MIRACLES YOU'LL SEE IN NEXT FIFTY YEARS
by Waldemar Kaempffert

Also
COLOR CAN MAKE YOUR HOME HAPPIER

See page 148
Smart 1950 buy—this Studebaker's thrift and value!

Just a look at the low, long, alluring new 1950 Studebaker tells you that it's a car with the right build for real money saving.

You see no bulging excess bulk that would hitch a ride at your expense—no surplus pounds to squander your gasoline needlessly.

You get welcome protection against unexpected repair bills, too.

The whole structure of this refreshingly different new car has the solid durability of top-quality materials and wear-resisting craftsmanship.

Take the logical next step in getting the most for your new-car money.

Try out the amazing "next ride" of this distinctive "next look" Studebaker.

Stop in at a nearby Studebaker dealer's showroom and go out for a convincing drive in a low-price Champion—a value-packed Commander—a special extra-long-wheelbase Land Cruiser.

New 1950 Studebaker

*Styled ahead and engineered ahead!*

You ride in deep-beded comfort—New balance of design and a brand new kind of coil spring front-end suspension!

You're money ahead on gas with a 1950 Studebaker because it has trim, sleek, aerodynamic lines—and the whole White background!

You don't roll back on upgrades—Automatic hill holder is standard on Commanders and Land Cruisers—extra White sidewall tires and wheel trim rings optional at extra cost.

You get trustworthy craftsmanship that's the pride of numerous Studebaker father and son teams. It's your as-
"That hammer? You're kidding!"

It's a fact, Bill. I've been using this same hammer for 29 years. It helped to build the house you were born in.

Well, I don't know how you do it. I hardly ever use a hammer, and yet I've broken two of them in the last year or so.

That so? What kind of hammers were they? What brand, I mean.

Gosh, I don't know. Guess they didn't have any brand names. But they were good bargains.

That's where the trouble is, Bill. Look ... see the name on this hammer? Whenever you see that brand name, you know it's a good hammer. Stick to the well-known, advertised brands when you buy tools, and in the long run you'll save a lot of money.

That makes sense, Fred. I'll remember it.

And do your buying at the hardware store, where they don't try to sell you anything but quality tools. That way you'll always get your money's worth.
NEW box-type frame rails have steel of greater thickness for increased rigidity. Five rugged cross members give torsional strength.

NEW shields on front brakes plus labyrinth seals between backing plate and drum on all wheels protect brakes from dirt and water.

NEW gas filler tube and cover...new non-spill vent tube that allows air to escape freely. Closed cover blends into body.

NEW one-piece torsional stabilizer, rubber mounted on lower control arms, and improved front suspension add to Ford's famous roadability.

NEW front end styling...new parking lights...new smart medallion...new "Air Foil" grille...new stronger bumper guards and bumper support arms.

ENGINEERING ADVANCEMENTS MAKE
FORD'S 100 h.p. V-8
QUIET AS A WHISPER!

NEW permanent-type lubricant on hand brake shaft assures continued easy operation. Smart new hardware—inside and out—adds new beauty.

NEW "Magic Air" heater control is clearly marked, compact, easy to operate and lighted for after-dark use. (*Magic Air" heater optional at extra cost.)

NEW defroster openings are 44% wider and air flow is 25% greater for wider vision in bad weather...new interior light switch mounted on instrument panel saves groping in the dark.

Dozens of other BIG features!
There's a Ford in your future... with a future built in!
this month’s cover

DAVE MINK, one of the country’s leading illustrators and cover artists, is never baffled by the locale of a cover scene. Last September (remember the big twin-hulled airplane?) he presented an enemy beach and the aqua-blue water found in the tropics. This month’s chilling cover takes you to an ice field in Alaska. The explosion in the distance shows what happens when curious scientists set off a charge of dynamite on the crust of a glacier. Seismic recording equipment in the foreground picks up echoes of the explosion. The time that elapses between the original explosion and reception of the reflected wave is used to figure the depth of the glacier. In this case, it was close to 2000 feet. Thomas E. Stimson’s article, which appears on page 148, tells why the Office of Naval Research is promoting expeditions for “Probing the Secrets of the Glaciers.”

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The SOUL OF THE UNIVERSE is in the air you breathe. Deposited in your blood—with each inhalation you take—is the intelligence that directs the course of the planets through the misty reaches of space, and the strange phenomenon of life itself.

What is it that causes your heart to beat, your lungs to expand and contract? What mind directs the cells of your being, each in their purpose—some to create bone, others tissue and hair? What consciousness pervades these vibratory globules of life and gives them awareness of their Cosmic function?

Are you one of the millions who have looked beyond yourself for some external Divine Power or agency? Have you searched in vain for some outer sign or word of Divine assurance when in doubt or in need? Now learn of the unsuspected power that exists in every simple breath—and that becomes part of you. The ancient Egyptians believed that the essence of life was borne on the wings of the air. The Bible proclaims that with the first breath man becomes not just an animated being—but a "living soul."

Try this experiment, and prove a Vital Life Force exists in the air. When you are in pain or despondent take a deep breath. Hold it as long as comfortable—then notice the momentary relief.

This Amazing Free Book
Would you seriously like to know how to draw upon this Intelligence of the Cosmic, with which the air is permeated? You can use it to awaken the creative powers of your mind, and for making life an experience of achievement. Use the coupon below for a free copy of the book, "The Mastery of Life." It tells how in the privacy of your home you may learn to use these simple, useful, natural laws.

--- USE THIS GIFT COUPON ---

Scribe Q. C. F. The Rosicrucians (AMORC)
Rosicrucian Park, San Jose, California

I am sincerely interested in learning how to use the mysterious influences of the universe in the betterment of my life. Please send me a free copy of the book, "The Mastery of Life."

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Use Aircraft Pyrol B for lubricating oil, Aircraft Pyrol A for gasoline.

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Not much of a home for their minister—so the congregation built a house from Popular Mechanics' plans

WE MIGHT have titled the story on page 92, "The Minister Moved Out of the Doghouse," for that's what happened. There was no place for Rev. Clinton Rutherford to live in his new parish except an oversized kennel until the congregation got together and built him a home from Popular Mechanics' plans. Alden Stahr, the author, tells us, "I still shiver when I look at that high-pitched roof—it fell to my

Stanley Schoelfield, Homewood, Ill., scanned hundreds of plans, then built this PM home for his bride

lot to put up the cornice alone and on the top of a long extension ladder in a high wind. Guess I'm allergic to such places ever since I walked over the edge of a roof while looking in the ground glass of my camera, a very foolish practice. Enclosed is a photo of the Rutherfords in front of our doghouse, where they lived before starting their Popular Mechanics house."

The minister's new home is only one of hundreds of homes built from the plans (Continued to page 8)
IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of $5,000 to $10,000?

An accountant's duties are interesting, varied and of real worth to his employers. He has standing!

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they can be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an accountancy position?

Just suppose you were permitted to work in a large accounting house under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems became complex—soon you'd master them all.

That's the training you follow in principle under the LaSalle Problem Method.

You cover accountancy from the basic Principles right up through Accountancy Systems and Income Tax Procedure. Then you add C.P.A. Training and prepare for the C.P.A. examinations.

As you go along, you absorb the principles of Auditing, Cost Accounting, Business Law, Statistical Control, Organization, Management and Finance.

Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success does come to the man who is really trained. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

Write For This Free Book

For your own good, don't put off investigation of all the facts. Write for our free 48-page book, "Accountancy, The Profession That Pays." It'll prove that accountancy offers brilliant futures to those who aren't afraid of serious home study. We'll also include "Ten Years' Promotion in One"—a book which has helped many men. Send us the coupon now.

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Miami 30, Florida

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Commercial Pilot
Engineering
A & E Combined with Commercial Pilot
Drafting & Design
Veteran
Non-Veteran

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TRAIN IN MIAMI--AIR CAPITAL OF THE WORLD.

and "How-to-Build" house book published following our story (April-May-June, 1947) of the young GI who built the house for his bride. One Palatine, Ill., man towed an abandoned frame schoolhouse five miles to his lot and used it as the basis for a P.M. house. Some of the others of which we've heard are pictured here.

Letter to the Editor

Dear Sir:

I have a collection of 1000 sketches of aircraft designs and inventions, most of which, I am sure, are patentable. I want to dispose of this collection and wonder if any of your readers would be interested in having them... free, of course!

Rene Charette,
213 Besserer St.,
Ottawa, Ont., Can.

First come, first served.

Sniff the packages around some food products and you'll find that they have pleasing aromas similar to their contents, reports Monsanto Chemical Company, which predicts that many more cardboard boxes soon will be chemically treated with agreeable odors.
No one goes into a job perfectly prepared. Sooner or later the "weak spots" are bound to show up. And when they do, the successful man is quick to recognize them, quick to fill them. International Correspondence Schools can help you get whatever training you may need. You have some 400 famous, spare-time I.C.S. Courses to choose from. Or, if you wish, brief "refresher" courses, advanced lessons, or special instruction combining one or more specific business or technical subjects can be tailored to fit your needs. The coupon below brings full information without obligation. Mark and mail it today!
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WHAT
Every Auto
Mechanic
Wants to Know

A motor vehicle is a machine of many parts, each part designed and constructed for its own special function. All good mechanics, like good doctors, should know the working theory and operation of each part and understand what causes trouble and how to remedy it.

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IT PAYS TO KNOW HOW TO

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MAKE EXTRA MONEY WHILE LEARNING

I show you how to earn $5, $10 a week, or more, in spare time fixing Radios. I send you parts to build the SET TESTER you use to do it. Frank Lutzsky, Cicero, Ill., above, one of my many students who earned while training, writes, "when I enrolled, I didn't know the difference between a power transformer and a condenser. Your outstanding course made a new, prosperous man of me."
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MAKE EXTRA MONEY
IN SPARE TIME

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I trained THESE MEN

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Five Roads to Doomsday

By Richard F. Dempewolff

UNDER a star-studded dome of blue sky, people gazed upward uneasily. Something was wrong with the solar system. The friendly, familiar moon had ceased to be friendly. Slowly, it was moving closer and closer to earth until, finally, an unfamiliar moon, huge and terrible, filled half the sky.

There was no beauty in the awesome spectacle. With the moon’s advance, ocean tides grew into mountains of water, spilling over continents, obliterating cities. Molten matter from deep under the earth’s crust, spewed from every crater and crevasse. Oceans atomized with hissing roars. Cities crumbled and were engulfed in a sea of liquid fire.

At last, with an astronomical crash, the moon itself exploded, unable to stand the tremendous gravitational pull. Roar after roar filled a reddened sky as thousands of moon fragments broke into thousands more. Captured by the earth’s gravitational sphere, these moon bits circled the dying planet like a halo—a weirdly beautiful ring of moonlets.

Scare fiction? Not at all. For years astronomers have believed that some day, billions of years hence, the moon will be pulled back to the earth. When it is, the end of the world will be assured—provided we have not met with some other major calamity in the meantime.

At the Hayden Planetarium in New York recently, thousands of visitors gasped as they watched the big Zeiss star projector portray the five astronomical catastrophes that sky scientists now think may befall us. High on the vast blue planetarium sky-dome our own particular star—the sun—
Our earth is hurtling straight toward this star cluster at 12.5 miles per second. There's plenty of room for us to pass through, though. Right, spectograph attached to telescope analyzes star composition and movement.

Suddenly did what more than 30 stars in the firmament do each year. It "blew up," releasing incredible amounts of heat and energy, under which the earth shivered in sudden, hot death.

Spectators shivered under the second possibility as they watched a dying sun go into a long period of cooling until Arctic chill gripped an unfamiliar earth. Ice began a death march down the mountains to erase all vestiges of life on a planet whose eventual chill achieved the sublime frigidity of absolute zero, or about minus 459.4 degrees F.

The third great disaster from the thousand-eyed projector involved a hit-and-run star from space colliding with our own sun, resulting in a superatomic explosion that destroyed our entire solar system.

Similar was the approach of a wandering comet toward the earth. Across the celestial stage it came, fiery tail growing bigger and bigger, catapulting under terrific speed until—whooooom! It collided with terrific impact against a shuddering world.

The fifth calamity, of course, was the return of the moon.

Of all these five roads to doomsday, planetarium astronomers have found that people fear most a collision of the earth or sun with another star.

The planetesimal theory, explaining the formation of our solar system, is based on the idea that our sun, once much bigger than it is now, collided with or came too close to another star billions of years ago, and that we and our neighbor planets are the result.

Actually, such a collision is the most remote of all the probable ends of the world. Why? Astronomers merely point to the roominess of our universe.

The universe is made up of billions of wispy saucer-shaped spirals known as galaxies. There's quite a bit of vacuum between them—hundreds of thousands of light-years, in fact. It takes the light from the nearest one 750,000 years to reach us. If it disappeared from the sky 749,999 years ago we wouldn't know it until next year.

Each of those wispy galaxies is made up of billions of stars. We live in such a galaxy somewhere off the center of the saucer.

What we call the Milky Way is the edge of our saucer, made up of stars some of which would put our own sun to shame. There's one called Antares that's so big we could put our sun in the center of it, include all our planets in their orbits around it, and Mars still would stay inside the rim of Antares. That star is almost 2.5 billion miles in diameter.

So, you can readily see that the stars in our galaxy—and any other galaxy—have plenty of space to operate without colliding. The star nearest our sun is Proxima Centauri—about 4.2 light-years away, or 25 trillion miles. If you still think there's a remote possibility of collision then you still have no idea of the immensity of space.
Imagine a couple of ping-pong balls 500 miles apart crashing into each other. That's about the proper scale to use for the sun and Proxima.

So the remoteness of our sun or earth sideswiping another star is very remote indeed. Besides, there'd be plenty of warning.

With great modern telescopes trained on the heavens, astronomers keep pretty fair track of what's in the road. We'd have quite a few thousand years to get busy colonizing another solar system.

Old-time astronomers had to use crude triangulation to tell star distances and movements. Today's professional stargazers use the spectrograph, a prismatic instrument through which the light of a heavenly body is passed. Chemical elements of the star cause the light to break down into specific colors. The color lines shift depending on whether the star is coming or going. With this neat gadget, astronomers have discovered that most galaxies are going away from us at a good clip. The spectrograph informs our astronomers that right now our sun-taking us with it—is moving toward the star cluster Hercules at a rate of about 12½ miles per second. If the sun should pile into one of these big stars (a few billion years from now at that snail's pace) we'd never know what happened. Hot pieces of both suns would fly off in all directions. Earth and all the planets would vaporize under the tremendous heat energy released, or else the sun would lose its gravitational grip on us and we'd go flying off into space.

What are the chances of cracking into a Hercules star? Very poor.

Dr. Lloyd Motz, of Columbia University, points
out that if our whole solar system suddenly scooted off through space it might even travel through whole galaxies of stars without getting appreciably close to a collision course. But, it could happen. Maybe.

What about the comet collision? From time immemorial people who have seen these mysterious bearded wanderers from space sweep in toward the earth have wondered what could prevent them from becoming trapped in the earth's gravitational field, and being pulled in to wreak terrible destruction. "A head-on collision between the earth and a comet is possible, though not probable," says Gordon A. Atwater, chairman and curator of the planetarium. "Comets have been known to pass within 100,000 miles of the sun, so they naturally had to pass a point where the earth might have been at the time."

If a runaway comet should hit the earth, it would be the least disastrous of the possible calamities. Though the head of a comet may be as big as the earth, it's not as dense. There'd be a crash all right and, as one planetarium astronomer succinctly put it, "It would be moving day for a lot of people." But star experts know that such a collision would create only local destruction. The concussion would be terrific. The earth would shudder in a worldwide earthquake. Surface heat of the comet's head, caused by friction as the body zipped
through earth's atmosphere, might start huge fires. Cities in the vicinity would be wiped out, but a lot of the world would be left.

Less remote roads to doomsday than those requiring celestial collisions may be paved by the antics of the sun and moon, according to the planetarium experts. The business of the sun becoming a nova would purely finish us off. What is a nova?

Old-time astronomers often noticed bright stars suddenly appear in the heavens. Now with super telescopes like the ones at Palomar and Wilson, astronomers may watch an average of about 30 a year. They're not new stars. They are stars that suddenly for no accountable reason, blow up —release tremendous amounts of heat and energy, then simmer down again to a normal glitter. Sometimes, a supernova will blow up completely and disappear. That is what the astronomers say might happen to our own sun some day. By complicated mathematical formulas they have been able to calculate the normal surface temperature of the sun at something like 11,000 degrees F. Inside, it's estimated at around 70,000,000 degrees. If the sun became a nova, that inside heat is what we'd get. People on the dayside of the earth would fry to an instantaneous crisp. Those on the nightside would never know what happened, for within 8½ minutes the entire world — and all our other planets with it — would be turned into nothing but a thin gaseous vapor.

Many astronomers laugh at this possibility, however. "Nobody needs to worry about the sun becoming a nova," says Dr. Motz of Columbia, "for the only novae recorded have been limited to blue-white, or exceedingly hot

(Continued to page 238)
Revolving Rubber Heel

An ingenious Long Beach, Calif., inventor has come up with a revolving rubber heel. A large circular section can be separated from the rest of the heel. In the center of the circle is a hard-rubber button which fits into a socket in the base structure, forming a suction and pivot, allowing the heel to revolve.

Trigger Lock

Guns are locked to prevent accidental discharge or unauthorized use by a cover that slips over the gun’s trigger guard. The push lock works like the one on the glove compartment of your car and can be locked with a key or simply latched in place to prevent accidental discharge. Made of aluminum, it is lightweight and provides a sure method of preventing accidents when guns are carried through underbrush or over rough country.

Fly Tier

Fishermen are given a “third hand” in tying a leader to a fly by a holder that fastens to the rod like a guide. When a new fly is to be fastened to the leader, the hook is inserted into the holder. The leader then can be knotted properly without fumbling.

Arithmetic Jigsaw

Mathematics may now seem more a pleasure than a problem to the students of Arvil Davis, Wichita Falls, Tex., schoolteacher. Davis has devised a puzzle method for teaching arithmetic to elementary-school pupils which works on the theory of an ordinary jigsaw puzzle, but uses numerals instead of pictures. The pieces are shuffled and the students are required to put the puzzle back into form. If the addition board is used, the piece of cardboard bearing the numerals 10 plus 7 will fit only beside the piece marked 17. The same method is used with multiplication, division and subtraction.
“Liquid Stone” Table Tops

Ornamental table tops, hard as stone and smooth as satin, are made in a home in Southern Pines, Ga. Mr. and Mrs. Bill White fashion the table tops and trays from a formula they developed themselves. Water is added to dry ingredients, including a base of oxychloride cement, to produce a “liquid stone” which is poured into molds. When the cement is partially set, Mrs. White “paints” a design with a putty knife and colors. The decorating substance is a powerfully adhesive viscose material. Later the design is sealed in with a lacquer which is impervious to sun and water.

White blends the ingredients with a baker’s mixer. Then Mrs. White stirs design material with kitchen mixer.
These are the shapes of tomorrow, weird products of the new gas jet era. They are tail-end views of eight of America’s jet airplanes.

Above, fish or fowl? Neither, but instead a rear look at the U. S. Air Force’s first three-jet bomber, the Martin XB-51. Two of its engines are below the wing and forward, while the third power unit is in the tail.

Below, acclaimed as the “world’s most powerful bomber” when it first flew, Northrop’s YB-49 jet flying wing has the equivalent of 32,000 horsepower. The 100-ton sky dreadnought spans 172 feet between the wing tips.

Below, airmen blink when this emerges in mid-air from the bomb bay of a B-36. The McDonnell XF-85 “parasite” fighter, only 15 feet long and 21 feet across, is moved in and out of its aerial hangar on a “trapeze.”
Right, a new look in aquatic shapes is offered by the Convair XP5Y-1 flying boat. Four turboprop units give it a top speed near 400 m.p.h.

Below, folding wings add to the Phantom's odd rear-end appearance. They also cut the plane's "width" down from 40 to 16 feet for more compact stowage aboard carriers. The McDonnell-built craft tops 500 m.p.h.

Below, despite its trim, fighter-like lines, the North American B-45 is a heavy bomber by World War II standards. For ease of maintenance the four jet power plants are ahead of the leading edge of the wing, paired off in single nacelles.

Left, this is a view most flyers get as they trail in the wake of North American's F-86, holder of the world speed mark. Below, Northrop built the X-4 to help research behavior of tailless, swept-wing aircraft designs in the extremely high-speed zones.
Radioactive Atoms Aid Study of Mice and Plants

Atomic scientists, using the atom as a tool to increase our knowledge of plants and animals, are experimenting with "bull's-eye" farming and mice that live in glass houses. In the plant experiment, crops are laid out in rings around a bull's-eye where radio-cobalt, a source of radiation, is placed. The radioactivity of the plants is measured after harvest and the scientists learn how far radioactivity extends and what happens to plants as the amount of radiation decreases. The mouse, with less privacy than a goldfish, is sealed in an all-glass cage and is fed food "tagged" with radioactive carbon. The metabolism cage collects exhaled air and other body excretions so that scientists can learn new facts about body functions.

Internal Wrenches

Socket-head screws are tightened and loosened quicker and with less effort when you have an internal wrench which can be used with standard socket-wrench drivers. Hard-to-reach screws are easy to get at because of the long shaft of the wrench. The handle-type base of the wrench is knurled to provide a sure grip even with oily fingers. The wrenches come in sets of five of varying sizes.

Inboard-Outboard Runabout

Rough water won't bother an outboard runabout that has a motor well in the stern, allowing greater freeboard at high speeds. The propeller unit of the motor projects through a notch in the bottom. This notch is carried up into the outer transom to allow the motor to tilt normally when beaching. Air chambers on each side of the motor well provide enough buoyancy to support the weight of the outboard should the boat ever be swamped. Designed for use on large lakes and ocean bays, the boat is sold complete or in kit form.
Big Vacuum Cleaner Harvests Grass Seed

Grass seed now is harvested by a huge vacuum cleaner which sucks the kernels off the fields. The machine, built by Otto Bohnert of Central Point, Ore., is mounted on two trailers. One carries the motor and blower and the second acts as a receiving hopper for the straw and seed. A revolving brush loosens the straw, which then is picked up by the four individual nozzles of the vacuum cleaner. About two acres can be vacuum cleaned in an hour with the equipment. A treated field is free of any straw, and seed recovery is 90 to 95 percent complete, according to Bohnert.

Stars “On the Air” 24 Hours a Day

There are stars broadcasting on the radio waves 24 hours a day, day in and day out, but you’ve probably never heard of them. They’re real stars, too, stars high in the heavens which broadcast short-wave radio noises that are picked up with special antennas. British scientists, who have been listening to these stars broadcasting, believe they are dim stars, too faint to be seen by the naked eye, although they are about as large as most visible stars. Two major sources of the radio signals and 23 smaller ones have been discovered by the radio astronomers. Electrons in the signal-producing stars have a motion corresponding to at least 10-billion electron volts, suggesting the possibility that cosmic rays originate in them.

