Supply Up, Price Down

How fast such possibilities will be realized depends on the supply of hydrazine, which is going up-and the price, which is coming down. When hydrazine was being manufactured for experimental use only, it was priced at $\$ 50$ a pound. Today it stands at somewhat less than $\$ 2.50$, and Matholin officials believe that further improvements in the manufacturing process may eventually drop the figure to 50 cents. To see what this means to chemists, consider the following:

Hydrazine, like ammonia, belongs to a family of more than a dozen nitrogenhydrogen compounds called hydronitrogens. In structure they resemble the
familiar carbon-hydrogen compounds known as hydrocarbons.

Hitherto the industrial chemists have worked most of their miracles with the hydrocarbons, whose carbon atoms can be joined fairly easily into rings and chains, forming building blocks that in turn have vielded wonders like nylon and synthetic rubber.

To a limited extent they have been able to join the nitrogen atoms of the hydronitrogens, too. And this is important, because different qualities are imparted to drugs, dyes and other materials when they contain nitrogen instead of carbon. But building blocks of this kind have not been produced in large quantities, because it has been difficult to hook up the nitrogen atoms of available hydronitrogen compounds.

## Hydrazine Makes the Difference

Hydrazine changes the picture. Its favorable structure, with two highly reactive hydrogen atoms swinging from each of two tightly linked nitrogens, makes it an ideal building material of the hydronitrogen family. Already these possibilities are being explored. Further reduction in cost could make hydrazine a serious competitor of the hydrocarbons, as a raw material, in much wider fields. And so big news is in the making, in industrial laboratories, now that the search for a rocket fuel is transforming hydrazine from a scarce and costly material into a readily available and popular-priced commodity. End

## Simple Explanation

The chemistry professor was giving a demonstration of the properties of various acids. "Now, I am going to drop this silver dollar into this glass of acid. Will it dissolve?"
"No," was the prompt reply from a student in the rear.
"No?" queried the professor. "Then perhaps the young man will explain why the silver dollar won't dissolve."
"Because," said the student, "if it would, the professor would not drop it in."-The Columbian Crew.



## for accurate,

## low-cost machining

These lathes are popular in the toolroom, production shop, or wherever varieties of precision parts are machined. Users prefer them for their simplicity and practically effortless handling. Job set-ups and tooling changes are made so quickly and easily that down-time is held to a minimum. A very complete line of attachments simplifies tooling. Send coupon for complete information.

## SPECIFICATIONS

Swing - $131 /{ }^{\prime \prime}$ " over bed and saddle wings, $8^{\prime \prime}$ over cross slide.
Distances Between Centers-281/4", 401/4", $521 / 4^{\prime \prime}$ maximum.

Collet Capacity - $1^{\prime \prime}$ maximum (Collets interchangeable with South Bend $10^{\prime \prime}-1^{\prime \prime}$ Collet, $14 \frac{1}{2} 2^{\prime \prime}, 16^{\prime \prime}$ and $16-24^{\prime \prime}$ lathes).
Spindle Bore - $13 / 8^{\prime \prime}$.
Spindie Speeds - Eight, 40 to 940 r.p.m., approximate.
Power Longitudinal Feeds - 48 R.H. or L.H., .0015" to .0841".
Power Cross Feeds - 48, $.0006^{\prime \prime}$ to $.0315^{\prime \prime}$.
Thread Cutting - 48 R.H. or L.H. pitches, 4 to 224 per inch.



At last, secrets of this amazing miracle finish can to be tapped in profits waiting field. Flok-Kraft tremendo velvety, luxurious surface to radios, lamps, figurines, auto store displays, a thousand and dash boards be seen on every one hand easily and quickly beautified, enriched in value old objects beautiKraft. Make oble, make new things ful-saleable, more with this soft, wich covering. Can be old or worn. any surface, even if ol

## Yours to Examine Without Risk

Examine in your own home-then decide. The complete instructions, the full starting kit of materials and equipment plus full details on how you may open your own business-spare or full time-EVERYTHING will be sent to EXAMINE AT OUR RISK.