Flip-Flop Bait Box Fools the Worms

When fish worms are carried in a new bait box, they can’t hide from the angler. The two parts of the box are hinged on one side and fasten with a snap catch on the other. When the box has stood open for some time, the worms crawl to the bottom. The box is closed and flipped over. When it is reopened, the worms are on top.
When the minister arrived with his bride there was no home for them—so the congregation and community had a house-building bee

By Alden Stahr
Photos by the author

Rev. Clinton Rutherford carefully studies Popular Mechanics’ "how to build" house book with his wife

We Built the Popular Mechanics

"Plenty of room for the baby," was verdict of the Rutherfords as they went over plans for two-bedroom house
WHEN Clinton Rutherford, our young minister, got married, he was worried about finding a place to house his bride. Since he came from Kentucky and his wife from Kansas there was no moving in with the folks—both places are a long way from New Jersey.

One day, when we were talking about the difficulty of finding a place to live I said jokingly, "If the worst comes to worse you might move into our kennel house!"

"It has come to that already," he said. "I've looked everywhere and can't find a thing to rent and I haven't money to buy."

Our dog house at Basking Ridge, N. J., isn't quite as bad as it sounds. It's a 10 by 30-foot prefabricated building which my wife's folks had used for dachshunds. It had a coal range, hot and cold water, and we had put in a small bathroom. Soon the men and boys of the Wildwood Church had scrubbed, Sheetrocked, painted and trimmed the inside, and the ladies put up curtains and painted, too. Since we had stored surplus beds and bureaus in the building, furniture was no problem.

The arrival of little David a year later made the kennel house inadequate because babies have a way of taking up more space than their eight pounds might indicate. Clinton (everyone, young and old, calls him by his first name) thought long and hard about his new housing problem. His church is a tiny nondenominational chapel which holds only 75 persons and it had no manse nor the means to build one.

The solution to the problem was simply a projection of the work which had been done on the kennel house. If the men and women of the congregation could do that job so well, perhaps they could build a house. Everyone was willing to try so the project was begun last summer, following a set of Popular Mechanics plans.

The excavating was begun late in July on land at Mendham, N. J., given by a church member, and the foundation was put up by a local contractor because it was felt that this basic operation should be done professionally. Actually, this was the slowest part of the whole operation for it took a month before the foundation was ready. Then late in August a crew of amateurs assembled one Saturday morning to try to make a house out of the great piles of lumber which was trucked up from Kentucky at a saving of 25 percent.

That first day most of the first floor beams were set in place and many a blister and sore muscle reminded the men and women and children how unaccustomed they were to this kind of work. An electric saw saved a lot of pushing, but carrying beams and driving nails are still good hard labor. From

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House for Our Minister

With a little professional help the congregation finished the house just before Christmas and the Rutherfords moved in. There are two unfinished rooms in the attic.
this time on almost all the work was done on Saturdays, the only time most of the congregation had free, and as many as 20 persons would be swarming over the building at one time. During the week, however, several of the ladies would show up to drive nails and carry lumber for Clinton, who worked on the house from early morning till bedtime when his other duties would permit. His wife, Bonnie, came down almost every day with little David, who lent urgency to the work.

It was a problem at times to find jobs for so many inexperienced hands. Several of the men had worked on their own homes so each of these would have a crew. At one time, for example, three boys were digging a water trench, girls were carrying rough floor boards, several women and a couple of men were nailing these down upstairs, three groups were working on the cedar side shingles and two groups were up on the roof putting on shingles. It was bedlam but everybody was happy and such activity is recommended to any congregation.

When the roof was on and winter approaching, a retired contractor in the neighborhood came to our rescue. He hired a plumber and an electrician and a man to finish the shingling. Clinton and an equally unskilled helper had built the chimney up to the roof in two days and our contractor friend got a mason to top off the chimney. He said he was doing this as a memorial to his wife.

Help came from other unexpected sources, too. The young people of the congregation voted to devote the Wednesday evening recreational program to helping with the house so they reported en masse week after week and worked with the aid of electric lights. The Church of Christ in New York City learned of the project and on many a Saturday five or six helpers from the city showed up for this labor of love. And members of a nearby Methodist church, too, volunteered to help.

Here five helpers are at work shingling the roof and working on the rear wall. More or less experienced men headed up the congregation's crews.
All these helpers made short work of putting up inside partitions and fitting and nailing up the lath, but we were deprived of the fun of dabbling in wet plaster. A real mason was hired to do the exacting job of plastering but he did it, sympathetically, for a reasonable fee.

The Rutherfords moved in just before Christmas and they and the helpers carried on with laying finished floor and hanging doors and putting on trim. The painting was done by the same amateurs and the first outside coat of white paint was applied with the permission of an unusually mild fall. The house is handsome and people have come for miles to admire its neat design and the "expert" craftsmanship with which it was put together. We were lucky to get it up with few mistakes and no accidents.

It's a light, capacious house with two bedrooms, bath, kitchen and living room on the first floor and expansion space for two more bedrooms upstairs. The big basement houses the car, heating system and plenty of room for workshop and laundry.

The Rutherford's house is a heartening example of what cooperation and the spirit of giving can accomplish and, as usual in such cases, those who gave, received as much in satisfaction and good fellowship as they contributed in time and labor. Clinton and Bonnie Rutherford, on their own behalf and for the church, have already thanked everyone concerned, both privately and publicly, but they asked me to express in this article, too, how grateful they are to all who helped.

The economic results were gratifying to everyone who had a part in the project. Several contractors have said that the $3000 cost is just half of what such a house would cost to build today by contract, and mortgages were obtained for the entire cost of construction and materials. Anybody got a house to build?
Partition Gives Submarine Effect

Spectators receive the illusion of looking directly into a group of small, beautiful submarine gardens when they view the collection of rare tropical fish owned by Fred Joerger, Hollywood motion-picture artist. All the glass tanks that hold the fish are concealed behind a partition of shaggy redwood bark and are viewed through irregular ports cut through the bark. The partition completely hides the wiring and plumbing required for maintaining the fish. Each tank is separately lighted from above. Hinged at one end, the partition may be swung out of the way to feed the fish, clean the tanks, and adjust water and air supplies.

Portable Saw Guide

Precision work can be turned out in less time and maximum safety with a new radial-arm saw guide. The guide is completely portable, making possible quicker job changes, and it is easily put into operation in less than five minutes. Among many other capacities, it crosscuts, bevel-crosscuts, miters, bevel-miters, rips, bevel-rips and notches. Using a saw with an abrasive disk, the guide will cut ceramics, marble or tile to all shapes and sizes without breakage. The maximum travel of the guide is 21 inches. It will cut any angle up to 180 degrees vertically and angles up to 60 degrees horizontally. The guide weighs 26 pounds without a saw and is available in many sizes.

Dirt and snow are kept out of the engine room of Electro-Motive’s latest diesel-electric locomotives by a system of forced filtered air that keeps the room under slight pressure.
IF YOU ARE emotionally normal, your favorite color likely is a particular shade of blue and your wife feels a strong attraction for magenta-red.

Your small children — given a choice — select bright-red toys. If you are a farmer, you prefer a great many colors other than grass green, but if you work in a steel mill, grass green likely is one of your favorites.

You may not realize it, but you probably find a strong-blue room depressing, a vivid-yellow room head-splitting, a bright-red room nerve-wracking and a leaf-green room boring.

These are just a few of the facts turned up by a recent spurt in color research. Surprisingly, the theory that colors have a profound influence on human beings hasn't been given broad recognition until the past few years. Now psychologists, probing colors and their relation to people, have discovered some facts that can make anyone's life happier and more useful.

Among the foremost of these pioneering authorities on color is Louis Cheskin, technical director of the Color Research Institute of America. He has tested the reactions of thousands of persons to thousands of colors. He's a plain-speaking young man who can tell your wife exactly what color her dress should be to flatter her figure. More important, he can tell you what colors to paint or paper your walls in order to tune them to your particular way of life.

Cheskin's research has demonstrated that each color has an individual personality. He feels it's extremely important that the personalities of colors in the home match the personality of the homeowner. Otherwise, a home can become a place to escape from instead of a haven of relaxation. Emotional stability depends mostly on environment, of which color is one of the most important elements.

The spectrum specialist points out that cool colors of the green-blue families are sedatives—they provide excellent relaxation for nervous persons. On the other hand, the warm colors of the red-yellow families provide stimulation for persons who tend to be melancholy and morose.

Once Cheskin painted two adjoining walls of a living room a cool green-blue. The two walls that formed the opposite
Only two main colors—complementaries—plus their tints, tones and shades are used in decorating each room of this small home. Color plan would fit high-spirited young couple. Below are drawings of same room decorated to fit three different couples.

corner he painted a warm peach. Except for color, he furnished each of the two corners with identical furniture. When preparations were completed, he invited a married couple to visit. The husband disliked social life and tended to withdraw into himself. The wife, on the other hand, was lively and full of fun.

When the husband and wife entered the test room, they walked about for a minute or two. Then like well-directed robots they walked to opposite corners and sat down, the husband in the corner decorated with warm colors and the wife in the shadow of the cool blue-green.

"See?" says Cheskin. "They subconsciously chose the colors that were good for them—colors that complemented their personalities."

In a series of tests in the room, nervous people inevitably chose the cool corner and quiet persons the warm corner.

Cheskin has made a science of determining color preferences. He uses a Holland graphometer, similar to a lie detector, to determine the reaction of an individual to a particular color. Flash a hue that the person dislikes in front of him and the pen on the graphometer will wave like a pendulum. One surprising fact that Cheskin has learned is that frequently people will think they like a certain color, whereas they actually may detest it subconsciously.

He once ran a preference test with 85 women. Cheskin showed them six different kerchiefs and asked them which color they preferred. A great majority—68 women—chose the same color. Later Cheskin diverted their minds from the kerchiefs, then at the end of the test told the 68 women to take home a kerchief as a reward. When the women had cleared out, a tally showed that only 9 of the 68 actually had

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These colors and furnishings are tailored to a middle-aged couple. Cool walls give them relaxation in evening. Circled colors are the hues used plus one tone. Family of complementaries always pleases

† Some room decorated and furnished this way would fit young people who do much entertaining. Red rug, draperies provide stimulation. Below, restful color scheme with cool blues fits an older couple.
chosen the color for which they had voted. The color expert will come right down to earth in discussing colors for the home. He points out that colors take up no room, and correct colors are no more expensive than inharmonious colors.

Before he’ll make any recommendations, he insists that everyone should know the meaning of certain confusing color phrases. Here are the basic definitions:

**Primary colors** of paint pigments are green-blue, magenta-red and yellow.

**Hues** are the primary colors and their mixtures.

**Tints** are hues plus white.

**Shades** are hues plus black.

**Tones** are hues plus both black and white.

Combining primaries in varying proportions, therefore, produces an infinite number of hues. Adding black, white or both to any hue produces an infinite number of shades, tints or tones. Cheskin has developed a popular color system which has 4800 colors based entirely on the three primaries plus white and black. Gradations finer than that number of colors, he says, can’t be differentiated by the human eye.

Anyone who learns the fundamentals will be able to decorate his home in colors that will be as pleasing as punch, according to Cheskin. His major rule is this: Use only two complementary colors in decorating a room.

He quickly points out that a room in which only two colors appear might become tiresome. But books, pictures and other furnishings will provide countless spots of color. Cheskin’s idea is that only two colors should predominate. For example, paint or paper your walls the complementary hue of the rug. Then use draperies, lamp shades, vases and other small items that are the hue of the rug, but lighter or darker.

Each hue, of course, not only has its mate
— the complementary — but it fathers an entire family. Every tint (the hue plus white), every shade (the hue plus black) and every tone (the hue plus black and white) will fit into this color scheme. If your rug is a shade of yellow (brown, tan or beige), make the walls blue; if the rug is a shade of red, make the walls green. But instead of putting brilliant colors on the walls, use a delicate tint, tone or shade.

“The ideal combination,” says Cheskin, “is a deep tone with a complementary light tone or tint—or a shade with a complementary light tone or tint.”

There’s a sound scientific reason why it is as natural for humans to like complementsaries as it is for them to walk upright. Any color absorbs part of the white light striking it and reflects the rest. It is this reflected light which determines the color we see. The complementary color reflects the remainder of the spectrum. The total effect is a complete reflection of white light in the room but not from one source. And because the eye is accustomed to see in white light, the result is pleasing.

Now Cheskin sounds one warning. Complementsaries provide the most vivid possible contrast, and in their purest tones will vibrate. Therefore, Cheskin recommends that the woodwork in the room be painted a white or off-white, which will provide a separation between the two. Complementsaries work as highly-efficient partners as long as there is a third, neutral person in the vicinity.

Providing some concrete suggestions, Cheskin recommends that the home dweller who is about to redecorate a room determine what is his most important and valuable furnishing—the one item he can’t afford to change or doesn’t want to change. Often this will be the rug. Color the walls in a complementary tone of that furnishing. Duplicate the color of that valuable piece, only in purer tones, in the upholstery, draperies and lamp shades. Such things as pictures and vases, in the purest tones, can provide bright spots of color.

Ceilings, he says, should be pure white to reflect the greatest amount of light.

Cheskin realizes it usually is too expensive to wipe the color slate clean by changing or eliminating many expensive furnishings. So he recommends that a family design a balanced diet of color for the entire home, and then gradually work toward
COLOR-TUNE YOUR LIVING ROOM

The 14 colors just beneath the questionnaire on page 100 are arranged in complementary pairs. Most of them are shades, tints or tones of pure hues.

1. Choose the color which is closest to the hue of your rug. Then start with its complementary, which is just above or below.
2. If your favorite color is the same as the rug, drop the complementary and use a tint, tone or shade of the rug. Make other furnishings complementary. But if the hue of the rug is not your favorite color, then retain the complementary for a moment.
3. If this complementary hue is disliked strongly, drop it and return to the hue of the rug. Otherwise retain it.
4. If any member of the family becomes easily depressed, take another look at the color you now have in mind. If it is a shade of green, blue or violet, then switch to its complementary to pep you up. Otherwise retain the same color.
5. If the color you have in mind is a shade of red, orange or yellow, and if any member of your family is exceptionally nervous, then switch to the complementary to provide relaxation. Otherwise retain the same color.
6. You now have determined a color that will look well on your walls. Use a tint, tone or shade of this hue. If your light is north, use a tint. If it’s south, use a shade. If east or west you can go either way.
7. If your room is small, add white to the final color. If it’s large, add a little black.

Chart shows colors which most men and women prefer. For example, more men will accept color at top left in their surroundings than any other color that master plan as a goal. New furnishings then can be bought with an eye toward the ideal color scheme.

At this point the personalities of the family members and the use for each room should be analyzed.

Consider the living room first. It should provide relaxation for the entire family, but at the same time should stimulate discussion and play. If your family is inclined to be quiet, to entertain little, Cheskin recommends a warm color to pep you up. Therefore, the walls of your living room could be a shade of any of the warm red-yellow colors such as peach or rose.

If, on the other hand, your family is creative even in its hours of relaxation, if some of the members are nervous and high-strung, Cheskin recommends any of the sedative colors of the green-blue family. Or, you can use the warmer colors but in very delicate tints or tones that won’t be overstimulating.

As the bedroom is a place of rest, it should be decorated in cool, serene colors that will not hinder the occupants’ desire for relaxation. Shades and tones of green, turquoise and blue are ideal, although shades of red may be satisfactory for younger people.

Kitchens, on the other hand, are designed for work and should stimulate the housewife. Cheskin guarantees any husband more cakes and pies if he’ll redecorate his kitchen in bright peach, yellow-orange, red, or any color with red in it. In the kitchen, of course, it is the linoleum, dishes, clocks and flowerpots that can provide the complementary color.

Tots aren’t impressed a bit by baby blues and delicate pinks. The child recognizes pure, bright hues first, and it is these colors that appeal most to him. As a possible color combination for the nursery, Cheskin suggests a deep peach for the large walls, a blue-green for the narrow walls, a peach, gray and blue-green rug, natural furniture and a toy chest in bright red.

North light (light which is not direct sunlight, such as that which comes in a north window) and fluorescent light will increase the depth of any color and make it appear slightly more blue. Direct sunlight, which contains much more orange and red, makes walls appear brighter and warmer. An incandescent bulb has a maximum of red and can change the color of the wall greatly.

Deep, warm tones always give the impression of nearness; light, cool tones seem distant. Therefore a long, narrow room can be made to appear shorter and wider by using a warm color on the narrow, distant walls and a cool tone on the side walls. For the same reason, a red-tinted room

POPULAR MECHANICS
Cheskin uses graphometer—similar to a lie detector—to check subject's reaction to hues flashed on a screen.

Cheskin has worked with a paint manufacturer to develop an entirely new paint system. It is based on Cheskin's development of three primary pigments, each of which reflects exactly two thirds of white light. Mix the three pigments in equal amounts and you'll get black.

Today, if you walk into this type of paint store, you will find only these three colors plus a large supply of white paint and some black on the shelves. You'll look over the color chart and choose the particular color you want. Then, the dealer will give you

Graph shows reactions of three people to six colors. Note strong reaction of normal person to yellow. Melancholic person has no violent reaction to any color. Nervous person is affected most by reds and yellows.

appears smaller than a blue-tinted room. Tints, in general, lend spaciousness. And you'll definitely feel cooler in a blue room, warmer in a red room.

A light rug with dark furniture or a deep-colored rug with light wood produces a dramatic effect which is pleasing.

He suggests that the family of average means depend on small, inexpensive objects to accomplish color harmony by providing a complementary hue. Low-cost yard goods, a new lamp shade, a vase in a prominent place can do wonders.
Cheskin's system permits anyone to mix paint to match a color chip. Just follow the recipe, adding measured amounts of pigments to white-paint base white paint plus one or more of the primaries. He'll also provide you with a recipe.

You take the paint home and read the recipe. It says to add a four-ounce can of yellow pigment and a four-ounce can of red pigment to a gallon of white paint. As six teaspoons equal one ounce, you easily can measure out any specific amount. Mix it well and you'll come up with exactly the same color of peach as the paint chip. Even a color-blind person can do it.

Now suppose six months later you want to paint a new bookcase the identical color of the walls. If you had mixed the paint by the old system of "adding pigment until it looks good," you'd never be able to duplicate the color exactly. Under the Cheskin system, all you do is take your color specification back to the paint store. The dealer again will provide the necessary ingredients. Stir up another batch and you'll find that you have produced a perfect twin for the color on the wall.

Cheskin sounds one last warning to the family planning to redecorate. Don't use any color which is disliked by any member of the family. Once a man came to Cheskin who had a violent dislike for deep blue and became almost speechless whenever he was near a man wearing a deep-blue suit.

A psychologist as well as a color expert, Cheskin asked the man a good many questions. Among them—"Were you ever in serious trouble as a child?"

"Well," said the patient, "the only time I ever caused any trouble was when a pal and I swiped some apples and were caught by a cop."

"What was the reaction of your family?" asked Cheskin.

"They were mortified. So embarrassed my father even considered leaving town."

"What did the policeman do to you?"

"Put us in jail for several hours." As the man recalled his experience, he became so nervous that he had difficulty speaking.

"Do you remember the color of the officer's uniform?"

"Deep blue," said the man. As soon as he spoke, he realized why deep blue made him so uncomfortable. Once he had discovered the reason for his aversion, he no longer felt uncomfortable in the presence of the color.

That, says Cheskin, is pretty good proof why anyone should follow his color recommendations only to a certain point.
"Litter Blisters"

Two patients are accommodated fore and one aft in "litter blisters" in a new Sikorsky helicopter used by Air Force rescue squadrons. The litters are placed crosswise in the pontoon-equipped aircraft, after loading through side hatches either by hand or by winch power. Only the two patients forward are accessible to the medical attendant, the only crewman aboard the craft other than the pilot.

Reducing Suits

Horses, as well as overweight humans, can trim off pounds by sunning in a plastic "silhouette" suit. Jockeys say it helps them reduce as much as five pounds in an hour.

Sources of available products described in this issue are listed on pages 10, 14 and 18. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT INDEX, which is available without charge from Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11
FOR a house-to-house canvass that will make all the brush salesmen in the world look like an army of pikers, wait until you see the one that gets under way April first. Yup, it's time for the 1950 decennial census, Uncle Sam's national inventory of noses—the biggest quiz show, most mammoth tabulating phenomenon and most accurate poll in history.

It's a job that has taxed the ingenuity of a harried Census Bureau every zero year since 1790. At that time 17 U. S. marshals and 600 assistants knocked on colonial doors, asked five questions of whoever answered, then tacked their lists on the walls of local taverns, so that people who'd been skipped could add their names or Xs when they dropped by for a flagon of ale. Results were mailed to the President.

The job has grown a little more complicated since 1790. This year, 140,000 hurried but polite "enumerators" will scour the country armed with pencils and paper forms measuring about two by three feet. They must ring some 45,000,000 doorbells, ask 60 or 70 questions and tally data on an estimated 150,000,000 people; all in two weeks.

To accomplish the staggering job, the Census Bureau has divided the country into 14 regions. Each region is divided and subdivided into about 14,000 "enumerating districts." Census supervisors will man about 450 field offices. It's going to take 90 mail cars to haul supplies to those offices, and when the quiz is over, completed schedules will go to Washington in 60,000 boxes.

This year, census takers will have some new tools to help them with their great American man hunt. For years, Air Force and Department of Agriculture planes have been zooming across the country taking vertical aerial photographs of every nook and cranny of the U.S.A. Already these maps have helped farmers with their contour plowing and reclamation work. Now they're going to help the census taker. For the first time in history, the roving statistician will have a real picture of his territory, showing every road, stream, shack and shanty in the area.

All last year, up in the darkroom of the census map division, geographers were busy preparing about a million of these and other diagrammatic maps for the field workers. Many of the aerial shots have been used to make diagrammatic maps of obscure places. Census geographers project the aerials through a monster machine to scale. An operator traces the projection,
It would take the lifetime of 500 persons to do the job this machine will accomplish during the census. It counts, classifies and edits dwelling, roads, waterways, bridges and boundaries. Out goes the finished sketch to blueprint machines, or an Ozalid printer that reels off duplicates at a rate of about 20 a minute.

The Ozalid's four-foot-wide ribbon of paper takes two maps across. For a while, men stood at the end of the machine with great shears, snipping the endless sheet up the middle, and across, as each pair of maps came out. They tore a lot of maps with their double-barreled snipping. Then one smart opera-

tor rigged a crossbar over the drums. In the center, he hung a razor blade on an arm. Now the boys just snip the sheet across; the razor slits it down the middle between the maps, as it reels off the drums.

Importance of maps to an enumerator cannot be underestimated. Boundaries change from year to year. Rivers change course each year—especially the Mississippi, which continually builds new islands and inundates old ones. Suddenly an island belongs to the state on
the other side of the river; both states claim it, or perhaps neither. If people live on it, the census takers never know what state they belong to, or which enumerator’s responsibility they are.

So, this year, each census taker will have a diagram map or aerial photo of his exact district. There will be no overlaps or misses. He may find some new houses and roads, but the hunt will be lots easier.

Even with good maps, the census-taker’s job is no dream. Temporary trailer cities spring up and disappear overnight. There’s a tremendous population of gypsy-minded Americans living in tin and box-board “jungles” who are here today and gone tomorrow. Grizzled prospectors in the desert won’t hold still for counting. Nor will the shepherds on the wind-chilled plateaus of the Rockies, hermits living in wilderness caves, or the hoboes on boxcars in remote sidings. Yet, the enumerators must get them all, and they will.

Ex-schoolteachers, retired businessmen, widows are the people who do the nose-counting. Whatever their civilian calling, they all must have a spirit of adventure. Ten years ago, months before the counting was to begin in the states, Bill Arends, assistant to the Alaska supervisor, set out across the frozen tundra by dog sled to count Eskimo noses in the bleak regions above the Arctic Circle. His job was completed by the time the 1940 census got under way in the U.S. proper. His counterpart for the 1950 census is already on his way and will have his job done by the time you read this.

Down in the Florida swamps and the Mississippi Delta country, enumerators will have to ferret out Indian villages and wandering muskrat trappers, deep in the jungle bogs. They’ll pole their way through tangled cypress roots in long, thin pirogues which, says one government pollster, “are just stable enough so that if you hold your cigarette square in the middle of your mouth, you may not tip over.”

Their tired cars will climb to the heart of wilderness mountains at 10,000 feet elevation, and steam across the parched floor of Death Valley, 200 feet below sea level. They’ll be battered by hurricanes, whipped by blizzards. They’ll bog down in swamps and blow tires miles from civilization. They’ll meet high adventure at every turn, like the fellow tabulating lumber camps in the Northwest. He was caught in a raging forest fire and had to sit neck deep in a creek for a whole day while searing flames swept over his head. Every time a good blast of flame came through, he’d duck his
Aerial maps are used to help census taker with his work. Maps are projected by this machine to scale.

Scaled aerial maps roll off duplicating machine in pairs. Razor blade on center arm slices the paper.

Holding clothes and papers aloft in one hand, census taker swims icy stream to reach old prospector head under, and keep it there for a spell.

Census takers have done some incredible things in the line of duty. To get across an impassable gorge and tabulate workers in an ore mine, one enumerator rode over to the tipple in a glorified breeches buoy, dangling from cables 1000 feet in the air. Another swam an icy river with one hand, holding his clothes and papers aloft in the other, to quiz an old prospector who was too busy panning gold to quit for a moment and row across in his boat. Then, there was a lady census taker who climbed a 70-foot chimney to question a steeplejack who whimsically refused to come down.

In the course of their rounds, some roving compilers will find themselves as did enumerators in 1940, serving as midwives in delivering babies. Others will stagger home in tatters from encounters with dogs, billy goats, angry bulls, bears and peculiar people who, in spite of this enlightened age, still think the census taker is something akin to a member of the OGPU, out to grab all their belongings for the "State."

A tough job? You haven't heard half of it. When the field reports are complete by April 15, the real work starts. In the big white Census Bureau building in Suitland, Md., thousands of people will spend two full years checking, editing, coding and tabulating data on the 150 million people in the United States. By December 31, 1952, the job will be finished and printed in more volumes than an encyclopedia. No one knows how many books will be filled by the 1950 census, but the last one came to 80 volumes, filling three five-foot bookshelves.

To help them, census employees have the fanciest collection of complicated machinery the mind of man has been able to devise. The mechanization started in 1890,

(Continued to page 260)
Low-Pressure Tunnel To Test Rockets

High-altitude flight conditions are simulated in a new faster-than-sound, low-pressure wind tunnel developed at the University of Michigan. The “ionic wind tunnel” will be used for experiments with high-speed rockets and other high-altitude apparatus. It produces a flow up to 10 times faster than sound by means of an electric arc generated between a copper cylinder and a surrounding copper ring.

Jeep and Elevator Fly With Liftmaster

Part of the standard equipment of the Douglas Liftmaster, a new commercial cargo transport, is a Jeep and an elevator. The 4000-pound-capacity power lift easily handles the 2175-pound vehicle and its driver. A special adapter enables the Jeep to be driven aboard the truck-bed level of the elevator. With a top flying weight of 100,000 pounds and a cruising speed over 300 miles an hour, the Liftmaster was developed from the DC-6 airliner.

Stick of Screws

Screws made in one-piece “sticks” can be installed as fast as the operator can aim the driver. The head end of each screw is joined to the thread end of the following screw, making a stick which is inserted in a pneumatic driver. As each screw is driven home, the joining neck breaks and the next screw is automatically advanced. The head of the driven screw is burnished by the next one to be driven. The screws are uniformly tightened because the size of each neck is the same. The screwsticks, available in various sizes, can also be used in electric, spiral or hand ratchet drivers.
You'll eat food from sawdust ...

You'll cook by solar heat, shop by television in the world just around the corner.

Drop in by rocket plane on Totten-ville, the sootless garden city where you'll live in scientific comfort in A.D. 2000.
IN THE NEXT FIFTY YEARS

By Waldemar Kaempffert
Science Editor, The New York Times

WHAT WILL the world be like in A.D. 2000? You can read the answer in your home, in the streets, in the trains and cars that carry you to your work, in the bargain basement of every department store. You don’t realize what is happening because it is a piecemeal process. The jet-propelled plane is one piece, the latest insect killer is another. Thousands of such pieces are automatically dropping into their places to form the pattern of tomorrow’s world.

The only obstacles to accurate prophecy are the vested interests, which may retard progress for economic reasons, tradition, conservatism, labor-union policies and legislation. If we confine ourselves to processes and inventions that are now being hatched in the laboratory, we shall not wander too far from reality.

The best way of visualizing the new world of A.D. 2000 is to introduce you to the Dobsons, who live in Tottenville, a hypothetical metropolitan suburb of 100,000. There are parks and playgrounds and green open spaces not only around detached houses but also around apartment houses. The heart of the town is the airport. Surrounding it are business houses, factories and hotels. In concentric circles beyond these lie the residential districts.

Tottenville is as clean as a whistle and quiet. It is a crime to burn raw coal and pollute air with smoke and soot. In the homes electricity is used to warm walls and to cook. Factories all burn gas, which is generated in sealed mines. The tars are removed and sold to the chemical industry for their values, and the gas thus laundered is piped to a thousand communities.

The highways that radiate from Tottenville are much like those of today, except that they are broader with hardly any curves. In some of the older cities, difficult to change because of the immense investment in real estate and buildings, the highways are double-decked. The upper deck is for fast nonstop traffic; the lower deck is much like our avenues, with brightly illuminated shops. Beneath the lower deck is the level reserved entirely for business vehicles.

Tottenville is illuminated by electric “suns” suspended from arms on steel towers 200 feet high. There are also lamps which are just as bright and varicolored as those that now dazzle us on every Main
Street. But the process of generating the light is more like that which occurs in the sun. Atoms are bombarded by electrons and other minute projectiles, electrically excited in this way and made to glow.

Power plants are not driven by atomic power as you might suppose. It was known as early as 1950 that an atomic power plant would have to be larger and much more expensive than a fuel-burning plant to be efficient. Atomic power proves its worth in Canada, South America and the Far East, but in tropical countries it cannot compete with solar power. It is as hopeless in 2000 as it was in 1950 to drive machinery directly by atomic energy. Engineers can do no more than utilize the heat generated by converting uranium into plutonium. The heat is used to drive engines, and the engines in turn drive electric generators. A good deal of thorium is used because uranium 235 is scarce.

Because of the heavy investment that has to be made in a uranium or thorium power plant, the United States government began seriously to consider the possibilities of solar radiation in 1949. Theoretically, 5000 horsepower in terms of solar heat fall on an acre of the earth's surface every day.

Because they sprawl over large surfaces, solar engines are profitable in 2000 only where land is cheap. They are found in deserts that can be made to bloom again, and in tropical lands where there is usually no coal or oil. Many farmhouses in the United States are heated by solar rays and some cooking is done by solar heat.

The first successful atomically driven liners began to run in 1970 after the U. S. Navy had carried on many expensive, large-scale secret experiments. Outwardly the liners are not much different from the Queen Mary and Queen Elizabeth, but they have much more cargo and passenger space because it is no longer necessary to carry about 12,000 tons of fuel.

The metallurgical research that makes the gas turbines in the power plants and in the trans-Atlantic liners possible has influenced both civil engineering and architecture. Steel is used only
In 2000, rocket passengers may arch through space from New York to San Francisco in less than two hours.

for cutting tools and for massive machinery. The light metals have largely displaced it. Ways have been found to change the granular structure so that a metal is ultrastrong in a desired direction and weaker in other directions. As a result, the framework of an industrial or office building or apartment house is an almost lace-like lattice.

Thanks to these alloys, to plastics and to other artificial materials, houses differ from those of our own time. The Dobson house has light-metal walls only four inches thick. There is a sheet of insulating material an inch or two thick with a casing of sheet metal on both sides.

This Dobson air-conditioned house is not a prefabricated structure, though all its parts are mass-produced. Metal, sheets of plastic and aerated clay (clay filled with bubbles so that it resembles petrified sponge) are cut to size on the spot. In the center of this eight-room house is a unit that contains all the utilities—air-conditioning apparatus, plumbing, bathrooms, showers, electric range, electric outlets. Around this central unit the house has been pieced together. Some of it is poured plastic—the floors, for instance. By 2000, wood, brick and stone are ruled out because they are too expensive.

It is a cheap house. With all its furnishings, Joe Dobson paid only $5000 for it. Though it is galeproof and weatherproof, it is built to last only about 25 years. Nobody in 2000 sees any sense in building a house that will last a century.

Everything about the Dobson house is
synthetic in the best chemical sense of the term. When Joe Dobson awakens in the morning he uses a depilatory. No soap or safety razor for him. It takes him no longer than a minute to apply the chemical, wipe it off with the bristles and wash his face in plain water.

This Dobson house is not as highly mechanized as you may suppose, chiefly because of the progress made by the synthetic chemists. There are no dish-washing machines, for example, because dishes are thrown away after they have been used once, or rather put into a sink where they are dissolved by superheated water. Two dozen soluble plastic plates cost a dollar. They dissolve at about 250 degrees Fahrenheit, so that boiling-hot soup and stews can be served in them without inviting a catastrophe. The plastics are derived from such inexpensive raw materials as cottonseed hulls, oat hulls, Jerusalem artichokes, fruit pits, soy beans, bagasse, straw and wood pulp.

When Jane Dobson cleans house she simply turns the hose on everything. Why not? Furniture (upholstery included), rugs, draperies, unscratchable floors—all are made of synthetic fabric or waterproof plastic. After the water has run down a drain in the middle of the floor (later concealed by a rug of synthetic fiber) Jane turns on a blast of hot air and dries everything. A detergent in the water dissolves any resistant dirt. Tablecloths and napkins are made of woven paper yarn so fine that the untutored eye mistakes it for linen. Jane Dobson throws soiled “linen” into the incinerator. Bed sheets are of more substantial stuff, but Jane Dobson has only to hang them up and wash them down with a
are bought by chemical factories to be converted into candy.

Of course the Dobsons have a television set. But it is connected with the telephones as well as with the radio receiver, so that when Joe Dobson and a friend in a distant city talk over the telephone they also see each other. Businessmen have television conferences. Each man is surrounded by half a dozen television screens on which he sees those taking part in the discussion. Documents are held up for examination; samples of goods are displayed. In fact, Jane Dobson does much of her shopping by television. Department stores obligingly hold up for her inspection bolts of fabric or show her new styles of clothing.

Automatic electronic inventions that seem to have something like intelligence integrate industrial production so that all the machines in a factory work as units in what is actually a single, colossal organism. In the Orwell Helicopter Corporation's plant only a few trouble shooters are visible, and these respond to lights that flare up on a board whenever a vacuum tube burns out or there is a short circuit. By holes punched in a roll of paper, every operation necessary to produce a helicopter is indicated. The punched roll is fed into a machine that virtually gives orders to all the other machines in the plant. The holes in the paper indicate exactly how long a

Housewives in 50 years may wash dirty dishes—right down the drain! Cheap plastic would melt in hot water.

reamer is to smooth the inside of a cylinder, just when a stamping machine is to pass a sheet of aluminum along to its neighbor with orders to punch 22 holes in indicated places. There are mechanical wrenches that obediently turn nuts on bolts and stop all by themselves when the bolts are in place, shears that know exactly where to cut a sheet of metal for a perfect fit. Every

Inches-deep lake on roof already cools Southern homes and may become important air-conditioning method.
Because everything in her home is waterproof, the housewife of 2000 can do her daily cleaning with a hose operation in the plant is electronically and automatically controlled.

One of the more remarkable electronic machines of 2000 is a development of one on which hundreds of thousands of dollars had been spent in the middle years of the 20th century by Dr. Vladimir Zworykin and Dr. John von Neumann. The purpose of this improved Zworykin-Von Neumann automaton is to predict the weather with an accuracy unattainable before 1980. It is a combination of calculating machine and forecaster. The calculator solves thousands of separate equations in a minute; the automatic forecaster carries out the computer’s instructions and predicts the weather from hour to hour. In 1950, meteorologists had no time to deal with the 50-odd variables that should have been mathematically handled to predict the weather 24 hours in advance.

Following suggestions made by Zworykin and Von Neumann storms are more or less under control. It is easy enough to spot a budding hurricane in the doldrums off the coast of Africa. Before it has a chance to gather much strength and speed as it (Continued to page 264)
Plastic Umbrella
For Traffic Cop
Traffic officers in Rome, Italy, don't worry about rainstorms. They are equipped with a rainproof pedestal that is rolled out into the street intersection. A plastic umbrella keeps them dry on wet days and a shield, also plastic, around the base of the pedestal protects them from splash.

Motorcycle Skis
Motorcyclists now have a new sport—"ski cycling" over ice and snow. A broad, short ski fastens to each side of the motorcycle frame. It is held at the correct level by springs which absorb the shock as the ski runs over the snow surface. As the wheels are slightly lower than the skis, they still provide traction.

Mechanical Cow
Up in Whitehorse, the largest settlement in the Yukon Territory, children get their milk from a mechanical cow. Actually, the machinery works in reverse—it churns milk stock, pure water and butter back into rich milk. The water is heated to 100 degrees Fahrenheit and the milk stock added. Then the mixture is brought to a boil and butter mixed in at a temperature of 145 degrees. Electric heaters churn the mixture for a half hour, when it is homogenized and passed over the corrugations of the cooler where the temperature is dropped to 30 degrees. The result is a smooth and creamy milk. The mechanical cow produces milk at 30 cents a quart, compared to the former cost of 75 cents a quart for milk shipped to Whitehorse.

World production of commercial fertilizer has reached an all-time record high with 11,500,000 tons.

FEBRUARY 1950
World's Largest Airplane Service Dock at Miami

Quick, easy access to every inch of the biggest transports is afforded by the world's largest airplane service dock, now in use at Pan-American World Airways' Miami overhaul base. Fabricated in five major sections, the 75-ton dock is rolled into position around the plane after it has been towed into the hangar. The under-wing ramps, engine stands and lower parts of the four-story tail stand are mounted on retractable wheels. The upper sections and the catwalks fitting against either side of the fuselage are suspended on a monorail system in the roof girders. A nine-station "intercom" permits the foreman to contact workers at other levels and positions.
Skis for Navy's Arctic Plane

Aluminum skis, 16 feet long, are the newest additions to Navy P2V Neptunes, largest combat aircraft fully equipped for arctic operation. They fit over the wheels of the regular tricycle landing gear. Retractable in flight, the skis are tucked inside a fairing beneath the engines and at the nose to reduce in-flight drag. The plane also has special radio and radar for use near the magnetic poles.

Flexible Refrigerator Bag Carries Fisherman's Catch

Anglers can bring home their catch in good condition inside a flexible refrigerator bag which requires a minimum of storage space. When not in use, the bag folds small enough to fit into the glove compartment of a car. Made of waterproof fabric, it has a zipper opening for inserting ice and fish. A rubber tube leading from a drain in the bottom of the bag carries off water, keeping the contents as cold as possible at all times. The bag also can be used to carry beverages and foods for campers. It has a capacity of more than $2\frac{1}{4}$ cubic feet.

"Grass Skirt" for Fishing Plugs

More action from any treble-hook fishing lure is assured by a "hula skirt" that can be clipped instantly in place. The skirt has been permanently attached to several baits for years, but now is available as an accessory for other lures. Made of rubber, it has 20 individual tails and is manufactured in 11 colors.

According to scientific theory, the planet Jupiter consists of a core of metal and rock about 37,000 miles in diameter, surrounded by a layer of ice 17,000 miles deep.
By Alfred Eris

An Egyptian!" The FBI agent drew back, startled. "But, Doctor Stewart," he protested, "This hand was found in Oklahoma!" He waited for the slim, bespectacled Smithsonian scientist to switch his diagnosis.

Doctor Stewart just looked at him, quietly. "I know. Still, it's Egyptian!"

The Federal man stared hard at the shriveled hand partially wrapped in moldy fabric, then sighed. "Do you mind if we quote you?"

The scientist nodded assent.

The result was precisely what the FBI man anticipated. Midwestern newspapers had a field day gibing at the Smithsonian "expert" who confused the hand of an honest Oklahoman with the mitt of an ancient Egyptian. Eventually, the furore and hilarity came to the ears of a rural citizen who promptly claimed the mysterious hand and silenced the merriment by announcing that it was, without question, Egyptian. Furthermore, there was more than just a hand; there was all of the rest of a mummified Middle-Eastern gentleman—brought home by a family globe-trotter. Some playful children or household pets...
had probably dragged the appendage from an attic into the open, where it was brought to the attention of startled local sleuths, who hurriedly called in the FBI.

Episodes like this explain why FBI men call about once a month on Dr. T. Dale Stewart in his office at the near-by Smithsonian Institution. Formally known as curator of physical anthropology, Doctor Stewart is surrounded by more skeletons than any other man in America. Exactly how many, no one knows; the counting stopped when files bulged with over 20,000 separate specimens.

Day after day bones pour in from all over the nation, in paper bags or cardboard boxes, from the pit dug by a murderer or from Indian burial graves centuries old. Each bone is carefully lettered and neatly filed away in its appropriate group. Every bit of space in the offices of the physical anthropology section is so crammed that new arrivals now are stored in filing drawers stacked up some 10 feet high in the corridor.

From years of study of all these bones, Doctor Stewart has garnered a knowledge of our skeletal make-up rivaled by few. Given a few bones, he will quickly paint an astonishingly accurate portrait of the body that once surrounded them. Such data is invaluable to law-enforcement officers.

A few years ago, the federal men brought to Doctor Stewart some bones found in an abandoned well in Quantico, Va., by trembling workmen. After careful scrutiny, Doctor Stewart quietly announced that the body was that of a young, white man, 26 to 28 years old, five feet eight inches in height and of medium build. Then, he added casually that the victim had been suffering from pyorrhea and had been left-handed.

Investigators hurriedly went to work. Soon, in checking Marine Corps records at the giant Quantico base, they found that John Bradford Ellison, a left-handed Marine, had disappeared in 1928. Later, enough circumstantial evidence was gathered to convict Raymond "Scissors" Saunders for a murder committed 17 years previous to his arrest! Doctor Stewart, though, was far from elated; he was off a full ½ inch in his estimation.
of the Marine's height, and Ellison had been 29 instead of 26 to 28.

In appearance, Dr. T. Dale Stewart is a typical scientist, quiet-mannered, high-browed and with a slightly preoccupied air. It seems a bit farfetched to connect this mustached, soft-spoken, unassuming man with unsolved murders, grisly crimes and such. But the federal men have come to regard him as an important, if unsung, "aide." Time after time he has clinched cases for the state with his testimony.

One morning, in 1946, federal men drove over from Pennsylvania Avenue to the Smithsonian, carrying eight small fragments of charred bone found in Arkansas. If they were human, a murderer would hang. Several minutes after the bundle was deposited on Doctor Stewart's desk, the scientist looked up and nodded—"Yes, they're human."

"How can you tell?" the FBI agent asked. "You see this tiny bit of charred tissue clinging to this bit of bone?" Doctor Stewart pointed out. "Undeniably human." He indicated a suture of the joints on a bit of human skull. "These joints don't grow together until a person is over 35," he explained. "The victim was at least that age!" Incredible is the word for the lengths to which a murderer will go to conceal his crime. In this instance, Leon Merrow had, after killing his wife, put her body on a fire and stoked it for three days and three nights.

At the trial, the conviction hinged on Doctor Stewart's testimony as to whether or not the few bones found were those of an Indian, cremated decades ago, or those of the accused's wife. Stewart,
himself, had admitted that the bones resembled those he had seen taken from Indian funeral pyres. The courtroom was tense as the defense attorney tried to get the expert to testify that they were Indian. Doctor Stewart shook his head and pointed out that a small piece of tissue was still attached to one of the pieces of bone. The tissue was leathery and had obviously been subjected to great heat, but it would have disintegrated in time—and could not possibly have come from an old Indian grave. The defense collapsed.

This confusion of Indian remains with the victims of mayhem is a very frequent source of bother to Doctor Stewart. Only recently, a skull, complete with barnacles, was dredged from the mouth of the Mississippi by fishermen who were certain that here was genuine proof of a very foul deed on a dark night. Doctor Stewart took one look at the skull which he instantly recognized as that of a good Indian brave who went to the happy hunting grounds many years ago, and counseled—"Forget it."

Law-enforcement men have inquiring minds and Doctor Stewart marvels at the amount of chicken and duck bone they unearth and offer for his inspection. He must scrutinize said bones carefully, however, and decide on the few scraps available, whether the remains are those of a cow, sheep or a taxpayer.

At times, the relentless concentration of the police on human remains infects Doctor Stewart. When they brought in a few bones believed to be those from a human hand, the expert announced firmly that the hand could not be human. He suggested a chimpanzee or near-relation. Federal men went to the mammalogists, where they soon learned that their "hand" was really the tailbone of a horse!

As a scientist, Stewart welcomes police calls as another field for exploration. But, as a law-abiding citizen, he is shocked by the number of remains which never do seem to become finally identified. His reaction to modern crime is compounded of surprise and mild bewilderment. "There seem to be lots of bodies around," he says.

The young Mr. Stewart really didn't mean to stay very long when he first arrived at the Smithsonian in 1927 from York County, in Pennsylvania. He "substituted" for a sick friend who died. Now, after 20 years, it looks like a lifetime job.

Criminals and their doings take up only part of Doctor Stewart's time. Most of his mysteries are more complex. Among his most fascinating riddles: "Why do American Indians diminish in size according to their geographical location?" Anthropologists have found that an Illinois Indian

Tractor-Tire Remover

Stubborn tractor tires can be quickly removed from their wheels with a new leverage tool. The lever "breaks" the bead of the tire without injuring tire or tube. Attachments with the tool adapt it for use with wheels that have flat-base rims, disk wheels or drop-center rims. Tires can be removed when the wheel is either on or off the tractor.

Vest-Pocket Ash Tray

What can you do with cigarette ashes when there's no ash tray around? Dr. John H. Findlay, Westinghouse engineer, often was looking for a place to deposit ashes so his colleagues came up with an answer—a vest-pocket ash tray. They made it from part of an electronic tube and fastened on a clip that holds it to the user's pocket.