## FLOK-KRAFT IN INDUSTRY

This amazing miracle finish is of inestimable value for use on hundreds of manufactured products. Flok-Kraft offers you a way to big, extra money, assisting manufacturers in many lines as well as filling a big demand among home owners.


Big Profits Right Away-Learn in Few Hour Make $\$ 5.00$ - yes! even $\$ 10.00$ and more pe hour. Fully detailed Flok-Kraft instructionscomplete and easy to understand-every poin explained-shows you how to start on the roa to big money, full or spare time.
We Furnish Everything You Need To Star You also get complete Flok-Kraft kit of mate rials and equipment that enables you to star at once. Add to your income from your regula job or begin to build a successful business o your own and do it all, right in a corner of you basement, garage, service porch, kitchen o living-room.

## Grasp This Lifetime Opportunity TODAY

 I'll arrange to send you the complete Flok Kraft outfit - everything needed to start, fo leisurely no risk examination right in your ow home. You owe it to yourself to investigate thi wonderful opportunity now! Fill out and ma the postal card at right for FREE details, sam ple, plan etc. Do it today. Everything I sen you now is free of charge and postpaid. Sen no money-just name and addres MAIL POSTAGE-FREE CARDNOW FOR BOOKLET, SAMPLE PLAN!

# No OTHER ANI-REEEIE GNES YOUR CART TE SAME COMPLIEIE PRTEECTON: 



## You're SET...

One shot lasts all winter. Just put "Prestone" anti-freeze in and forget it till spring! No boil-away ... no repair bills - its special inhibitors give the best protection against rust, clogging and foaming.

## You're SAFE...

High compression engines and efficient car-heaters make non-evaporating anti-freeze more important now than ever. There's not one drop of boil-away alcohol or methanol in "Prestone" anti-freeze.

## You're SURE...

With "Prestone" brand anti-freeze in your car, you're sure you've bought the best. It's America's No. 1 brand. No other anti-freeze gives your car the same complete protection. It's guaranteed!
$\mathbf{\$ 3 . 7 5}$ per gallon • \$1.00 per quart, in quart cans



[^0]:    Godfrey Hammond, publisher - Stephen P. Glemon. advertising director
    ADVERTISING OFFICES: NEw чork-353 Fourth Ave.; chicago-360 North Michigan Ave.; dethort-820 Book Bldg.; san francisco-681 Market St.; cleveland- 328 Citizens Bldg.: los angeles- 2550 Beverly Blvd. EDITORIAL OFFICES: 353 Fourth Avenue, New York 10, N. Y.

[^1]:    $\left\{\begin{array}{c}\text { Dept. 1283-R } 417 \text { So. Dearborn St. } \\ \text { Chicago 5, III. }\end{array}\right\}$

[^2]:    MAIGET FAGTS FASTEST!
    MAIL TO OFFIGE NEAREST YOU:
    (mail in envelope or paste on postal card) NATIONAL SCHOOLS, Dept. C-123

    4000 S. Figueroa Street or $\mathbf{3 2 3}$ West Polk Street Los Angeles 37, Calif.

    Chicago 7, III.
    Please rush Free Book \& Sample Lesson checked below. No obligation, no salesman will call.
    $\square$ "My Future in Radio-Television \& Electronics"
    $\square$ "My Future in Automotive-Diesel \& Allied Mechanics"
    NAME
    BIRTHDAY $\qquad$ ADDRESS
    CITY $\qquad$
    CITY
    $\square$ Check here if interested in Resident School Training at Los Angeles. STATE $\qquad$ VETERANS: Give Date of Discharge

[^3]:    $\qquad$
    Address
    Occupation
    512

[^4]:    The Macmillan Co., 60 Fifth Ave., N. Y. 11
    Please send me Mandl's TV Servicing. I will either pay the full price of $\$ 5.50$, plus small delivery charge, or return the book in 10 days. (Save: Send check or money order and we pay delivery charge.)

    Signed...............................................................................
    Address...........................................................................
    (This offer good only within continental limits of U.S.A.)