(Continued to page 256)
Fuel Tanks Lengthen Range of Boeing Bomber

Two droppable 700-gallon wing fuel tanks have stretched the new Boeing B-50's range to more than 6000 miles. The tank fittings, when not needed for extreme range, each may be used to carry a 4000-pound bomb, giving the airplane a total bomb capacity of 28,000 pounds. An earlier model of the bomber, Lucky Lady II, made the first nonstop flight around the world with the aid of midair refueling.

De-icing Fluid Clears Windshield

Sprayed over an ice-covered windshield, a de-icing fluid turns the ice into slush which is quickly cleared away by the wiper blades. The fluid is packaged in a flexible Bakelite container that acts as an atomizer when squeezed, spraying the fluid over the ice. The “bottle” is unbreakable and can be carried in the glove compartment.

Saw Setter and Filer

Teeth on a circular-saw blade are set and filed to correct height by a combination tool that assures a fast-cutting and absolutely round blade. Adjustable, the tool will firmly hold blades with diameters from 6 to 12 inches. Changing from jointer to saw set takes only a few seconds.

(Per capita aircraft ownership is highest in the sparsely populated states of Nevada, North Dakota, Montana and Wyoming.)
Air-to-Air Missile For U. S. Planes

First Air Force air-to-air guided missile is the 10-foot-long Ryan "Firebird," which can head off and destroy its objective in a matter of seconds. It is fired from a "mother" plane in single or multiple launchings. A booster rocket propels the missile until maximum speed is reached, then it is jettisoned by explosive charge and rockets in the remaining section carry on to the target. A self-contained radar navigation system guides the "bird." The warhead, preset to explode close to the objective, automatically detonates if the target is missed.

Sign Sticks to Glass Without Adhesive

Simply by pressing it in place, you can mount a new material on glass or other polished surface. As smooth as the glass to which it sticks, the material won't adhere to the fingers or to any surface except one that is highly polished. Advertising signs or other legends can be printed on the material in any desired colors. Ideal for showroom labels on automobiles or electrical appliances, the material is instantly removable and leaves no mark.

Bike With Extra Seats Carries Family of Six

How to provide inexpensive vacation transportation for a family of six is the problem solved by Lars Georg Swerin, a Swedish farm worker. The enterprising young man built two front seats and two back seats on a tandem bicycle. Then he and his wife pedaled down the highway while their four small children enjoyed the changing scenery from the extra seats.
TRIPLE-DUTY DINETTE, consisting of two benches and a table, also serves as a laundry aid and storage cabinet. One bench contains a built-in ironing board, the other holds linens or cutlery.

“FROST” PAINT for windows gives the same effect as ground glass. It can be sprayed or brushed on the pane.

STEAMER ON WHEELS rolls anywhere to direct a jet of steam on clothing, removing wrinkles and creases, softening shoes and refreshing felt nap.

DOUBLE-BLADE SPATULA firmly grasps food and prevents splashing of grease. Bottom, ALUMINUM FOIL slips into oven to eliminate soiled pots and pans.
PORTABLE DISHWASHER, right, folds down into a unit only 10 inches high when not in use. Tiny electric motor swishes 79 jets of water across dishes. The little washer cleans, rinses and dries full service for a family of four.

POCKET TOOL KIT has nine implements pivoted inside steel frame which serves as a handle. Tools include can opener, knife, awl, hammer, auger, saw.

BIGN VACUUM CUP holds fixtures to any smooth surface including side of the refrigerator. The vacuum is created by turning a screw in middle of cup.

WRINKLE CHOPPER cuts vegetables with wiggly edges. Potatoes cut this way can be French fried faster. Six-inch blade also will tenderize meat.

HOOK-ON BAR, bottom, clamps over the edges of most home doors to provide tie or towel rack. The bar itself is tightly coiled, rustproof spring.
GIANT FOOTPRINTS

Like a prehistoric dinosaur, a huge dragline left an interesting pattern of "footprints" as it "walked" across eastern Washington on its way to a new excavation job.

The giant machine, walking backwards for 30 miles, left a broad swath of ripples on the ground. No speedster, the machine moves only one mile a day. It will be used in the excavation of a new canal in the Columbia Basin irrigation project.
Campfire cooking is easy with a griddle that also can be used in the kitchen. Made of lightweight metal, the griddle measures 10\(\frac{1}{4}\) by 16 inches — large enough to cover two burners of a stove when used by the housewife. Two wire standards are pushed into the ground to support the griddle for use outdoors. A detachable aluminum handle slips into either end of the griddle, eliminating the need for pot holders. The housewife also can use the griddle inside the oven for baking biscuits and cookies.

Controller Supplies Power With Unwavering Voltage

Electrical measurements requiring a virtually unwavering power supply now are possible through a controller used by the National Bureau of Standards. The wide-range instrument is believed to be the most accurate of its kind ever built, maintaining electric power that varies no more than .05 percent, according to General Electric engineers. The voltage on an ordinary power supply may vary as much as 10 percent and therefore cannot be used in delicate measurements. The controller provides power from 500 to 50,000 volts.

Japanese Taxi

Built by a former general of the Japanese Air Force who is now in the taxi business in Tokyo, a two-seater taxicab is powered by a motorcycle. The cab driver rides behind the passengers on a standard motorbike frame. Two wheels support the cab and balance the cycle.

Cedar Paint for Closets

Cedar coating for closets and trunks now can be applied with a paintbrush. A new moth preventive in powder form is mixed with water to form a heavy paste, then brushed on closet walls to about the thickness of a penny. The product is made from wood grain and cedar oil mixed with a powdered plastic binder. It can be spread on wood, plaster, wallpaper and most other wall-covering materials. The resulting surface, which dries in 24 hours, gives off the odor of cedar wood, prevents moths and is fireproof. Nails will not crack the surface.
NEW DISCOVERIES OF THE DIAMOND CUTTERS

By John L. Kent

DIAMONDS — prize gems throughout man's history — now are pitching in to help him probe the secrets of radioactivity. Scientists at the National Bureau of Standards laboratories in Washington have come up with some modern methods of handling diamonds and sparkling new uses for these million-year-old pebbles.

First, they found that modern science could improve the age-old, time-consuming method of cutting the diamonds. Then they found that they could harness the inherent quality of diamonds to modern laboratory use of radioactivity.

Radioactivity studies at the bureau have shown that diamonds are highly sensitive to gamma rays and may be used to detect this radiation in the same way as a Geiger-Muller counter. Gamma rays, of short wave length, are used in medicine for treatment of disease and in industry for radiographic examination of metals.

To use a diamond as a counter, it is clamped between two small brass electrodes maintained at a difference in potential of about 1000 volts. When a
source of gamma radiation is brought within range of the diamond, pulses of current occur across the electrodes which can be amplified and counted by such indicating devices as an oscilloscope, a current meter or even a loudspeaker.

The pulse-producing property of the diamond is believed to be a result of its highly symmetric crystal-line structure. Because of the nature of its "oscillations," the diamond is a very "fast" counter, capable of indicating a much greater number of pulses per minute than is possible with the Geiger-Muller counter.

The diamond counter is longer-lasting, being almost indestructible, while the Geiger-Muller counter lasts only three months to two years.

The diamond-cutting improvement is of value in preparing diamonds which will be used as milady's precious gems.

Diamonds have always been stable currency in an unstable world. Because of their great value in relation to their small size, diamonds have figured prominently in history.

The Piggott diamond was a factor in the death of a sovereign. The big Koh-I-Noor — which carries a legend of hard luck to all male owners—is now in the crown of the Queen of England. The "jinxed" blue Hope diamond, owned by the late Evalyn Walsh McLean, is linked with several disasters.

During World War II the U. S. Army found itself in possession of many diamonds and gems belonging to royal families. The temptation of the glittering stones was too much for a few men. The postwar court-martial of Colonel Durant, for example, revolved around the Hesse jewels stolen from a German castle.
Almost every well-known diamond has a tragic history of robbery, treachery or violent death. Yet, the diamond was once such a dull little pebble that you wouldn't even stoop to pick it up.

Diamonds are found in deep, rootlike veins called blue ground, some of which extend more than two thirds of a mile straight down. The hard ground is blasted by dynamite, loaded into little cars and wheeled to the mine head. The "ore" is crushed, sieved and washed.

About 99 percent of the material is discarded. The one percent remaining is called the concentrate. At one time the diamond crystals were picked out of this concentrate by trained hands. Today, a vibrating table, the surface spread with a ⅛-inch layer of petroleum jelly, is used. A group of the natives mixes the concentrate with water and flushes it over the tables. The diamonds stick fast to the grease while the other material flows away.

Other workers now scrape the grease tables, melt down the Vaseline and retrieve the actual diamonds. These are sorted at long tables in north light. The sorters use tweezers or even pencils to push the stones into little piles according to color, size and clarity. Out of 4½ carats of diamonds, only one carat is fine enough to use in jewelry; the balance goes into tools and other industrial channels.

The gems are now placed in little white diamond papers. These look just like headache-powder envelopes but their fold is a little more intricate. The diamond slides into a groove at the bottom of the paper and cannot pop out when it is opened.

At the cutting plant, the first step in changing the rough diamond into a brilliant gem is study. The expert examines the stone through a little magnifying glass called a loupe. He must decide which way the grain runs, how the stone should be divided so as to eliminate flaws and still save the greatest possible amount of the precious material from loss in the process of cutting. He then marks the stone with India ink to show where it should be cleaved or sawed.

If the stone is to be cleaved, it is first set in a shellac mixture at the end of a holder. A small notch is then cut into the stone by means of another diamond which has been sharpened and set similarly in another holder. The notch must be cut in such a way that it guides the knife along the direction of the cleavage plane. The cleaver must know the structure of the stone, else the one blow may shatter it to chips!

When the rough diamond is a natural octahedron (like two pyramids base to base) it is usually sawed. The saw is a thin phosphor-bronze blade treated with diamond dust mixed with oil — because only a diamond will cut a diamond. This is a mechanical process taking up to several days on a large stone. It is here that the Bureau of Standards scientists stepped.
When the stone is to be cleaved instead of sawed, a notch is cut in exactly the right place. Then a light top of mallet splits gem along natural cleavage plane. Right, drawings show how standard 58-facet stone is cut.

in and found a short cut. They hooked the saw and the diamond together in a 5000-volt electric circuit. The high voltage had the effect of “softening” the hard diamond so that it could be sawed through in a matter of hours.

The octahedral stone has a deep slice taken off the top, leaving a piece somewhat larger than an exact pyramid. The corners are then removed from this in a process called rounding. One diamond is rubbed against another and the diamond dust resulting is saved and used in the next step—facet cutting. Grinding facets on the surface of the diamond at precise intervals allows light rays to enter to make the stone sparkle.

This is the most highly skilled and highly paid work. The cutting wheel for faceting is flat, like a phonograph record, made of porous iron coated with a mixture of diamond dust and oil. The disk whirls at high speed and the diamond is held in a “dop” (holder) against it. The angle must be changed for each facet of the stone.

The latest improvement is the adoption of the high-voltage cutting technique for the faceting operation. It speeds up this difficult job so that only a few hours instead of weeks or even months are required.

The most popular form of cutting is the “brilliant” which produces a round gem with 58 little facets or sides.

A few years ago three New York jewelry firms came out with their own patented ways of making diamonds with more than the standard 58 facets. One of these known as “King-Cut” provides 86 facets above and below the “girdle” or widest part. The upper part of the King-Cut has 12 instead of 8 facets. Another cut known as “Multi-Facet Cut,” has 98 facets. The extra 40 facets are cut into the edge of the girdle. Even this wasn’t enough, and the creators of “Magna-Cut” designed a cut with a total of 102 facets.

During the cutting, half the weight of the diamond is lost but its value is greatly increased. It begins to sparkle with the polishing of the first facets. When it has been finished and cleaned in acid, your eye catches the “fire” that never burns out even if you hold the gem under water.

It has been months now since the diamond was mined, and many weeks have gone into the cutting, but it still is a loose stone which nobody could wear. So the next step is the creation of a metal mounting to transform the gem into jewelry.

This may take from one to six months. In the case of an elaborate piece where large fancy-cut stones must be matched—perhaps in the diamond markets of Europe as well as in New York—a full year may be required. But the finished work-of-art is timeless.

The diamond itself is probably millions of years old when man discovers it. A few more centuries as a family heirloom are but a few days in its fabulous history.
18-Layer Suit Protects Firemen at 2000 Degrees

Aircraft crash firemen in a newly developed suit stay at a comparatively cool 130 degrees while working in a flaming inferno of gasoline and oil registering a sizzling 2000 degrees. Though only about 1/2 inch thick, the suit is made up of 18 layers of various kinds of glass fiber, cloth, aluminum and silver foil and nylon. A blanket of the same material shields victims being brought out through the flames. Developed by the Air Materiel Command, the suit's total weight is 29 pounds.

Nose Doors 12 Feet High In Globemaster

Clamshell doors almost 12 feet high allow wheeled vehicles to enter through the nose of the Air Force's new C-124 Globemasters. Weighing 175,000 pounds, they will be the largest production transports in military service. As a troop carrier, the C-124's interior can be double-decked for 200 men and their field equipment. As an airborne hospital, it can accommodate 136 stretcher patients and 52 attendants.
DOWN ON THE FARM the Yankee trick of making maple syrup "ain't what she used to be." The maple tree itself is still a mystery, challenging scientists who don't know why its sap is so sweet and flows so temperamentally. But sugaring has gone modern, using mechanized equipment and pipe lines to convert the maple's juice into fancy-priced nectar.

In its fundamentals, this odd type of farming remains unchanged. From a hard-maple tree, between 30 and 45 drops of sap produce one drop of syrup for the great American pancake. If you have the tree, all you need is a tap-hole, a spout, a can, fruit jar or pail for collecting sap, and a pan for boiling it until a few drops on a spoon will "sheet" like jelly. That's finished syrup. Anybody with maples in his yard has the makings of a worth-while springtime hobby. A dozen trees should net five gallons of syrup for pancakes, cake icings and candy, plus a few quarts to spare at Christmas.
Pouring the sap downhill is a lot easier than the old method of hauling it with oxen. There are six miles of pipe on this sugar farm. Each main line is numbered and the markers are set high so snow won't hide them.

Below, this is the end of the pipe line and the end of the sap, too, because here it is boiled down to syrup. There two sap houses produce 1000 gallons of syrup a year. Even the tree in the foreground has been tapped.
Large bucket screws to pipe to serve as a funnel. Perforated pail, left, slips inside to strain sap.

But to the commercial syrup maker, the drip-drip-drip of sap into metal buckets hung on thousands of maples is sweet music to the ears and dollars in the pocket. He hangs at least 4000 buckets and aims to get 1000 gallons of syrup worth $5000. It's all done in a hurry. Compared to other crops, syrup piles all the work into six weeks of hectic harvesting — there's no plowing, seeding or weeding necessary.

It takes a million drops of sap to make a gallon of syrup and that's why labor saving pays. A new device is the power tapper, replacing the breast drill and old-fashioned brace and bit for boring tapholes.

It's a portable gasoline motor equipped with shaft-driven bit that drills holes 3/4 inch in diameter and 1 1/2 inches deep. Most are homemade. Some, mounted on war-surplus rucksack frames, are parked on the back. Others are held over the chest by shoulder straps.

When Wilson Clark of Wells, Vt., built one for his father's farm, he used a motor from a washing machine and handle bars from an old sled. He made aluminum castings for the chuck and pulley. With the rig he can "tap out" for 800 sap buckets in six hours. It takes two men, driving spouts and hanging buckets, to keep up with him.

That's only the first step. Most of the work is in visiting a few thousand trees through snow and mud to empty the buckets daily during a sap run — then bring the "liquid sunshine" to the evaporator.

One canny farmer, Jay Gould of Middle Granville, N. Y., uses a tractor to pull the trailer carrying his collection tanks. He sticks to highway maples, usually higher in sugar content than woodland ones, over a route of several miles. For every dozen trees "rented," he returns a gallon of syrup to their owner and nets himself about eight gallons.

Most efficient method of horseless sugaring is the pipe line. Some operators have tried linking the sap hole right to the pipe by means of a gooseneck connection, but it hasn't worked as well as pouring sap into the line and letting gravity do the rest of the work. At Scott Nearing's mountain farm near Jamaica, Vt., six miles of pipe line — a fanning system of four main lines and their spurs — bring 35,000 gallons of sap down during a season.

Spaced 100 feet apart through the woods are standpipe Ts into which Nearing's men pour sap gathered from near-by trees. Buckets on the Ts serve as funnels.

Downhill, sap is boiled in two fireproof sugaring houses, each with a modern evaporator. A valve sends sap into either or both, when a big sap run is on.

Like other modern producers, Nearing doesn't allow sap to accumulate — that causes fermentation. Old-timers blamed bad sap on a swelling of the maple tree's buds. They called it "buddy sap." Scientists say it should really be called "buggy sap." The bacteria are not harmful to health, but cause a change in the sap's sugar composition, resulting in syrup that is too strong, and black instead of amber.

Holding late-afternoon sap for the next day's run caused much of this. Now, big operators have electrified sugar houses and they keep up their boiling into the night.

In a modern sugar house, much of the space is occupied by the evaporator — large ones are 5 by 16 feet. Sugaring has come a long way since the pioneers learned the art from the Iroquois Indians, who simply gashed a tree, caught sap in a hollow log and evaporated by throwing hot stones into the liquid.

The modern tin evaporator is a refined version of a shallow pan. It rests on a long, narrow furnace, called an "arch." In the firebox, a hungry fire devours cords of wood and it's a knack to know how hot the fire should be.

Unlike the mountain moonshiner who cooks corn mash and wants the alcohol in the vapor, the mountain syrup maker lets steam go up through a roof vent and cashes in on the residual liquid. Sap enters one
end, flows around several partitions of the pan, losing water as it moves.

A special hydrometer and thermometer record the finish point. Standard syrup weighs 11 pounds per gallon and boils seven degrees above water's boiling point. Many producers, however, admit they like to double-check by using the old sheeting method, too. Syrup is then strained through felt to remove mineral grit before it is graded according to color and stored in tins or barrels.

There is still room for improvements in the process and a fortune awaits the man who can figure out how to get rid of the water in the sap more quickly. Vacuum distillation has been tried. It boiled the sap quicker and at lower temperatures, but the resulting syrup had lost its famed maple flavor.

One improvement scientists are promising is a sweeter maple tree. Richer sap will mean less boiling to produce more syrup.

The tree most commonly tapped because of its superior sugar content is known as the sugar or hard maple. Its sap averages three percent sugar. Since pioneer days,
Roadside trees are rich in sugar content. This farmer drives his tractor on the highway, picking up his crop of sugar. It has been a wild tree. But the University of New Hampshire has begun a program to grow better ones. After a long hunt for outstanding specimens, UNH men found one just off their campus and promptly named her Sweet Sue. Her sap contains nine percent sugar—three times average. They are now rooting cuttings from that tree under fluorescent light. Their goal is to populate farm lands with lots of Sweet Sues which will be set out in orchards the way pedigreed fruit trees are planted.

Meanwhile, although the maple is one of the best known of trees, scientists still don't know just what goes on inside the tree itself. They want to know why one sap season is good and another bad and why sap flows well only on a sunny spring day after a freezing night.

There are many oddities in the picture. It's ordinary belief that sap flows up a tree. But during tapping season, twice as much comes down as goes up.

One experimenter, using an ordinary steam gauge mounted at a taphole, found it registering 25 pounds of sap pressure per square inch inside the tree at noon. That's as much pressure as you carry in your automobile tires. At night, the sap pressure turns into suction.

Even the log of a freshly cut maple tree will work like a sap pump. UNH experimenters got sap from branches, logs, posts and trees standing upside down in tubs of water. Every night, the "dead" wood sucked in water and every day it gave forth sap through the taphole.

Researchers at the University of Vermont have gone even further. They cut limbs from a maple tree in March and store them in refrigerators.

In July or November, they take out a branch. It wakes up and starts right in flowing with March sap.

Dr. Stuart Dunn, botanist at the University of New Hampshire, is raising maple trees with three times as much sugar as the average...
Huge Rotterdam Building Covers Two Blocks

Two blocks long and covering about twice the ground area of the R.C.A. Building in New York City, a Rotterdam building now under construction is said to be the largest in Europe. Located in the center of the city, the building, known as the Rotterdam Trade Center, will house 150 trade organizations which lost their offices and warehouses under German bombardment. Passageways and elevators are designed to permit trucks to go as high as the third floor of the seven-story building. In the building will be offices, warehouse space, garages, showrooms, stores, a bank, post office, restaurant and medical center. The construction was started in April 1948.

Telescope Walking Stick

Hikers can spot faraway objects as they tramp with a walking stick which has a built-in telescope. Made in Japan, the telescope can be fitted to any stick to form the handle. It is pivoted across the top of the stick and easily adjusted to see through.

Lead-Glass Gowns

Gowns made of a lead-glass fabric are protecting doctors and their assistants from injury by X-rays and the beta rays of atomic fission. The gowns were developed by Dr. Vincent W. Archer of the University of Virginia. They replace gowns made of lead and rubber, which have less flexibility and cover a smaller portion of the body.

Information not listed on articles in the index, starting on page 10, frequently is listed in the WHERE-TO-FIND-IT INDEX, available without charge from Bureau of Information, Popular Mechanics Magazine, 200 East Ontario St., Chicago 11
Cloud Analyzer

Clouds withhold no secrets from an electronic analyzer that is carried aloft by a weather balloon so it can transmit a running description by radio to a ground station as it passes through cloud formations. The balloon carries the analyzer upward at 1200 feet a minute until it reaches 75,000 feet where it bursts, allowing the equipment to descend by parachute. Should the analyzer be lost or damaged in the fall, the reports are not affected because they are automatically recorded by the ground station throughout the flight. Among the data transmitted are the height of the cloud at its base and summit, its density, temperature, air pressure and relative humidity. The airborne transmitter sends this data 120 times a minute during the flight. A piece of string, saturated with a salt solution through which an electric current is passed, forms the heart of the analyzer. As moisture in the air increases, the conductivity of the string increases in measurable amounts.

Rockets Get Atmosphere Samples at 230,000 Feet

Using rockets, University of Michigan scientists have obtained samples of the earth's atmosphere at 230,000 feet. It was the first collection ever made above 100,000 feet. Thin-walled steel bottles, like the breathing-oxygen type used by airplane crews, are sent aloft with rockets at the government's White Sands, N. Mex., rocket-testing range. On each is a mechanism that opens the evacuated sealed bottle after 80 seconds elapse, when the rocket is about 40 miles high. Then the bottle's intake tube is closed by a "mouse trap," an electrically operated double-headed hammer that smashes the tube together. At the same time, a small charge of powder in the hammer head is ignited, providing heat that melts the solder covering the inside of the tube. Fusing of the solder seals the bottle and prevents escape of the atmospheric sample. The bottles are recovered after the rocket crashes to earth.
Cement is mixed with clay waste. It is deposited in steel molds and pressed into shape. The complete blocks are lifted from the molds by suction.

Above, after cement is mixed with clay waste, it is deposited in steel molds and pressed into shape. The complete blocks are lifted from the molds by suction.

Right, before they can be used, blocks have to be stacked outdoors for a three-week drying period. The finished blocks are then trucked to construction sites.

Above, material from piles of china-clay residue in the background is washed down stream in foreground to factory for processing and molding.

HOMES of CHINA CLAY
WASTE from the Cornish china-clay industry, long heaped in great piles that have become a regular feature of the landscape near St. Austell, is helping to solve Britain's housing shortage. The residue is mixed with cement, molded into blocks, dried for three weeks and used to form double-walled unit homes. The various-sized blocks, easily fitted together by semiskilled workers, are strong and permanently waterproof. Their edges are placed in grooves along the sides of upright posts, erected securely at intervals on a substantial plinth. Four-man teams, two masons and two laborers, build the homes. Originally intended to meet a serious housing shortage for Cornwall workers, they are now used all over Britain.

Above, the blocks forming the walls of these trim homes for Cornwall workers were made from residue once heaped in mounds like those in the background.

Below, left, workmen fitting blocks into the grooves on the sides of upright posts. The Cornish factory makes enough blocks each day to build six houses.

Below, right, unit-constructed part of a house nears completion. Two layers of blocks, with an air cavity between for extra insulation, provide a sturdy wall.
Assault Transport

Combat troops and supplies are carried into front-line, unprepared fields and then supported by a new assault transport, the Chase XC-123. The plane is powered by two 2400-horsepower Pratt & Whitney engines mounted in special nacelles which can be quickly removed from the wings for engine change. Wingspan of the transport is 110 feet and it is 77 feet long. The cargo hold is about 36 feet long.

Jet Sailplane

French sailplanes equipped with 190-pound jet engines enable a pilot to get home if he runs out of thermal currents. The engine is capable of propelling a plane at speeds up to 160 miles per hour. Not only a boon to the sailplane pilot, the engine also enables the ground crew to relax and watch the flying instead of dragging equipment over the countryside to find the house from which the pilot phoned after landing.

Airplane Pilots Spin Wheel to Get Navigational Data

Pilots who want navigational data for flights from Medford, Ore., to other airports in the West get it quickly from a drum-type chart developed by CAA employees. Simply by spinning the drum to the desired destination, the pilot reads through a slot in the housing the following information: distance, magnetic course, field elevation, runway length and type, and terrain characteristics en route.
Above, featuring a clean-cut, streamlined design, this electric locomotive of the French National Railways has a top speed of 100 miles an hour. Left, the engineer has unrestricted visibility from the cab.

**Fast French Locomotive**

With a top speed of 100 miles an hour, a new French electric locomotive was recently put into service between Paris and Tours. Establishing a record for the 362-mile run between the two cities, the locomotive made the trip with an average speed of 71.3 miles an hour. It is said to be the fastest electric locomotive in Europe.

**Portable Machine For Shape-Cutting**

Light enough to be carried around the shop by two men, a portable oxy-acetylene shape-cutting machine cuts steel up to 8 inches thick at speeds from 3 to 30 inches a minute. Any shape can be cut within a 32 by 54-inch area. The machine also handles straight-line, circle and bevel cutting with a high degree of accuracy. The complete unit packs in a carrying case that can be stored in a small space and its total weight is only 110 pounds.
That favorite whopper of Alaskan sourdoughs—glacier worms—is absolutely true. It’s also true that glaciers have built-in plumbing and talk constantly to themselves, say scientists who are peeking inside these mountains of ice.

Flow lines, formed by gravel and dirt at the convergence of separate ice streams, draw a striking pattern on Barnard Glacier. Seismic recording equipment, hauled across the ice on a sled, is set up to measure the depth of firm and ice of the glacier.
TWO EXPEDITIONS to Alaska last summer literally dusted off a few of that territory’s glaciers and then settled down to study these creeping mountains of ice.

The scientists probed 200 feet beneath the surface with a gigantic hot needle. They penetrated a 50-foot layer of fresh snow to lay bare the real skin of the glacier. They exploded black powder charges in and above the snow, listened with seismographs and shot radar beams hundreds of feet through the ancient ice. They tooted in supplies and carried out notebooks crammed with facts on the lives of these glaciers.

Their purpose? Little has been known about what goes on inside glaciers. Yet they dot the earth to form one of the few living clues to the history of the world’s weather during the last century. When the growth of a glacier can be compared to its rate of dissipation, it may be possible to forecast a glacier’s future. A mass of such information from all parts of the world may explain how glaciers were born and make it possible to forecast the general trend of the world’s climate for a century or more. Sort of a worldwide weather prediction for our great-grandchildren.

In addition, the armed services are vitally interested in all kinds of arctic conditions. The Office of Naval Research supported both these expeditions to Alaska as part of a vast program of research. Cold facts learned now could save servicemen’s lives in the future.

The scientists turned up some interesting lore on glaciers. For example, an easy way to get lots of water from some of them is merely to dig a well. The zone where a glacier gets its moisture is called its generation area. In such an area, the glacier contains a great deal of water. You may have to pump it out mighty fast in winter time to prevent its freezing before it reaches the surface, but it’s there.

That favorite fiction of Alaska sourdoughs—glacier worms—is not a whopper after all. Thousands of living black worms

Right, snow forms a natural bridge which hides a portion of the crevasse. Studies of the crevasse walls yield much information on the annual snow deposit

Dynamite blasts the surface of Seward ice field. Sound wave of the explosion will bounce back from bottom of glacier, recording depth of river of ice
about an inch long have been found on glacier ice and snow, presumably feeding on pink algae that also live there.

Glaciers have annual rings comparable to tree rings and by measuring these layers and their densities scientists can calculate the annual precipitation for as many as 10 years back. This phenomenon occurs in the generation area where each year's deposit of fresh snow rests on a film of dust that was blown across the old crust during the summer.

Glaciers are "talking" all the time though not always loud enough for their voices to be heard by human ears. Sensitive geophones that are buried 10 or 20 feet in the new snow at a glacier's upper end often pick up an occasional sound similar to the drip of a leaky faucet. Embedded in the wall of an ice grotto the geophones reveal occasional creakings much like those made by a rusty door hinge. When placed at greater depths, the instruments pick up a steady sizzling noise punctuated by pops or bursts of louder crackling. All these sounds are caused by the gradual settlement of new snow, called firn, during its change into ice.

Most glaciers are shrinking because of the warm climate but at least one of them is advancing at about two feet per day. Some of them, with huge upper ice fields that must squeeze through narrow mountain passes before spreading out again, flow at speeds of approximately 100 feet
Trees and brush grow in dirt that covers part of the Malaspina Glacier. The cliff in background is solid ice per day through the constricting “funnels.”

Each of the two groups of scientists is to return to the North to continue its studies this summer. Among other things, the glaciologists are learning a great deal about the depths of glaciers, how they are formed and how they maintain themselves.

Contrary to general belief, no more than 30,000 square miles of continental North America are covered with permanent ice. All the continent’s icy regions added together are smaller than the state of Maine. Two thirds of these ice-covered lands are found in southern Alaska, mostly in the vicinity of the Gulf of Alaska. The rest of the northland gets bitter cold, to be sure, but especially in the interior the climate is too arid to permit formation of glacial ice.

Thus, when scientists want to study glaciers they usually make their headquarters at Juneau or some near-by spot. The expedition of the American Geographical Society made its base at Juneau and studied the Juneau ice field, in particular the 25-mile-long Taku Glacier.

During the same months a group sponsored by the Arctic Institute of North America and headed by Walter A. Wood operated out of Yakutat, about 200 miles northwest. The expedition probed the huge Seward ice field that consists of a generation area about 35 miles long and 10 to 20 miles wide, the outflowing 20-mile-long Seward Glacier and the vast Malaspina Glacier, 25 by 40 miles in area, that is fed by the Seward Glacier.

Included in the Arctic Institute’s group were Dr. Henri Bader of the University of Minnesota, formerly of the Swiss Snow and Avalanche Commission, and a team from the California Institute of Technology.

Each expedition was flown to a smooth...
In Poulter system, charges explode above glacier. Geophones pick up reflected wave to record glacier's depth

landing area on the upper end of its chosen ice field. From there the members hauled their equipment and supplies to the selected site on sleds and on their backs. They marked sled trails through the tumbled snow and ice on the Juneau ice field by chopping and cleaning arrow designs into the veneer of summer dust that lay on the surface. The cleaned ice melted less rapidly than did the surrounding dust-covered ice. In a few days the “carved” arrows were raised and gleaming, an inch or so above their surroundings.

Similarly, the ice and snow under the tents melted less rapidly under the summer sun. Within several weeks the tents stood on well-drained pedestals 20 inches high.

A typical glacier has its beginnings in a high mountain snow field and flows downhill until it melts or reaches the ocean. It is literally a river of plastic ice.

(Continued to page 252)
Sky Spear

Mounted on the nose of high-speed research aircraft, a slender, needle-nosed spear probes the atmosphere ahead of the plane as it zooms through the skies at supersonic speeds. Crowded into the restricted space of the tube are instruments which give instant readings of air speed, yaw, angle of attack and temperature. An altitude indicator also can be installed. The spear is said to be the first all-electric instrument mast for high-speed research planes.

Prune Picker

Powered by the operator’s feet, a new machine rolls along the ground to speed the harvesting of prunes and other ground crops. A platform supports the operator in a prone position above his work. He flips the prunes off the ground into a hopper. A conveyor then carries them to a receiving box. When he wants to move the machine, he shoves two pedals with his feet. The inventor estimates one picker on the machine can do the work of three to five using ordinary methods.

Pneumatic Quonset

Something new in Arctic housing—an inflatable Quonset-type hut—has been developed by the Air Materiel Command and the U.S. Rubber Company. The hut, which can be inflated in three minutes with hand pumps, is designed as an emergency home for airmen stranded in cold zones. Four feet high, seven feet wide and nine feet long, the little building will comfortably house four men. It is made of inch-thick, two-layer cotton fabric coated with a synthetic rubber that will withstand severe cold. The air space between the two layers provides excellent insulation. A 10-foot-long air duct attached to a sidewall is snaked along the ground outside the hut to provide good ventilation without drafts.
Elmer Lever's workshop roof is studded with unusual weather vanes, each handmade by the 86-year-old craftsman who has been working with metal for 70 years and still loves his work.

Below, the country doctor in his buggy is Lever's favorite design. Here, he uses gold paint to satisfy a customer, although he prefers black which shows up best against the sky.

Motorists passing through Red Bank, N. J., stop to gape at a workshop roof top thickly populated with dogs and horses, sailing ships and golfers—each with an arrow pointing into the wind.

The roof top is the advertising billboard of Elmer Lever, the weather-vane man. Eighty-six years old, he has been fashioning weather vanes for 70 years.

Lever began as an apprentice ornamental iron worker in Philadelphia in 1880, but only in recent years devoted full time to creating copper and brass vanes for customers around the country, most of his designs following drawings or photographs furnished by the customer.

Transferring the design to the metal by means of carbon paper, Lever cuts out the figure with a circular hand shear. Compass-point letters, in gothic type, are snipped out with a tinsmith's shear as are the arrow point and feather. Arms and supports are made of copper tubing and the vane rotates on a steel ball bearing. This bearing is the only part of the vane that is not either copper or brass.

The vanes are always painted a

By H. W. Kellick

Popular Mechanics
VANE MAN

dull black, a finish which provides the best visibility against the sky. Some customers ask for colors, but Lever usually persuades them that black is the best.

Weather vanes are not his only product. He also creates decorative figures and picturesque signs for homes and estates, usually duplicating drawings or photographs provided by the customer.

Recently a Kentuckian, attracted by the roof-top display, asked him if he could make a sign that would be representative of his business, horse breeding. He showed Lever a photograph of a thoroughbred and several Colts grazing in a wooded pasture. That was all the craftsman needed. He had the small photo enlarged to the size he planned to make the sign and traced the outlines on a copper sheet. With a circular shear, he cut out the horses, foliage and other features. In tight spots, he used chisels and punches. Two name plates, about four inches high, were chiseled out and a sheet of white enamel sandwiched between them so the name could be read from either side. A brass strip formed a frame around the completed sign, which was a sheet-metal version of the photograph. Total cost of the materials was $10. Lever sold the sign for $150, realizing a good profit for his work.

Lever, being a man whose work and hobby are the same, can't turn down any metalwork that calls for imagination and skill. He makes copper window boxes, flower boxes, brackets and decorative figures for walls and doors. He has even made metal grave markers, one of them being a lifesize image of a pet cocker spaniel, hammered from lead.

The octogenarian loves his work and he likes to talk about it to strangers. But you have to talk to him while he is working, he's too busy to stop for a long chat. In fact, although his roof is covered with weather vanes, most of the time he's too busy to step outside to find out which way the wind is blowing!

FEBRUARY 1950
Truck Keeps Plane "Alive" on Ground

When a giant airliner comes down to earth and cuts its engines, it is dependent on an earth-bound power truck for electricity to run its many accessories and, when ready to leave, to start its powerful engines. Such accessories as the scores of instruments, air-conditioning system, galley, heaters, interior and exterior lights and the radar and communications equipment are all dependent upon electricity. In flight, the giant motors drive generators which provide the necessary current, but when the plane comes down it has to call upon a mobile power unit. A new unit, designed for such planes as the Stratocruiser, has its own 140-horsepower gasoline engine that drives two generators, one 50-kilowatt, d.c., the other 15-kilowatt, a.c. In addition, the truck contains floodlights and emergency fire-fighting equipment.

Pop-Up Lighter for Table Plugs Into Electric Outlet

Push down on a new table cigarette lighter and a moment later it will pop back up ready for use. The electric lighter operates on the same principle as most car lighters. It can be plugged into any 110-volt outlet and has the advantage of requiring no flints or fuel. The anodized-aluminum finish is available in several color combinations.

Lighter operates from any 110-volt outlet, pops up when ready for use. The base serves as an attractive desk accessory.
Youngsters' Personal Car Is Battery-Powered

There may be prouder youngsters in the world than the two MacFarland boys of Atlantic City, but that is hard to believe once you've seen them driving around in their personal car! The tiny vehicle, built by their father, is powered by an old 12-volt Dodge generator and two storage batteries. With its full load of two youngsters, the car travels at a top speed of five miles an hour. The single rear wheel is chain-driven and the tires are pneumatic. Recharged every three days, the two batteries have been found to last more than 18 months even though used daily.

Homemade Convertible Will Go 100 M. P. H.

Discouraged by the high price of convertibles, Russell Kmiecik of Peshtigo, Wis., built his own for $300. The 55-horsepower engine was made from Ford parts ranging in age from 1914 to 1949. The sleek body was formed from white ash and tempered hardboard. Kmiecik's innovations include placing of central wiring and all vital parts directly under the hood, a heavily padded crash panel in front of driver and passengers, a back-to-back twin radiator and power-controlled brakes. There are two Model-T fenders, a Model-T front axle and a 1934 V-8 rear axle.

Poison Gases Make Blood Transfusions Safer

Nitrogen-mustard war gases, designed to kill enemy soldiers, soon may be used to make blood-plasma transfusions safer. The gases have the power to destroy the virus which causes jaundice. Pooled plasma, which comes from the blood of many donors, sometimes is contaminated with jaundice virus by a donor who did not know his blood contained the virus. From four to ten out of every 100 persons who receive pooled plasma are attacked by jaundice. Scientists at Henry Ford Hospital in Detroit discovered that nitrogen mustard could be used to sterilize the plasma.
1—Here you see eels climbing to the top of a plywood trap. Finding no place to go from there, they flop into the netting on either side of the board.

2—Once in the netting the eels have no way of securing a suction so they wiggle snakelike down the netting into a flume filled with fast-running water.

3—The fast-water flume carries the befuddled eels into a scow where they are loaded into barrels to be hauled away. It takes 500 eels to fill a barrel.

4—This is a close-up of the end of the flume and shows eels dropping into the scow. In one season, traps like this netted 110 tons of eels for market.

5—Hardest job is dipping eels into barrels. This trap was perfected by Lee Critchlow of Oregon City, Ore. Many like it are used in the Willamette River.
A killer from the sea is slaughtering our lake trout and whitefish at an enormous rate. U. S. and Canadian wildlife scientists have joined forces in a war on this new enemy—the lamprey

By Cleland van Dresser

An UNDERWATER BATTLE is now raging in the Great Lakes that may mean life or death to the nation’s greatest fresh-water fish resources. Allied on one side are the scientists and technicians of the United States Fish and Wildlife Service and the conservation departments of the eight lake states and Canada. They are pitted against the sea lamprey, an eel-like killer from the Atlantic Ocean, which is slaughtering the fish population of the Great Lakes at a rate never before experienced in history. On the outcome of this life-and-death struggle depends the future of the game and commercial fish of the Great Lakes.

At present, sea lampreys are killing lake trout at an appalling rate. Trout, the principal catch of Lake Huron up to a few years ago, is practically nonexistent today in that body of water. The annual catch on that lake has dropped from almost 2,000,000 pounds to about 5000 pounds. The situation in Lake Michigan is almost as bad—23,000 pounds caught last May, as contrasted to 350,000 pounds during the corresponding month of 1948. Other species of fish—the famed whitefish, pike, sucker, chub—all are beginning to show declines from depredations of the sea lamprey and all are threatened with potential extinction.

As far as the contestants in this war of survival are concerned, the conflict has just started. The sea lamprey has the edge at present for it has recently sneaked in and got a foothold in the Great Lakes where science never dreamed it could establish itself on a permanent basis.

Seemingly going against all natural laws, the sea lamprey, a hideous creature from
the salt waters of the ocean, has decided to live out its life span in the Great Lakes and dine sumptuously on the fish therein.

Heretofore, this marine denizen had spawned in tributary waters of Lake Ontario, and after the eggs had hatched and the resultant larvae had emerged into the young adult stage, they migrated back to the ocean via the St. Lawrence to live out most of their lives in salt water.

Until recently, the lampreys pursued this migratory life cycle: the adults spawning and dying in water of the Lake Ontario area; the larvae existing up to five years in mud bottoms of streams and rivers; the young adults, after emerging from the larval stage, migrating to the Atlantic to live for three more years; and finally returning again up the St. Lawrence to fresh water to spawn and die. This entire process of minor evolution took approximately eight years. At no time during that period did sea lampreys in any form prey noticeably on freshwater fish.

During the last few years, and for no reason as yet discovered by science, the sea lamprey is changing its habits and is living its entire life span in the Great Lakes, the last three years of which is devoted to devouring fish, mostly lake trout. It has traveled westward through the Welland and Sault Ste. Marie canals until it is now spread throughout all of the Great Lakes. Even Lake Superior fishermen, who never
before have seen sea lampreys in that body of water, now report that last year the killers put in an appearance there.

The effect on the fishing industry of the lake states and Canada is one of the gravest apprehension, and immediate steps are being taken to exterminate the underwater murderer before it exterminates the fish.

In appearance, the sea lamprey resembles an eel with a suction disk, a head equipped with sharp teeth and rasplike tongue. It attaches itself to the body of a fish, cuts through its scales and feeds on the blood and juices of its victim. Such an attack lasts from several hours to upward of a week, usually resulting in the death of the fish. Apparently, few trout escape attack. Even with the drastically reduced catches today, the vast majority of the fish caught bear scars from lamprey attacks.

The lamprey attains an average full adult length of slightly under two feet, but specimens of 40 inches have been caught. The female lays up to more than 100,000 eggs at a spawning in streams and rivers that empty into the Great Lakes, and if conditions were entirely favorable, its rate of increase would be astronomical.

With a request for federal funds to equip and man a floating laboratory, the U. S. Fish and Wildlife Service plans to make a thorough survey of the Great Lakes and its tributary streams and rivers in a grim effort to find some means, biological, chemical or mechanical, to wipe out this scourge. Joining forces with the service is the technical personnel of the Great Lakes Sea Lamprey Committee, comprised of the conservation departments of Minnesota, Michigan, Wisconsin, Illinois, Indiana, Ohio, Pennsylvania, New York and the Province of Ontario. The committee has headquarters at Ann Arbor, Mich., and is headed by Dr. John Van Oosten. The campaign is being conducted by W. F. Carbine, who is Chief of the Inland Fisheries Division, Washington, D. C.

One phase of the sea-lamprey's life cycle is in favor of the conservation scientists. They have learned that if lampreys cannot find suitable spawning beds in rivers and streams, they will die before laying their eggs. Already the Fish and Wildlife Service has located and charted several such spawning beds and is trapping and destroying the underwater killers as they approach them. One trap on the Ocqueoc River in Michigan has yielded some 9000 adult lampreys so far this year. Two more have just been erected by the Michigan Department of Conservation, and additional structures planned as new spawning beds are located throughout the Great Lakes area.

The use of "electric screens" will also come into play. This mechanical device emits a shock that is sufficient to deter any aquatic animal from entering a stream or river across which it is erected. The idea is to locate these screens across the mouths of streams which harbor known lamprey spawning beds.

The main trouble with this system is that the screens will also prevent all fish

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Giant Circuit Breaker

Protecting the power line from Grand Coulee Dam is a gigantic circuit breaker, said to be the world's largest, that can interrupt an electrical fault of 10-million kilovolt-amperes. Exceedingly fast despite its massiveness, the breaker can clear transmission-line trouble in $\frac{1}{50}$ second. It automatically re-establishes the flow of power in $\frac{1}{2}$ second. The disconnect switches are motor-operated. Twelve similar breakers will be installed in the new east switch yard of the Grand Coulee Dam.

Probing Tool Removes Pebbles From Tire Cuts

Pebbles and other foreign objects embedded in tire cuts can be quickly and easily removed with a probing tool. After the probes are inserted in the cut, pressure on the handles spreads the jaws apart to expose the embedded object. The pebble then can be picked out with a pointed instrument or gripped with the serrated jaws of the probing tool and lifted out. With this tool, it is unnecessary to remove the tire or wheel as long as the car is jacked up. The tool is six inches long and is made of steel with a rustproof finish.

Even at a standstill, the Westinghouse jet engine on the Navy's Banshee fighter "breathes" 100 tons of air an hour, sucking air in the front end at 250 miles an hour and spitting it out the jet nozzle at the rear at 1200 miles an hour.
“Baby” Jet Unit Boosts Light Plane Into Air

Slightly larger than a picnic jug, the Jato Junior rocket engine develops 250 pounds of thrust for 12 seconds to assist pilots on steep take-offs from small high-altitude fields surrounded by obstacles. Developed by the Aerojet Engineering Corporation, the motor was mounted beneath the cabin of a Ryan Navion for the tests. Assisted by the Jato engine, this plane was able to clear a 50-foot obstacle in only 300 feet, whereas it normally required 875 feet to climb over the obstacle. The engine was designed and developed for the commercial market, but as yet is not available because of restrictions by the U. S. Navy Bureau of Aeronautics.