[^5]:    Statement required by the Act of Congress of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233) Showing the Ownership, management and Circulation of Popular Science Monthly, published monthy at New York, N. Y., for October 1, 1953 .

    1. The names and addresses of the publisher, editor, managing editors and business manager are Publisher, Popular Science Publishing Co., Inc., 353 Fourth Avenue, New York 10, N. Y.; Editor, Volta Torrey, 353 Fourth Avenue, New York 10, N. Y.; Managing Editor, Howard Allaway, 353 Fourth Avenue, New York 10, N. Y.; Business Manager, Godfrey Hammond, 353 Fourth Avenue, New York $10, \mathrm{~N}$. Y.
    2. The owners are: Popular Science Publishing Company, Inc., 353 Fourth Avenue, New York 10, N. Y.; Stockholders of Popular Science Publishing Company Inc.; Mansell and Company, 45 Wall St., New York 5, N. Y.; Noreen S. Capen, Capeswold, Bedford Village, N. Y.; Robert Cade Wilson, 683 Springfield Avenue, Summit, N. J.; Ada B. Wilson, 683 Springfield Avenue, Summit, N. J.; Marguerite N. Cole, Round Hill Road, Greenwich, Conn.; Irma V. Hammond, 1 Carstensen Rd., Scarsdale, N. Y.; Helen B. Glennon, 65 Prospect Ave., Larchmont, N. Y.
    3. The known bondholders, mortgagees and other security holders, owning or holding 1 percent or more of the total amount of bonds, mortgages or other securities are: none.
    4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.
    (Signed) Godfrey Hammond, Publisher
    Sworn to and subscribed before me this 21st day of September, 1953. Esther Eyl, Notary Public, State of New York No. 24-6219000. Qualified in Kings County. Certificates filed with: New York and Kings Co. Clks \& Register. Commission expires March 30, 1954. (Seal).
[^6]:    Electronically controlled for superb results. Rapid service and satisfaction guaranteed. Prints from ANS CO COLOR any size KODACHROME transparency E K T A C H R O M E

    | $4 \times 5$ | $5 \times 7$ | $8 \times 10$ |
    | :--- | :--- | :--- |
    | $\mathbf{5 0}$ | $\mathbf{\$ 1}$ | $\mathbf{\$ 2}$ |

    PROCESSING: ANSCO \& EKTACHROME 24 hours - Roll Film 120-620, 35 mm , 20 ex mfd. . . . Only $\$ 1.00$ roll
    COLORFAX LABORATORIES
    

    DEPT. S -123 BOX 3521 Georgetown Sta., Wash. 7, D.C.

[^7]:    U. S. patents on these inventions have been granted to: 1. W. A. Lommen, Windom, Minn.; 2. R. Schostal, NYC; 3. N. Prupis, Seattle; 4. M. M. Williams, Miami; 5. R. S. Coolidge, Center Sandwich, N. H., H. W. Keeley, NYC, R. S. Smith, Norwalk, Conn. and T. N. Anderson, Huntington Stntion, N. Y.; 6. R. A. Robert, Paris, France; 7n F. E. Null, Dayton, Ohio; 8. J. S. Tepper, Monrovia, Calif.; 9. E. C. Bordurs. Milledgeville, Ga.

[^8]:    Further information on these products can be obtained from: 1. Amerwood, Box 391, Fort Worth, Tex.; 2. Morgan Products, Box 213, Palo Alto, Calif.: 3. Majestic Gifts Co., Bor 1417, Beverly Hills, Calif.; 4. Columbia Fastener Co., 3232 S. Ashland Ave., Chicago; 5. Rene-Crajt Products. 22 Owens Building. Wilmette, Ill.; 6. Glasfloss, 15.5 E. 14th St.. NYC 17; 7. Carborundum Co., Niagara Falls, V. Y.; 8. Porta-Fold Co., 52.5 Alvarado St., Los Angeles; 9. International Allied Industries, Box 202, Hialeah, Fla.

[^9]:    CARTER CARBURETOR CORPORATION St. Louis 7, Missouri
    Division of American Car and Foundry Company