Either Power or Pedal Drives “Bombo” Boat

Made from a salvaged B-29 drop tank, the first of a series of “Bombo” boats that can be propelled either by power or pedal has been completed by a Californian. A 1½-horsepower engine, operating on a V-belt drive, moves the craft along at a seven-knot speed. The boat has a 10-inch, three-blade propeller. Emergency power is provided by a bicycle pedal drive, with a simple gear arrangement for either forward or reverse directions. A scissor jack used to tighten the V-belt also serves as clutch for instant transfer of power from engine to pedal, or vice versa. Two 32-inch inner-tube “pon-toons” are attached to the sides of the boat near the center as an added safety factor, though the craft’s low center of gravity makes it difficult to capsize.
FROM A BLOCK AWAY you hear that sickening sound of tires braked hard against pavement, then an explosive crash. Ahead of you, automobiles pull to the side of the street. You, too, swing over and park. You see men running, a crowd already forming. Then you hear sirens.

Surely—you say to yourself—whatever help you could give won't be needed now. There are plenty of hands, and the police are here.

But in your car, you have a camera.

You can help—if you will—by taking pictures.

Pictures taken at the scene of a traffic accident are evidence of what happened. In court they can be used to bring punishment upon a law-breaking, negligent driver, or to protect an accused driver from unjust punishment. They can help to bring fair settlement of damage claims.

Good photographs can be the best evidence obtained at the scene to show what really happened, so that judge or jury can reach a fair decision. And you will not be expected to donate your pictures; law-enforcement agencies, insurance companies and attorneys will pay reasonable prices for pictures that "tell the story."

What kind of pictures should you take? What should they show?

In almost every traffic accident, there has been a violation of right-of-way or a turn from a wrong lane of traffic. One party, or the other, or both, violated one or more rules for safe driving. The court problem in either criminal or civil trial is to determine what happened.

To tell what happened, your pictures must show many things—more things than a hurry-up snapshot will show. If you know what those are, your work will be more effective.

Your pictures must define the location.

By Richard W. Emery

Photos by the Author

FOCUS ON THE

Excellent accident shot shows witnesses who may be found later if case comes to court
They must show the general layout of the scene, revealing whether there were traffic signals, road stripes or marks and other signs. They should make clear the nature of the area, whether business district or residential.

Your pictures should indicate weather conditions and their effect on road surface and visibility, and in at least a general way should show about what time the accident happened.

They should show the presence or absence of any marks indicating the paths traversed by vehicles just before the collision occurred.

They should show what damage was done to each vehicle.

They should show license numbers, makes of vehicles, names of streets involved and permanent landmarks on either side of the accident scene.

They should show the face of at least one person who can be identified and located long afterward—perhaps a year or two later—to identify the pictures in court.

All those requirements sound like a big

Photo records exact place of accident by showing railroad signal, edge of pavement, telephone pole

One driver was killed in this accident. Photo shows that one of the automobiles was struck broadside.
order. But those are the things which help to show who was at fault and who wasn't, and may determine who pays the bills.

If there are injured persons still present when you arrive with your camera, you should first make a picture showing them and the vehicles involved. This picture times your arrival.

That first picture, the close-up of injured, is the typical news photo. In court its value is limited because the picture shows only a very small area and probably does not locate the scene in relation to permanent landmarks.

In making that first photo, take care not to impede urgent work being done by police and ambulance men. Experienced traffic officers know that photographic evidence may be needed later; they probably will let you move about the scene to take pictures if you don't get in the way. Ask them if there is any picture they want you to shoot.

Many big cities equip their traffic investigators with cameras. "On the scene" photos are excellent evidence for prosecution in accidents involving hit-and-run, drunken driving and other serious offenses. A picture showing a driver at the scene of a wreck has been used in court to help prove that it was he who was driving, not someone else using his driver's license.

Your next photos should be made from farther back, to show relative positions of the vehicles involved. Set your camera carefully for enough exposure to show skid or abrasion marks on the pavement. Get far enough back to include landmarks in foreground and background—such immovable things as buildings, poles, curbs, trees and fire plugs.

If you can climb to a high spot overlooking the scene, you can make a panoramic view. Perhaps you can stand atop an automobile, or on a porch or fire escape. A high shot reveals respective distances better than a street-level picture.

For additional photos, get long shots indicating the view each driver had of the road ahead, some 200 feet before the crash. These pictures may show whether his vision was obstructed, and whether signals were present.

Keep in mind that your pictures may be used to prove that something was not there. Absence of skid marks may indicate one driver was inattentive or asleep.

Absence of traffic signs, road marks, wiggles or other warning signals at the time of the accident may be an important point

Panoramic photos of this type may be bought by insurance companies to help prove their case during trial.
in court. Your long shots may be used to prove that the big billboard on the corner lot was not there when the accident happened—it was erected several days later.

Close-ups of damage to vehicles may help experts to determine what happened in the split second before the crash. Dents made by a pair of headlights in the side of a second car have been used as court evidence to show that a driver did not swerve his car, an indication he was either asleep or otherwise inattentive. In shooting such pictures, stay far enough back to show license plates or other identification marks.

Close-ups of windshield damage may help to determine that a passenger was pitched headfirst into the glass. Dents or

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Here one car was in the wrong lane. The location of the center line on highway makes this photo valuable
Straw Chopper Stops Road Erosion
Highway builders have found a new use for a farm implement. A chopping machine, used on farms for chopping hay, straw and silage corn, now is distributing straw evenly over the dirt shoulders of new highways to prevent erosion while grass seedings are getting a start. Ordinarily, men scatter the straw with pitchforks. Now two men feed the chopper baled straw while two others aim the long flexible tube to scatter the straw across the dirt.

Calking for Cars
Calking material of a putty type which can be rolled in the hands to any shape is useful as an autobody sealer. It is packaged in a solid bar 10 inches long and 2½ inches in diameter and is wrapped in an oil-resistant paper inside a foil-lined sleeve. The sealer is designed for use on seams between roof and side panels, between floor and side panels, over dust holes, under clip moldings and other areas which are not in contact with occupants or materials carried in the car. It requires no application equipment and will not shrink or harden.

Hymns in Color
Using fluorescent chalk and black light, N. R. Swartwout of Evanston, Ill., draws two pictures on the same board and, with an ingenious lighting system, fades one picture out as the other is faded in. Swartwout developed the lighting system to illustrate hymns during church talks.

British doctors have successfully replaced an eight-inch section of a diseased thighbone in the leg of a 10-year-old boy with a substitute “bone” which was carved from polyethylene plastic.
Fire-Fighting Gun Shoots Foam 190 Feet

Fire-extinguishing foam is squirted 190 feet through the air by a gun invented by M/Sgt. Valton Allen, Jr., of the Air Force. Sergeant Allen is fire chief of the Air Force base at Furstenfeldbruck, Germany, and his gun is used on every large base in Europe. Three jets feed a mixture of water and foam into the gun, where air pressure swirls it into the smothering agent found to be the most effective for fighting gas and oil fires. A high-pressure pump forces the foam through the long nozzle. Properly mounted, the gun discharges 500 gallons of the foam in 3 minutes and 22 seconds.

Deepest Hole Ever Drilled

Drilling at ever increasing depths into the earth for oil, one company recently set a new record of 20,251 feet — nearly four miles. This operation, which turned out to be a dry hole, was in Sublette County, Wyo., and is reputed to have cost the Superior Oil Company around three million dollars. The temperature at the bottom of the hole exceeded 300 degrees Fahrenheit. Drill pipe used to reach the 20,000-foot depth weighed 300,000 pounds and it had to be withdrawn every time the bit was changed. Deep drilling has increased rapidly over the last 15 years. In 1934 the depth of 10,000 feet was reached for the first time. The 15,000-foot mark was passed in 1938 and early this year a well was abandoned in California as a dry hole at 18,734 feet.

Miniature Bandsaw Complete in Case

Weighing only 30 pounds, a midget bandsaw can be carried from job to job. The bandsaw case holds the belt, pulleys and motor. Blade tension is adjusted by turning a knob on the top of the saw frame. The little saw also can be used as a shaper. Rotary files in the base cut sharp contours. A double pulley permits speed changes.
Auctioneer harangues inquisitive crowd. It’s as much fun as a county fair.

17-ACRE BARGAIN COUNTER

Wanna buy a duck, a 1914-model coffee grinder or a slightly used swimming pool? Everything’s for sale at the Auction City dreamed up by three U.S. Army officers while on European duty

By Weldon D. Woodson

WHO EVER HEARD of an auction sale that went broke?” asked young Albert G. Jeffries. He was speaking to two Army buddies in Europe, Charles W. Harris and Ernest Kleiner. The three officers were figuring angles for their careers after the war was over.

Harris and Kleiner thought about auctions for a moment. Then Harris said, “Might work.”

“But we’d have to enlarge and improve upon auctions,” commented Kleiner.

By the time the three turned in they had worked out a basic idea for a novel postwar business enterprise.

Two weeks before the European phase of World War II ended, however, Jeffries got shot up. For 2½ years he was confined to a hospital. When Harris was released from the Army, he became an insurance salesman. Kleiner waited for a while, hoping that the three would get together, then enlisted in the Army for a three-year hitch. When his enlistment was up he planned to join his partners.

Finally Jeffries was dismissed from the hospital. He and Harris still were convinced that a gigantic auction, week in and week out, was their chosen occupation. To attract attention, they realized, the auction must be gigantic. Their home, the southern part of California, is accustomed to large enterprises. Therefore, they would create in California a super-auction, the biggest
in the world, an “Auction City” where anything could be bought or sold.

They searched for a place to establish it. Not all communities permit auctions, so when looking over an area they first learned whether it was legal. They decided upon 17 acres of level land 1 1/2 miles east of the small town of Downey, or approximately 15 miles southeast of downtown Los Angeles. It fronts Firestone Boulevard, over which an incessant stream of traffic flows. Tens of thousands each day would see the “city.” They in turn would tell others. Newspaper, magazine and radio advertising helps, but a locality adjacent to a busy highway is a necessity for an auction sale gone “big time.”

To buy the land, erect the buildings and promote it would require money. When in Europe, the three began to save a portion of their officer’s pay each month. In all, they managed to pool about $3000. Not much, but enough to carry out their idea.

“In fact,” confides Harris, “we even had 17 cents left over when we were ready to hang up our sign.”

Going! Going! Gone! And sold to the highest bidder was this 1914-vintage coffee grinder. That’s Jeffries himself swinging the gavel and no one asks a buyer what he’ll do with the stuff. Below, typical western zoo appeals to visiting kids and most of their parents, too.
Already, a lawyer friend had advised them to form a corporation. They had to obtain an option on the 17 acres; plan the buildings to the minutest details; draw up a program of public relations. Moreover, they determined the exact nature of their contemplated business. They not only were well versed in the good points of their dream, but could—without the least hesitation—offer sound answers to any possible objections. Too many persons, it is true, launch an enterprise without thinking it through and appraising it from every angle. Under Auction City, Inc., and with Jeffries as President, Harris, Secretary-Treasurer, they placed the stock on the market. It all was purchased the first day.

On July 25, 1948, they held their first auction—or auctions, for actually as many as 14 may be going at once. So large is the main building that the sign “Auction City,” painted across the entire length of the roof, can be seen from the air. That initial day, more than 75,000 persons milled from one auction gallery to another. Three and a half acres had been marked off for parking, but this was not sufficient. As far as the eye could see, cars were parked on both sides of Firestone Boulevard.

There was only one flaw during the day—30 children lost their parents, or their parents lost them, depending upon whether you look at it from the child’s or the adult’s standpoint. At any rate, by closing time the stray children had been matched with the stray parents and everybody—including Jeffries and Harris as they totaled their day’s receipts—called the opening a tremendous success.

Since then, they never have worried about crowds. The weekly attendance averages over 50,000 persons. Sunday (morning, afternoon and evening) is their best day, but Wednesday and Friday evenings—the other auction days—see a great turnout. So far, the opening day holds the record, but another approached it. They held a charity auction for the benefit of the Los Angeles Orthopedic Foundation, a hospital for crippled children. It brought in $2000 for the hospital.

The coffers of Auction City, Inc.,
are enriched in many ways. Of the 14 auction galleries, the corporation reserves only one for itself. It employs an auctioneer to handle it. Some of the remaining 13 are rented outright for various periods of time; others leased on a commission basis. Each operates independently.

In addition, Jeffries and Harris will auction off, for a percentage, anything you bring to them, from last year's Easter bonnet to—as happened in one case—a baby coyote. Throughout the Los Angeles area folks periodically ransack their own homes to see what, if anything, can be disposed of at "The City," as it is referred to. If there are no bidders, your material will be returned to you without charge.

Especially do mechanically minded persons come here to buy every gadget imaginable. Ready buyers were found for two auto tires on wheels, a set of fog lights and a rubberized electric cord with wire guard around the globe. Also without effort, they sold air horns used on large trucks and transcontinental busses. The new owners rigged them up on family jalopies. Easily disposed of are

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Huge "Vacuum Cleaner" For Land of Cotton

Like a gigantic vacuum cleaner, a new semimechanical cotton picker sucks the cotton bolls from the plants, speeding the harvesting of the Dixie crop. Mounted on a tractor, the picker has eight suction tubes and will harvest up to 3200 pounds of the fluffy fiber each day. It was demonstrated on a cotton field near West Memphis, Ark.

Converted Tire Chains Go on Wheels Quickly

You don't have to jack up your car, move it or even crawl around behind the wheel to put on a set of tire chains that are equipped with a new hook-up device. The device, which can be installed on any set of chains, even makes it possible to mount the chains while the car is bogged down on a steep hill. It consists of an extension of one end section of the chain so that it is long enough to be pulled behind the wheel, then crossed over the tread to serve as a cross chain and finally locked on the shorter end section on the outside of the wheel. To mount the chains, you merely drape them over the tire and toss the end-section extension behind the wheel so that you can reach it from the rear. Then by pulling it across the tread, through a pair of bottle links, you are ready to hook it to the other end section. Two clamps on the extension hold the chain in place should a cross-chain link break during use.
Fluorescent Street Lights

Fluorescent street lights, developed by General Electric, provide glareless illumination which means better visibility, especially when pavements are wet. The new light consists of a long, slender aluminum tube in which two pairs of eight-foot fluorescent lamps are mounted. Two reflectors, mounted back to back, direct the light downward through plastic windows. Well suited for tunnels, the lights may be used eventually on open roadways.

Gasket Cutter

Cutting all types of gasket materials, a new cutter not only cuts circular gaskets quickly and accurately, but also can be used for freehand cutting of irregular shapes. The cutter, made of plastic, has a slot in one end for the blade, which can be adjusted for depth of cut. An adjustable center post, locked in position by a knob, serves as a pivot when cutting circles. The scale on the pivot post permits quick setting of the desired radius. For cutting straight lines or irregular shapes, the center post is removed and the cutter guided by hand. The cutter, which comes with four blades, works equally well on aluminum foil, asbestos, canvas, cork, leather and other gasket materials. It can also be used for cutting designs in linoleum, rubber tile and wallboard.

Coast Guard photographic airplanes "counted" 40,232 icebergs during the 1949 iceberg census conducted over the Baffin Bay region near Greenland.
In the world's largest supersonic wind tunnel, at Cleveland, engineers are getting their first opportunity to study turbo and ram jet engines operating at speeds twice that of sound. Equipment in the six by eight-foot test section is run under temperature and pressure conditions similar to that at 35,000 feet. At maximum speed, as much as two million cubic feet of air per minute—weighing almost 75 tons—are drawn into the tunnel. The process, used to keep the air dry, to prevent condensation and velocity disturbances, removes as much as a ton of water a minute on a hot day. The test area's size is controlled by flexing its stainless-steel side plates, 35 feet long and 8 feet high, with 14 hydraulically operated screw jacks. The tunnel is part of the Lewis Flight Propulsion Laboratory.

Largest Supersonic Wind Tunnel

Car "Crashes" Wall
24 Hours a Day

Motorists driving on Route 78 near Escondido, Calif., are startled momentarily by the sight of a car "crashing" into a restaurant. A closer look reassures them, however, since the car is really only half a car and the "crash" is painted on. The restaurant is located on a sharp curve, thus heightening the effect.
The CRAFTSMAN

★ No special skill or practice is required to lay linoleum. It's so simple to do that you can expect a good floor the first time you try if you carefully follow a few easy-to-understand directions. A story on page 194 pictures and describes the procedure in detail.

★ If you're a home craftsman, sooner or later you'll be called on to drill holes in glass. It's easy when you use special drill bits made from old files. Just turn to page 224 for full instructions.

★ Nowadays farmers can ease the back-breaking job of loading baled hay onto a truck or trailer by building a bale loader which handles the job automatically. The construction details are outlined on page 217.

★ Readers have asked, "How do finishers produce that satin-smooth finish I see on fine furniture?" On page 202 one of the experts lets us in on a few tricks of his trade.
HERE ARE TWO quickie projects that utilize transparent plastic to the best advantage. The circular candy plate, Fig. 1, is entirely of plastic and features an unusual frosted design, while the jewel box, Fig. 6, is an attractive combination of clear plastic and pieces of select hardwood.

To make the candy plate, cut a 7-in. disk from 1/8-in. plastic, leaving the protective paper covering intact. Lay out the design on the paper covering according to the squared pattern, Fig. 3, and cut through the paper around the outline of the design with the point of a knife. Peel off the paper
to expose the areas to be frosted. Use a small flat-bottomed burr to frost the design, Fig. 2, and after frosting, vein the leaves with a fine grinding tool or a dentist's drill. The plastic is dished with the aid of a two-piece wooden form as in Fig. 5. The bottom of the form consists of a 6½-in. disk, one face of which has been rounded in the lathe. The top makes use of the waste stock from which the disk was jigsawed and is used to press the edges of the plastic over the form. To soften the plastic, remove the protective paper and heat the disk until pliable in an oven set at 250 deg. F. The two leg units are cut out as shown in Fig. 3. Be sure that the radius along the top edge of the legs matches the curvature of the plate. The legs are half-lapped and cemented to the underside of the plate.

Begin making the jewel box by cutting the ends and bottom from ¼-in. hardwood. The ends are disks with the lower portion cut off as in the left-hand detail, Fig. 4. The sides and the lid of the box are cut from ½-in. plastic and the lower edges of the sides are beveled so they are flush with the bottom of the box. One side of the box is slotted for plastic hinges. The parts are heated and shaped by bending around the box ends, Fig. 7. It is best to protect the hands with cotton gloves or cloth when doing this. After the sides have been cemented to the ends and bottom, the hinges are bent to fit through the slots, Fig. 8, and cemented to the lid. With the lid in the closed position, the latch is formed so it serves as a friction catch against the front side of the box, and it is then cemented to the center of the lid, the lower portion overhanging the front edge as in Fig. 6.
Metal Shingle-Nail Dispenser

Hooks on Trouser Belt

When shingling a roof there is nothing like having a good supply of nails where you can reach them easily, and the answer to this problem is a sheet-metal nail dispenser hung from your belt. The metal is cut and soldered to form a four-sided box. The back of the box is T-shaped and is bent over and riveted to form a belt loop. The nails drop into a slot which runs the full length of the bottom of the box. These are pulled through a notch in the end of the box one or more at a time, as desired. A piece of spring steel screwed to the box covers the notch to keep the nails from sliding out when the box is tilted.

Buttons Improvised From Beads

If buttons of the desired color are not available, use wooden or glass beads as a substitute. These are obtainable in a variety of colors and sizes and are sewed to the fabric as shown.

Removing Candle Drippings

To remove unsightly candle drippings from a tablecloth or scarf, place several layers of blotting paper both over and un-
der the spotted portions of the cloth. Then heat the blotting paper with an iron so that the wax will be melted and absorbed by the paper.—Helen Lemberger, Chicago.

Pen Modified for Drawing Ink

Should you have occasion to use drawing ink to make sketches or special place cards for a party, there is no need to buy a special pen for the purpose. The ink capacity of an ordinary writing pen can be increased sufficiently by pressing a straight pin into the lower end of the penholder. The head of the pin should rest against the inner surface of the pen.

Edward A. Lakso, Glendale, Calif.

Towel Rack Holds Iced Doughnuts

After icing doughnuts on both sides, it is often a problem to find a spot to set them while the icing hardens. Next time, try slipping the doughnuts over the arms of a folding towel rack. This allows the icing to dry uniformly on both sides of the doughnuts.—Benj. Nielsen, Aurora, Neb.

Block Aids Fastening Tire Chains

Attaching a tire chain is done faster and with less effort if the wheel of the car is raised with a small block of wood. Cut the block from a 2 x 4 or use half of a brick. Lay the chain flat on the ground and place the block in one of the sections of the chain. Then, just back up the car until the wheel rests on the block, pull the ends of the chain up around the tire and fasten them. By using two blocks both wheels can be raised simultaneously. As the blocks require little storage space, they can be carried in the trunk along with the chains.

Charles Herbst, Dallastown, Pa.
FIREPLACE HOOD

Made of gleaming burnished copper, this attractive hood adds a Western touch to the front of a plain brick fireplace. Installation of the hood makes the opening appear lower and therefore wider, resulting in a more pleasing over-all appearance. Sheet copper is cut to the dimensions given in the detail. Note, however, that the length of the hood is not listed, as this must be determined by adding 16 in. to the width of the fireplace opening. The sheet is drilled for rivets and lag screws and then bent along the dotted lines. The top edge is rounded at the corners by brazing pieces of scrap copper to fill the notches opposite the bends, and then a \( \frac{1}{2} \times 1 \)-in. brass strip is riveted to the bottom edge. The completed unit is mounted on the fireplace by driving lag screws into lead shields inserted in the mortar joints as in the center detail. If desired, copper pilasters may be attached to the corners of the fireplace opening.
**SOLVING HOME PROBLEMS**

**CLEANING A KITCHEN RANGE** is simplified by using a toothbrush to get into the cracks and crevices around handles, burners and vents. Dip the toothbrush first in warm water and then in a cleanser.

**TO PREVENT UNRAVELING** of fabric when cutting out patterns, trace around the edge of the paper pattern with a wax crayon and cut along the line made by the crayon. The cut edges will not fray.

**WHEN CHOPPING NUT MEATS,** keep the pieces from flying all around by using a guard made from a coffee can. Cut the bottom from the can and place the metal cylinder around nut meats.

**SAGGING DRAPERY CRANES** can be leveled by supporting them with wire coat hooks turned into the window casing near the outer ends of the cranes. The draperies will conceal the hooks.

**IF THE AROMA OF THE WOOD** in an old cedar chest has lessened noticeably because of age, gently rub the interior of the chest with very fine sandpaper to restore the odor to its original intensity.
POLISH IS REMOVED from a shoebrush by soaking the bristles in a solution of paintbrush cleaner and washing soda. Suspend the brush as shown and soak overnight. Then rinse in water and allow to dry.

A MUFFIN TIN forms an excellent serving tray for cold beverages. If the glasses are a close fit in the depressions of the tray, there is no danger of their sliding while the tray is being carried.

BEDSIDE POCKETS for slippers, tissues and other items are had by inserting one end of an 8 or 12-pocket shoe bag between the mattress and spring of the bed. Allow several pockets to hang over the side.

SECTIONAL-SOFA UNITS won’t separate if they are coupled with screen-door hooks attached to underside of the frame. Combinations can be varied if hooks are located similarly on each unit.

DARNING THE FINGER TIPS of woolen gloves is facilitated by using an ordinary glass marble to provide a miniature darning egg. Just drop the marble into the glove finger in need of repair.
Repairing Rotted Fence Posts By Reinforcing With Pipe

If wooden fence posts have rotted below ground and the upper portion is still in good condition, a long-lasting and inexpensive repair can be made by reinforcing them with lengths of discarded water pipe. Cut a length of 3/4 or 1-in. galvanized pipe for each post so it is long enough to extend at least 3 ft. into the ground when its upper end is even with the top of the post. Then fasten the pipe loosely to one side of the post with three or more pipe straps and drive the pipe into the ground. The straps serve as guides for driving the pipe and are tightened after the pipe has been driven.

Charles Doescher, Waterbury, Conn.

Inexpensive Gluing Clamps Made From Turnbuckles

Enough gluing clamps to handle all your projects from comparatively small novelties to large pieces of furniture can be had at little cost by making them from turnbuckles, rod and flat iron. The original eyebolts of the turnbuckle can be pried open to form the linkage between the turnbuckle and the flat-iron hooks, or L-shaped links can be made by bending and threading lengths of rod. The hooks are bent from flat iron and a series of holes is drilled in each one to permit attaching to the linkage. The capacity of the clamps is determined by the length of the rods or hooks and by the number of holes drilled in the hooks. When gluing flat work, the hooks are inverted from the position shown.

W. W. Cary, St. Paul, Minn.

Pulley Holds Dowel Upright To Facilitate Drilling End

It's considerably easier to drill accurate holes in the ends of short lengths of dowel if a jig is used to hold the work upright on the drill-press table. An extra pulley is just the thing to provide a steady base to aid in centering the work under the bit. Insert the opposite end of the dowel in the hub of the pulley and tighten the setscrews to lock the dowel in place.

Roland Cueva, Heyburn, Idaho.

Squeezing Pulp-Free Lemon Juice

By squeezing lemon juice through small slits cut in the rind, pulp-free juice can be had even though a strainer is not available. Make two slits through the rind, one on each side of the navel and parallel to the other. The juice will flow from the slits while the pulp and seeds are retained inside the lemon. Do not apply pressure to the lemon too suddenly, as it may result in breaking the rind and releasing the pulp.

Repairing Holes in Linoleum

A long-lasting repair for small holes in linoleum is had by filling the holes with a paste consisting of finely chopped cork and shellac. Allow the paste to harden in the hole, smooth carefully with sandpaper and then touch up with paint to match the surrounding area.

R. F. Donovan, Jersey City, N. J.

Melted ski wax provides an excellent waterproofer for leather footwear.

By Thomas A. Dickinson

LIKE THE BRONZING of baby shoes, here's an idea that can be turned into a profitable spare-time business—casting book ends from human hands. But whether it's done for profit or just for fun, it costs little and your friends are sure to be intrigued by a life-size reproduction of their own hands, supporting their favorite books.

Producing a pair of these personalized book ends consists of making a "splash" plaster mold directly from the person's hand. To do this, the hand is first coated with Vaseline, Fig. 1, which prevents the plaster from sticking. Then the hand is rested palm down on wax paper on a flat surface and covered to the wrist with a mixture of casting plaster, Fig. 2. This splash coating should be at least ½ in. thick all over. After allowing the plaster to harden for about 30 minutes, the hand is turned over and worked free by gently wiggling the fingers, Fig. 3. This usually can be done without damaging the mold, but any small chips or flaws that might occur can be easily corrected later in the master pattern.

Next, the hand impression in the splash mold is coated with two or more applications of lacquer, Fig. 4, to seal the pores in the plaster and to produce a glossy finish. This is followed with a coat of paste wax to prevent the master pattern from sticking. The master pattern is made by merely filling the splash mold with plaster, the open end of the cavity being blocked off as in Fig. 5. As the splash mold is no longer needed, the
When this is done, a base is added to the hand. Using a tin can as a form, plaster is poured into the can to a depth of 1 in., and while the plaster is still wet the master pattern is placed upright in the can and embedded in the soft plaster, Fig. 8. Small holes due to air bubbles and other irregularities in the master casting can be corrected by sanding and patching where necessary. A handy tool for cleaning up the pattern is a small hand grinder, Fig. 7. The portion of the base projecting on the flat side of the hand is carefully sawed off flush with the surface. Next, the master pattern is coated with lacquer, followed, when dry, with linseed-oil soap, consisting of equal parts of linseed oil, water and laundry soap. This is applied to keep the pattern from sticking to the flexible mold.

Material for the flexible mold is compounded by mixing together 4½ lbs. of flake gelatin, 4½ pts. of water, 9 lbs. of glycerin, 1 lb. of glucose and 1 oz. of denatured alcohol in the following order: Add the water to the gelatin and cover the container with a damp cloth to prevent evaporation. Stir the water-and-gelatin mixture every 10 min., replacing the cloth each time until the gelatin is thoroughly softened. Drain off any surplus water in the mixture and then place the gelatin in a double boiler, Fig. 9. Next, warm the glycerin and add it to the melted gelatin,
and then warm and add the glucose. When thoroughly “cooked,” remove the mixture from the double boiler and stir in the alcohol, Fig. 10. The mixture is now ready to be poured over the master pattern. A mold for the pattern can be made by removing both ends from a large can or by wrapping cardboard into a tube, Fig. 12. The form should clear the pattern at least 1 in. all around. After pouring, the flexible mold is allowed to stand for about 12 hrs. before separating it from the pattern.

Preparatory to making the finished casting, the flexible mold is dusted on the inside with talcum powder and left for an hour to allow any moisture in the mold to evaporate. If the casting material used requires a melting point of more than 100 deg. F., the mold cavity should be treated with a strong solution of alum, which is made by heating 1 lb. of alum in 1 qt. of water. This is applied cold to the mold and allowed to dry. If any alum residue remains in the mold, remove it by tapping.

Low-melting materials that may be used to make finished castings include a metal called Cerrolow, thermo-setting plastics, regular casting plaster and other compounds which do not require heating the mold beyond 150 deg. F. Before each casting is made, the mold cavity should be brushed with a mixture of 7 parts of kerosene and 5 parts of stearic acid. In addition to cleaning the mold surface, this mixture serves as a parting agent. In filling the mold, care should be used to pour the liquid down the side of the mold so that the lowest parts of the mold will be filled first, forcing any air bubbles to the top. Pouring should be done steadily without splashing. When the flexible mold has served its purpose, it can be melted and the material used again.

Finishing the book ends can be done with pastel enamels or bronzing powders. A glaze-like finish in shiny black makes an attractive pottery-type job. If plain plaster is used to cast the hand, it should be sized with shellac before painting to seal the porous surfaces. Apply several coats of paint to build up a smooth heavy finish.
Colorful Window-Shade Pulls
Utilize Spools and Beads

Two wooden beads, an empty thread spool and a length of cord can be combined to provide an attractive shade pull. Select beads and cord of the desired color and paint the spool to match or contrast to suit your taste. Wind the cord around the spool, tucking the ends under a few turns to hold them tight. Then tie a knot in the end of another length of matching cord, string one of the beads, the spool and the other bead on the cord and tie another knot to hold the parts securely together. Then, simply tie the cord to the shade. If you don't wish to paint the spool, it can be wound and then the exposed ends colored with crayon.

Metal Loop on Receptacle Plate
Snubs Appliance Cord

Attached to the plate of a wall receptacle, this metal loop anchors the plug of a portable tool or vacuum cleaner so that it is not pulled from the receptacle whenever the slightest tension is exerted on the cord. The loop is bent from \( \frac{3}{4} \) in. rod, one end being flattened and drilled to receive the mounting screw of the receptacle plate. The hole is countersunk for the head of the screw. Note that the space between the ends of the loop must be sufficient to permit passage of the appliance cord. If necessary, extension cords from both outlets can be snubbed simultaneously with the metal loop.

Arthur Trauffer, Council Bluffs, Iowa.

Neckties Carried in Suitcase Protected by Magazine

When taking a couple of spare neckties on a trip, use a magazine to protect them from becoming wrinkled in the suitcase. Lay the ties flat between the pages of the magazine as shown.

Floating Jackshaft for Wood Lathe Facilitates Shifting V-Belts

To make it easier to shift the V-belt on my wood lathe when changing speeds, I made this floating jackshaft. The jackshaft maintains tension on the belt and also increases its life, as the belt does not have to be forced over the edges of the pulleys when making changes. The shaft assembly is mounted on a floating hardwood base which slides back and forth on steel rods fastened with nuts between angle-iron mounting brackets. A compression spring on each rod maintains tension on the V-belt, and this is relieved for shifting the belt by pulling the lever shown in the detail. Note that oilholes are drilled through the base to permit lubricating the sliding mechanism, and also that the jackshaft must be driven from below. If the jackshaft handle is fitted with a hold-down to lock it in the forward position, the lathe can be stopped for frequently checking the work without turning off the motor.

Decorative Candleholder Has Clear Plastic Base Surmounted by Polished-Aluminum Leaf Design

Used individually as a centerpiece for the small table or in pairs on a buffet or larger table, these plastic and aluminum candleholders will add a touch of elegance to your dining room. The base of the candleholder is a block of transparent plastic approximately 1 in. thick x 3 in. square. After a 1-in.-dia. hole has been bored through the center of the base, the latter is polished to a high luster. Then a 3-in. length of 1-in.-o.d. polished aluminum tubing is pressed into the hole in the base. The hole should be slightly undersize so the tubing is a snug fit. The leaf design is laid out on a sheet of paper according to the full pattern and the paper is cemented temporarily to a sheet of .064-ga. soft aluminum. The sheet metal is cut out roughly, drilling holes at the center ring and also at the small radii to facilitate cutting. After roughing out, the edges are finished to exact shape with fine files. The leaves can be veined by tapping a dull screwdriver blade along lines penciled on the sheet metal. The metal is polished and the leaves curved gracefully, the stems being bent upward as shown in the detail. When the leaves are finished, the center ring is slipped over the aluminum tubing and fastened to the plastic base with roundheaded screws driven into undersize holes in the plastic.

Simple Decoy for Crow Hunters Easily Shaped From a Wire Coat Hanger

A wire frame bent to the profile of a crow and covered with black cloth results in a quickly made decoy that will lure flocks of crows within shotgun range. Bend the frame from a wire coat hanger, straighten the hook and sharpen the end. Then, cover the frame with a piece of black cloth or a black stocking and press the pointed end of the wire into the top of a fence post or stump. The decoy will bring flocks of crows within range and their excited cawing will lure other crows to the vicinity.

R. A. Jenkins, St. Louis, Mo.

To restore the appearance of parchment-paper shades, first remove dirt with wall-paper cleaner and then rebind the edges of the shades with ribbon or gummed tape.
As favors at a children's party, these comic heads will bring squeals of delight—and they're so simple that a child can make them. Using the same general idea, a clever adult can fashion hilarious caricatures of friends to provide entertaining place cards.

By W. A. Simpson

Using ordinary school drawing paper and coloring with crayon or water color, a number of these original party favors can be turned out in a short time. Making them also affords an entertaining pastime for the youngsters who, after once getting the knack of it, can give free rein to their imaginations and artistic abilities. The first step is to mark off a sheet of paper in squares of the desired size as shown on the opposite page. Use a pencil and mark lightly so the lines can be erased later without difficulty. Then draw the eyes, ears, nose, etc. with pen and ink or directly with color and completely color the design. Cut the head from the sheet as indicated by the solid vertical line and then cut out around the hair and ears. The ears are cut along the solid lines and folded forward along the dotted lines. Cut the necessary slots in the head and cut out the nose and accessories. Assemble and glue the ends of the head to form a cylinder.

CUT ON LINES AND BENT FORWARD

METHOD OF ASSEMBLY

EARS CUT OUT AND BENT FORWARD ON DOTTED LINE

BROWN ON EARS AND SPACE AROUND EYES

COLLAR INSERTED IN SLOTS

GREEN TAB INSERTED IN SLOT

BENT UNDER AND GLUED INSIDE NOSE

YELLOW BUCKLE

COLORED WHILE FLAT, THEN CUT OUT. REAR EDGE LAPPED 1/4" AND GLUED.
Vertical Shoe Rack Conserves Closet Space When Mounted in Convenient Spot on Wall

You won't stumble over shoes lying on the closet floor if you install this handy wall rack which holds 10 or more pairs of shoes. The rack is only 10 in. wide and projects 12 1/2 in. from the wall. The height of the lower shelf is 7 in. for high-heel or work shoes and the remaining shelves are 4 in. high. These dimensions, of course, may be varied to suit the style of shoes commonly worn by members of the household. The curved mounting bracket and shelves are made of 1/2-in. stock or plywood, and three strips of lattice stock on each side hold the unit intact. The mounting bracket is screwed to the wall just above the baseboard, and the top of the unit is simply nailed to the wall or fastened with steel angle irons.—A. J. Price, Canandaigua, N. Y.

Sawdust Sprinkled Evenly Over Wet Varnish Provides Nonslip Boat Deck

The slippery deck of a sailboat or shell-type iceboat can be given a nonslip surface by coating the dangerous areas with sawdust embedded in wet varnish. If the deck has been newly finished, allow the varnish to dry completely. Then, apply a second coat of varnish to the areas where a nonslip surface is desired. Sprinkle sawdust or coarse sand evenly over the wet varnish and allow to dry thoroughly before using.

Toolbox Handle Serves as Reel For Winding Extension Cord

To keep an extension cord from becoming tangled and sometimes buried under an assortment of tools when stored loosely in a toolbox, one man made the center partition of his toolbox into a combination handle and reel. The partition is jigsawed from one piece in the shape shown, a handhole being cut in the top.

Foot Switch Operates Saw

In order to facilitate starting and stopping his bench saw, when both hands are used to hold the work, one craftsman utilizes a high-low dimmer switch from a car to provide a foot switch. The switch is wired in series with the saw motor, one side being "open" and the other "closed."—Leonard Reed, Natick, Mass.
Novel decorative effects are attained by cutting spiral grooves in lengths of dowel. Actually, doing this is easier than you might think, as the job can be done on a circular saw with the simple addition of a wooden fence on the miter gauge. Use a fine-toothed saw and set the miter gauge at an angle, moving the gauge forward so the saw will cut a groove to the desired depth and locking it in place with a C-clamp. Setting the miter gauge at an angle of 75 deg permits cutting 1/8-in.-deep grooves 7/8 in. apart in a 1-in. dowel. An angle of 45 deg. with a 1-in. dowel will result in a spiral about 3/8 in. wide and the grooves spaced 3/4 in. apart. The appearance of these two spirals is illustrated in the photo. However, various spirals on different sizes of dowel can be determined by experiment. To cut the spiral, hold the dowel against the fence and feed it into the saw, turning it slowly in a clockwise direction. When the spiral has been cut one full turn around the dowel, stop the saw and drive a finishing nail into the fence, as shown, so it will ride in the groove. When the saw is turned on and the work fed into it as before, the nail will keep the spacing of the grooves even. After being cut, the grooves can be smoothed with a file and finished with sandpaper, the corners left sharp or rounded as desired.

Dick Hutchinson, El Monte, Calif.

Washer Facilitates Scroll Layout

When laying out a scroll cutout design, the distance between the lines can be kept uniform throughout by using a washer as shown in the photograph. After the first line is drawn in with a curve, the latter is left in place while the second line is drawn. Washers of different sizes can be used to suit various requirements.
**TOOLS**

- Linoleum knife
- Dividers
- Trowel
- Toothed style
- Homemade spreader
- Cement spreaders

**LINOLEUM**

*STANDARD SIZES AND TYPES OF BASES*

- Plain-felt base should be applied “loose-lay.” No liner is used... Should not be cemented.
- Duplex-felt base is a double type of backing and is intended for direct cementing to floor.
- Burlap base is cemented to a felt liner.

**FIRST POINTERS IN LAYING**

- Linoleum is usually extended halfway through doorways.
- Seams should fall across joints in wood floor whenever practical.
- The smoothness of your job depends on a smooth floor, take time to plane and nail.

**METHODS OF LAYING**

- Wall-to-wall
- Simple border
- Border and feature strip
- Personalized designs (make your own)
Lay Your Own LINOLEUM

By Sam Brown

Part 1

LAYING your own linoleum is one of the most satisfying of all homecraft jobs because definite results can be accomplished in a comparatively short time. The money saved makes it well worth-while to do the work yourself and the approved procedures are so easy to apply that, by following a few simple directions, you can expect a good floor, even on the first job.

Types of linoleum: First of all, study the sketches on the opposite page which cover the fundamental procedure. Then decide what kind of linoleum you want. The cheapest material has a plain felt base and the pattern is usually a printed enamel. This type of floor covering must always be applied “loose-lay,” that is, not cemented or tacked to the floor, because it must be free to expand. A better grade comes with a duplex felt back and can be applied either loose-lay or cemented directly to the floor. The best grade of linoleum is built up on a burlap base and is always cemented over a lining felt. All linoleum is stiff and brittle when cold and should not be unrolled until warmed to a temperature of 70 deg. for at least 24 hours. When it is practical to do so, it also is a good idea to allow the linoleum to lie flat for another 24 hrs. after unrolling. In this way, all danger of breaks in the surface of the linoleum will be avoided.

Laying wall-to-wall: This is the most common application and is illustrated by the details on the following page, which also explain the basic operation of scribing. Scribing simply means marking the linoleum to a shape and size to fit the room in which it is to be laid. It is done with a pair of dividers of the type used in woodworking, or with special dividers made for linoleum work. The latter tool is called an overscriber. In laying linoleum floor covering wall-to-wall, begin by removing the shoe mold at the bottom of the baseboard. If the floor is rough, with offsets at the joints, it should either be sanded or planed smooth. Then, cut the first sheet of linoleum about 4 in. larger than needed and fit it in place against one wall, letting the ends ride up on the baseboard. Follow through with the procedure pictured in Figs. 1 to 4 inclusive, which show the methods of scribing quite clearly. A close fit against the baseboards is not advisable in ordinary wall-to-wall installation. It is best to allow at least 3/8 in., or better, 1/2 in., all around. The gap will be covered when the shoe mold is replaced. Most wall-to-wall jobs will require fitting the linoleum into at least one doorway. If the doorway is of the arched type or if it is fitted with a swinging door, it is common practice to extend the linoleum halfway through. Otherwise, the linoleum is ended at the
SCRIBING IS BASIC OPERATION ON ALL JOBS

Cut linoleum 4 in. over required length. Lay on the floor with one side about 1 in. from wall and let both ends ride over baseboard. Set dividers at the required opening (Fig. 2) and, with one point of the dividers in contact with baseboard, scribe the line.

When scribing to fit a doorway, metal edge molding can be temporarily fastened in place with two screws to serve as a guide. Shoe mold will cover the cut at A, so linoleum can be cut from 1/8 to 1/4 in. beyond the scribed-to-wall mark, making piece easy to fit.

Shift the linoleum lengthwise until it clears one end wall. Set dividers to the exact distance between the key marks and scribe the end wall at this setting.

Measure width needed for second sheet and cut linoleum over the required width. Place about 1 in. from wall and scribe as before, using the method in Fig. 2 when doorway is involved. This method is not used on patterned goods as it will destroy pattern register.
The edge should be protected with a metal molding of the type shown in the upper detail, Fig. 2. This can be fitted before or after laying the linoleum, as desired. As suggested in Fig. 1, fasten the mold with two screws and then scribe to it. If required, it then can be shifted easily.

Laying second sheet: The second sheet is fitted as shown in Figs. 5 and 6. When rough trimming the second sheet, be sure to scribe and make the cut parallel with the opposite edge. When fitted in place, the edge at the seam should be parallel with the wall. After fitting the second sheet, there will be an overlap where the two pieces come together, Fig. 6. A neat butt joint, or seam, is made by double cutting as in Fig. 5. A recommended alternate method involves the use of a special tool called an under-scriber, Fig. 7. This tool speeds the scribing job and assures accuracy. When the under-scriber is pulled along with the round boss riding against the edge of the under sheet, the pointer scribes a mark on the top sheet directly above the edge of the under sheet. The top sheet is then cut on the scribed line for a perfect fit. The seam-cutting method used will affect the manner of applying the cement. If the seam is made by double cutting, both edges are left uncemented for a distance of about 4 in. from the edges. After cutting, cement is spread under the projections to complete the job. If an under-scriber is used, the first sheet is cemented to the edge as in Fig. 7. When using either method of cutting, avoid fitting the seam too tightly. It is better to leave them a little loose to prevent ridging or buckling. Then, after cleaning up the surplus cement with a damp cloth, press the edges down to a perfect fit by rubbing with a hammer head covered with a soft cloth.
Fitting with paper pattern: Sometimes you will run into a job that is difficult or impractical to scribe by ordinary methods. In this case, use of a paper pattern probably will be the solution. To build up the pattern, cut and paste pieces of heavy paper or cardboard together to form the exact shape you want the linoleum to be. Then apply rubber cement or linoleum cement to the face of the pattern and roll the linoleum onto it so that the two stick together firmly, Fig. 8. Then turn the linoleum over and you have the required cutting pattern cemented to the back. This method also works out well when fitting linoleum having a figure or design imprinted or inlaid. In this case, you cannot cut to form a seam in the usual way as this may destroy the design register. Using the paper pattern, the linoleum is cut a little over the required width, the second sheet is butted against the first sheet and then rolled to the wall where it picks up the paper pattern.

Fitting simple border: In nearly all border jobs, you have the choice of laying either the field or the border first. Figs. 9, 10 and 11 show the border laid first. Chalk a line all around the room an equal distance from the walls. Use either the scribing or paper-pattern method for marking the border pieces at doorways. After the pieces have been cut out, place them in position and check for fit. Then remove the pieces, one at a time, and spread cement under each one out to the chalk line. Replace all pieces and double-cut the corner seams, using either a miter or plain butt
joint at the corners. Although the miter joint wastes more material, it is by far the neatest and most attractive. After the border has been cemented down, clean up all excess cement and then rough-cut the field material 1 to 2 in. oversize, except, if desired, one factory edge, which can be butted to the border. On the remaining edges use the under-scriber, Fig. 10, to mark a line for the cut above the border. Cut on the scribed lines and finish cementing at the edges of the field. Clean up with a damp cloth and then rub down all joints with a hammer head.

**Border and feature strip:** This attractive style, Fig. 17, requires only a little more time to lay than does the simple border. The method pictured in Figs. 15 to 20 inclusive calls for laying the field first, a procedure which many workers prefer for this installation. Chalk a line around the room a distance from the walls equal to the combined width of the border and strip. Butt one factory edge of the field to the line and trim the other edges about 1 in. oversize. Roll the material back and spread the cement, first on one half of the floor, then on the other, Fig. 12. Be sure to keep the cement inside the line. Bed the linoleum in the cement, pick up the chalk marks with a straightedge and cut the field to the required net size, Fig. 13. Then sand-bag the field and clamp the edges with wooden strips nailed to the floor, Fig. 19. Allow to stand for 24 hrs. Border pieces are now trimmed to a width of about 1/2 in. less than the distance between the edge of the field and the wall, Fig. 18. Set the scribe (dividers) to the width of the feature strip, Fig. 14, and, with the border pressed tightly against the field, scribe as in Fig. 20. If all measurements have been made correctly, the border and feature strip will fit neatly into the opening as in Fig. 16. It should be noted that in border work, the border itself is scribed net to the wall without a gap. The slight pressure fit thus obtained helps to get a good, tight joint between the border and feature strip and between the strip and the field. In some jobs involving a border of the same pattern and color as the field, the linoleum is laid wall-to-wall and the feature strip is cut in. This procedure is sometimes advantageous, depending on the size of the room and the distance from the wall to the strip. Make suitable allowances at the baseboard.

*(To be continued)*
Turning Dowels on Disk Sander

You don't need a lathe to turn tenons and lengths of dowel if your shop is equipped with a disk sander. Just use a board and cleat clamped to the sander table to aid in holding the square stock against the sanding disk. Tack the cleat close enough to the face of the disk to serve as a rest for roughing off the corners of the work, feeding the work from one side, as pictured, and turning it slowly. Then move the cleat to within $\frac{1}{2}$ in. of the size of dowel required and run the work through again. The work can be finished smooth with fine sandpaper.

Horseshoe Provides Ceiling Hanger

Bolted or welded to flat-iron extensions, a pair of horseshoes can be suspended from a garage ceiling to provide a convenient hanger for an extension ladder. They also can be used to form a rack for clothes poles, pipe and other hard-to-store items. One arm of the horseshoe is cut off, as shown, and the flat iron is fastened to a joist or rafter.

O. H. Hampsch, Oak Park, Ill.

Brush a dust mop well with a whisk broom after using it and it will be preserved in excellent condition.

Dress Snap Holds Fabric Samples

A number of small pieces of lightweight fabric can be fastened together with a large dress snap. This lessens the possibility of trimmings being mislaid and facilitates carrying cloth samples.

Keeping Fingernails Clean

Especially for the office worker or salesman whose hands must look well groomed, here is a way to keep the underside of the fingernails clean while tinkering with the car or working in the basement shop. Before starting the job, wash the hands and clean the fingernails. Then scratch the nails across a bar of soap until the space under the tips of the nails is completely filled with soap. When the job is finished, wash up in the usual way and remove the soap from under the fingernails by brushing or with a nail file. The nails which have been protected by the soap will be left clean.—George L. Elston, Kirkwood, Mo.

Sag Removed From Folding Cot By Straps at Rail Hinges

Installing a leather strap on each side of a folding cot permits spreading its center legs to remove the uncomfortable sag usually found at the center of the canvas. After the cot is set up, the straps are simply drawn tight and buckled to hold the canvas taut. Each end of the strap is fitted with a sheet-metal tab. The lower tab is screwed to the wooden cot leg and the upper one is soldered or brazed to the metal rail hinge.

Louis H. Keding, La Grange, Ill.
**Wall-Bracket Ivy Holder Made of Aluminum**

Filled with real or artificial ivy, this aluminum plant holder is just the thing to enliven a vacant-looking spot on the wall. The bed of the holder is made from a length of 2½-in. aluminum tubing which is cut in half lengthwise. If the aluminum is the type that can be welded, half disks of sheet aluminum may be used to enclose the ends of the bed. Otherwise, pieces of hardwood fastened with escutcheon pins will serve the purpose. The wall brackets are cut and bent from .040 or .064-ga. aluminum and then drilled for two cross braces. The brackets are bent simply by clamping them one at a time between two hardwood blocks and hammering down the edge with a rawhide mallet. Each cross brace consists of two lengths of aluminum tubing. One length, having a ¼ in. o.d., is a press fit in the holes in the brackets and the other length, ⅛ in. o.d. and ⅛ in. i.d., slips over it to provide a spacer. The inner lengths should project about ¼ in. from both sides of the brackets. The holder is finished with fine steel wool and oil and then waxed.

R. J. DeCristoforo, New York City.

**Vacuum Cleaner Plugged Into Dead Outlet Facilitates Replacing Fuse**

If the basement lights are not on the same circuit as those in the main part of the house, it sometimes is difficult to tell when a blown fuse has been replaced without going back upstairs to check. To avoid this extra trouble, plug the vacuum cleaner into one of the dead outlets. Then, by listening for the cleaner to turn on, you will know when you have replaced the right fuse.—Linda Larsen, Ludington, Mich.

**Ink-Bottle Stand Includes Handy Utility Tray Which Forms Nontip Base**

When placed on a desk or clipped to the edge of a drawing board, the wide base of this novel holder prevents accidentally tipping a bottle of drawing ink. The base also serves as a tray for holding paper clips, thumbtacks and spare pens. A large cover from a potato-chip or syrup can forms the base, or tray, and the upper portion of a small can is soldered to the center of the base to provide the container for the ink bottle. The cover which fits snugly over the bottle container is made from the bottom portion of a slightly larger can. Note that a hole is cut in the center of the cover so that it fits over the top of the ink bottle. A suitable clip for attaching the holder to a drawing board can be made by soldering a strip of spring brass to the underside of the base and bending it to fit over the edge of the board.

Robert Scott, Saltsburg, Pa.

Dress snaps are not damaged if they are fastened before garment is washed.
BEFORE RUBBING

AFTER RUBBING

Pour abrasive powder into a glass tumbler about two thirds full of water and allow to settle. Then pour off most of the water and mix to a creamy paste.

Pouring the powder into the tumbler:

Before rubbing:

After rubbing:

Pouring off the water and mixing:

The final touch of the craftsman is best expressed in a hand-rubbed finish.

By Rollin H. Wampler

That glass-smooth satiny finish you see on high-grade furniture is still done by skillful hand-rubbing with powdered abrasives. What happens to the surface of the finish during the rubbing process is shown graphically in Fig. 1. Rubbing the dry finish removes brush marks, orange peel (the wavy effect caused by spraying lacquers without the proper retarders), dust specks, and bubbles. All are common defects and are almost impossible to avoid in some degree unless the finish can be applied under ideal conditions of dust-free air and rigid temperature control. The first rubbing removes defects and levels the finish, giving it a dull, flat appearance. Then the surface is brought to varying degrees of sheen, or gloss, with a flour-fine abrasive and a final polishing. In current practice the finish is left dull flat on antiques. For period furniture a semigloss is preferred but on modern designs the finish usually is rubbed to a high satin polish.

Although rubbing may be done with a cloth pad, a thick felt pad is best. Felt has just enough "give" to follow slight irregularities without danger of cutting through the finish. Powdered pumice, FFF grade or finer, is commonly used for the first rubbing. Pour the powder into a tumbler of water as in Fig. 2 and allow it to settle before pouring off the water. Mix the sediment to a creamy paste. Some finishers...
Use a felt rubbing pad for polishing flat surfaces with the grain and make sure that the pad is clean.

Turnings can be polished with a clean cloth charged with abrasive cream. Use only light polishing pressure.

Above, paint small carvings with abrasive cream and polish with a toothbrush. Below, some finishers apply wax with a cloth pad to get a uniform coating.

Above, be careful not to cut through finish when sanding or rubbing corners and edges. Below, some finishers prefer to apply paste wax with a steel-wool pad.
prefer rubbing oil instead of water. In either case, mix the powder and liquid to a creamy paste and pour or brush it on the surface to be rubbed, Fig. 3. In rubbing with the abrasive-charged felt pad, use a long sweeping stroke, Fig. 4, each stroke overlapping the previous one about half the width of the pad. Always rub with the grain on straight-grained woods and the long way of the surface on panels or tops having a burled or butt graining. Be especially careful when working near the edge, Fig. 7, allowing the pad to overlap the edge on only one or two strokes at the most. Otherwise the abrasive may cut through the finish and expose a narrow line of bare wood. Check the progress of the work occasionally by wiping a spot clear of abrasive and examining it carefully in a good light. An easy way to determine the uniformity of the surface is to look across it obliquely. Small areas that are still rough or untouched are easily spotted in this way. When the surface is uniformly flat and feels smooth to the touch of a finger, it is ready for final polishing.

Turned legs, pressed or carved moldings and both overlay and relief carvings require a different treatment. Turnings are rubbed by means of an abrasive-charged muslin cloth as in Fig. 5, special care being taken not to rub the finish off the high places. Small carvings are rubbed with an old toothbrush after painting the surface with the abrasive cream. On large carvings a worn scrubbing brush is often used to advantage. In finishing carvings be careful to brush as much as possible lengthwise of the high places, not across them. This often will require brushing in several directions. As a rule, carvings and the short-radius portions of turnings are left in a dull-gloss finish, rather than high luster. Much the same procedure is used in polishing except that a finer abrasive is used. On some types of work, such as colonial designs, a high-gloss wax finish is appropriate. When wax is used, the final abrasive polishing is omitted. Most finishers apply a paste wax with a soft cloth pad as in Fig. 8, but others use a pad of fine steel wool, 0000 grade, as in Fig. 9. By continuous rubbing with the steel-wool pad a fairly heavy film of wax is built up to a uniform thickness. This can be polished to a very high gloss if desired. Before polishing certain types of work, some finishers go over it with 8/0 wet-or-dry sandpaper backed with a felt pad as in Fig. 10. Rubbing oil is applied to the surface as a lubricant and to prevent the fine abrasive paper from clogging. This treatment cuts down any high spots that may have been left by the first rubbing, and gives a flat surface of even greater uniformity. Then the surface is polished by applying a creamy paste of rottenstone and oil with a cloth pad and rubbing with long, uniform strokes. In this final step the finish can be brought to any desired sheen from dull flat to high gloss. The trick is to stop at just the right point. To do this, the finisher must check on the progress of the work at frequent intervals.

After completing one step, the work must be thoroughly cleaned in preparation for the next. Surfaces that have been rubbed or polished with an oil-abrasive mixture must be cleaned with a mild solvent to avoid the discolorations known to finishers as “blushing,” or “blooming.” Be sure that the finish to be rubbed is thoroughly dry. Most lacquers will require only 24 to 36 hrs. For the rubbing varnishes, 10 days to 2 weeks generally will suffice.
Wooden Turn Button on Tool-Chest Lid Supports Doors for Planing

Needing a quick method of supporting doors and window sash on edge for planing, one craftsman in remodeling his home found that a wooden turn button fastened to the lid of his heavy tool chest would do the trick. If necessary, regular table-leg braces can be used to hold the chest lid in the vertical position and the weight of the chest will keep the door from slipping. Should the chest have a tendency to slide, rubber feet tacked to the corners will help to hold it stationary.

Polishing Plastics Quickly

To obtain a high gloss on plastic without the usual buffing, use a paste consisting of a fine abrasive, such as flour of pumice, mixed with a light lubricating oil. Apply the paste with a soft cloth, rubbing until all scratches are removed. Then rub the surface briskly with a clean, soft rag moistened with liquid metal polish. The result will be a brilliantly polished surface.

S. S. Palestrant, Bronx, N. Y.

Novel Metal Piggy Bank Assembled

Made entirely of scrap parts, this all-metal piggy bank will please the craft-minded youngster. The round body of the pig is made from a flush-tank float and the head from a small oilcan. Cut a hole slightly smaller than the base of the oilcan in one end of the float. Then remove the bottom from the oilcan and, later, solder the can.

From Flush-Tank Float and Oilcan

over the opening in the float. Cut one or two coin slots in the top of the bank, depending on whether or not a partition separates the float into two parts. To cut the slot, drill a 1/8-in. hole at each of its ends, make double saw cuts between the holes and file the slot smooth. Lengths of metal tubing twisted spirally and soldered to the flush-tank float form the four legs and the tail. The eyes of the pig are cut from two roundheaded screws, the shank and threads being cut off so there is just a slight projection of the shank below the head. The screwheads are pressed in undersize holes drilled in the oilcan. The spout is cut from the can cover and a copper disk is fastened over the hole in the cover with sheet-metal screws, the screwheads forming the nostrils of the pig. The ears are cut and bent from sheet copper and soldered to the oilcan. Sheet-metal screws can be used to hold them in place while soldering and do not have to be removed, as when the ears are bent forward the screws will be inconspicuous. Coins are removed from the bank by unscrewing the oilcan cover. However, if the float is divided, coins will have to be removed from the rear compartment with typical piggy-bank-robbing technique, or just one coin slot can be cut and the rear section of the bank not used.

Doris Aller, San Francisco, Calif.

Stale bread soaked in linseed oil is an excellent bait for rattraps.
BY KEEPING in mind a few simple tricks, you can bring home as many pan fish during the winter months as the best catches you've had throughout the summer. One of the first things to remember about ice-fishing, however, is to dress for it. To keep your feet warm on the ice, fit two or three inner soles cut from an old felt hat, into each boot. Wear two pairs of lightweight woolen socks, as these are warmer than a single heavy pair, and take along several pairs of woolen gloves or mittens so you will always have a dry pair. Waterproofed leather choppers' mitts worn over the wool gloves afford added protection when handling cold, wet lines and fish.

In winter, the location of the fish and whether or not they are biting cannot be judged by the usual rules, such as wind, barometric pressure, or water temperature. The fish seem to show the most action between 10:00 A.M. and 4:00 P.M., but this is not a hard-and-fast rule. If the water is shallow, the fish will take to the deepest holes they can find. Other good fishing spots are near weeds in 6 to 20 ft. of water, off rocky points, in sheltered coves, over sand bars and around spring holes in the lake bottom. An excellent location for catching pike and walleyes is frequently found off the mouth of a stream that flows into the main body of water.

An efficient and inexpensive tool for chopping holes through the ice is made by welding a wide chisel blade to a length of pipe, Fig. 1. A hole is drilled at the top end of the pipe for attaching a leather thong or strong cord, and a loop tied in the end of the thong is slipped over the wrist so the tool will not fall through the hole if it is dropped. Make the holes in the ice about 15 in. in dia. and flare out the edges on the underside so the sharp ice will not fray the line. After cutting the hole, use an old tea strainer to skim the pieces of ice from the water as shown in Fig. 4.

Pan fish bite daintily during the winter, usually nibbling only at the head or tail of a worm. To outsmart the nibblers, fasten a pan-fish hook to each end of an 8-in. nylon leader and knot the center of the leader to form a loop for tying to the line. Then simply impale the ends of the worm on the hooks as in Fig. 2.

In some lakes and rivers fishing through the ice is best after dark. To attract the fish to the bait, lower a tightly capped fruit jar containing a small, lighted flashlight into the water and fish around the light, Fig. 3. Use stones to weight the jar so it
THROUGH ICE

will sink and tie a line around the rim of the jar or tie it to a screw eye soldered to the jar cover. Another way to attract fish at night or in deep water during the daytime is to tie a small perfume vial to each line just above the baited hook, Fig. 5. The inside of the vial is coated with luminous paint and the vial is capped tightly. The glow of the paint will bring curious fish to the vicinity of the bait. To attract fish to your bait in the daytime, drop a handful of crushed oystersHELLs through a hole in the ice. The shells will glitter on the lake bottom and lure the fish to the location of your bait. These shells usually are available at poultry-supply dealers.

Although bait minnows can be trapped as easily in winter as in summer, most wire and plastic traps freeze under the ice. A serviceable trap can be made from a large fruit jar and the upper half of a quart milk bottle as shown in Fig. 6. Set the trap in shallow channels where the current is swift, anchoring it between two large stones so it is not washed away. The mouth of the trap should face downstream. Several of these traps baited with raw oatmeal or bread crumbs will keep you well supplied with minnows all winter long.

While worms and minnows are the most widely used baits, they are not necessarily the best for pan-fishing through ice. Here are some bait suggestions for sure-fire results. When fish won’t take any other bait, use winter-killed honeybees which can be obtained from a local beekeeper. Or, if you can find a wasp nest in the woods, the cold dormant wasps will work as well as bees. Another bait that will give satisfactory results is the meal worm which you can obtain from almost any feed store or grain elevator. Leeches are an excellent bait for game and pan fish and may be purchased from drug-supply houses. One of the best winter baits is had by using small bullheads with the sharp spines and fins snipped off. Game fish are attracted by the blood and quickly notice the lack of sharp spines, attacking at once. As a bait for large pike and walleyes, there is little better than a 4 or 5-in. sucker, chub or perch, and one or two small, red glass beads slipped onto a No. 12 or 14 gold-plated hook will often take pan fish in the winter.

To keep bait worms from freezing in zero weather, carry them in a woolen sock which is half-filled with dry sawdust. Keep the top of the sock closed tightly with a rubber band. Fishlines can be prevented from becoming coated with ice by rubbing them with linseed oil or kerosene before putting them in the water.
Locking Pliers Form Bench Vise

Attaching a pair of locking pliers to a C-clamp and mounting it on the edge of a workbench provides a neat quick-acting bench vise for holding small work. This setup is particularly useful for holding knives and tool blades for sharpening. The rivet on which the pliers jaws pivot is replaced with a stove bolt and wing nut. The latter hold the pliers between two pieces of sheet steel which are welded to the C-clamp to form a yoke. Two additional pieces of sheet steel are welded to the inside surfaces of the pliers jaws to increase their width. By loosening the wing nut, the pliers can be adjusted to the most convenient working angle.

W. G. Waggoner, Sacramento, Calif.

Paper Aids Drying Wet Shoes

As soon as wet shoes are removed, stuff them tightly with wadded newspaper or tissue paper. This will keep the leather from shrinking and also speed drying. When dry, a leather preservative should be applied to the tops and soles of the shoes.

Handle for Vacuum Bottle

A length of cord tied to two sheet-metal clips forms a convenient handle for carrying a vacuum bottle. The clips can be cut from a tin can and are bent as shown in the detail, the edges being folded over to make them smooth. Paint or other covering is removed from the sides of the bottle at the points where the clips are to be attached, and then the latter are soldered to the metal case. The glass bottle should be removed from the case before soldering. Braided metal cable or a length of strong cord will serve as a handle. However, if the cord is used, it is best to braid it with a series of slipknots for added strength.
Owners of box-type cameras equipped with a built-in flash attachment are not restricted to ordinary flat frontal lighting if this little auxiliary flash adapter is at hand. It permits the flash attachment to be removed from the camera, Fig. 2, and flashed at arm's length to produce more interesting side-lighted shots. An open-and-shut technique is used in taking the picture in subdued light; the shutter is opened, the bulb fired and the shutter closed. The adapter has a push-button switch which is depressed to fire the bulb in the manner illustrated in Fig. 1. A safety catch is installed as in Fig. 3 to prevent accidental premature firing of the bulb when loading. In locked position, the catch fits under the head of the push button. Assembly of the adapter, detailed in Fig. 4, is self-explanatory. A recess is routed in the wooden block for the sheet-brass sockets and contacts. A furniture nail forms a head for the push button. E. Peter Smith, Los Angeles, Calif.
When a regular darkroom is not available, processing photos at home is sometimes extremely inconvenient. It's usually a case of having to work either in the bathroom or kitchen with more time devoted to getting ready and, afterward, putting things away than the actual time spent in enjoying the hobby of making your own pictures. When I moved into a studio apartment I found it necessary for the kitchen to serve as both a quick-change darkroom and a place to cook and eat. So here is what I did:

Typical overhead wall cabinets were located above the sink, and this meant that there was insufficient clearance to permit using my enlarger on a small cabinet located next to the sink. To overcome this problem, I sacrificed the storage space of one of the overhead cabinets, removing the bottom to take the column of the enlarger and allow the lamp house to be extended to its full height. Thus, when the cabinet door is closed the enlarger is inconspicuous and the arrangement contributes considerably to the quick-changeover idea.

Now, the question of what to do for a work counter for my large developing trays. Limited space meant that whatever I used would have to serve a double purpose and also be located conveniently to the sink. A cabinet that could be rolled out of the way seemed to be the answer. Luckily, a movable work cabinet was already installed along an adjacent wall of the kitchen. Being 5 ft. long and having a linoleum top, it was just the thing. All I had to do was to fit it with rubber-tired casters.
so it could be rolled easily into working position and back against the wall when not in use. Part of the cabinet is used for storing equipment and a towel bar attached at one end also serves as a handle. Placed at right angles to the sink, the cabinet is convenient to a safelight mounted above the sink, running water and the enlarger, as shown in Fig. 2.

If you have a kitchen arrangement where a work counter could be pushed out of the way, you can build a similar cabinet by following the details in Fig. 1. Or, a standard cabinet remodeled a little and painted to match other units in the room will serve the purpose. The cabinet shown makes use of common lumberyard stock and plywood, the top being covered with linoleum and metal edging. One end is devoted to tray storage, and although designed for three doors, one of the compartments can be fitted with drawers for storing small items. Note that only one end of the cabinet is fitted with casters so it will not roll.

Refrigeration of Stock Print Developer Results in Brilliant Negatives

Negatives with a greater range of contrast are easily attained by using your kitchen refrigerator as an aid to developing. First store a bottle of standard print developer (D-72) in the refrigerator until cold and then load the developing tank, pouring in the cold stock solution. Set the tank in the refrigerator overnight. No developing action takes place at this time, but the film emulsion absorbs the amount of solution required to develop the image. In the morning, pour out the solution, unload the tank and hang up the negatives in total darkness so they can develop at room temperature. After an hour or so, fix and wash them. You will be pleasantly surprised with the crystal brilliance of the negatives. As this is achieved at the expense of grain fineness, negatives intended for extreme enlargement should not be processed in this way. However, with care in drying the negatives, normal degrees of enlargement will be successful.

Martin S. Dworkin, New York City.
Safelight Mounted on Gooseneck Permits Using Brighter Lamp

One photographer mounted his safelight on a gooseneck desk lamp to permit using a brighter light than usual and thus facilitate judging the quality of prints in the developer solution. With this arrangement, the light may be swung over the tray momentarily to check the print and then moved to one side so the print will not be fogged. As most lamps of this type have holes drilled through the base, it is a simple matter to screw them to a shelf or wall.

Virginia Hanson, Santa Monica, Calif.

Solution Bottles Washed After Use To Prevent Chemical Dust

Chemical dust floating in the darkroom air is liable to cause small spots or pinholes on negatives. The dust, which is the dried residue of photo solutions, results in either clear or black spots depending on whether it comes from hypo or developer. For this reason, it is a worth-while practice to wash down the outside of every photo-solution bottle before putting it away, as the water will remove any droplets of solution which would otherwise dry on the glass and form the troublesome dust particles.

Photos Marked With Credit Line By Using Flashlight Printer

Helpful advertising can be gained from your commercial photos by using a flashlight to print an inconspicuous but legible credit line in the corner of each photograph. Place a copy negative of the credit line over the lens of the flashlight so it reads from right to left. Then, cut a piece of opaque black paper to fit over the lens and cut a section from the paper just large enough to expose the credit line. Lay the paper over the negative so the credit line is completely visible and clamp the parts together with the lens retainer. The credit line is printed by pressing the negative tightly to the photo paper and turning on the flashlight. An exposure of approximately 10 seconds is necessary on contact paper and about 2 seconds on enlarging paper. Because light usually is concentrated at the center of a flashlight lens, it may be necessary to use a little dye on the portions of the negative to print uniformly.

Ken Sellers, Columbia, Mo.

Timer Made From Alarm Clock

When a darkroom timer is not available, a suitable one can be improvised in a few minutes by using an alarm clock. Remove the glass from the face of the clock and slip a rubber band over the clock so it stretches across the face. Set the minute hand and position the rubber band so the space between them is equal to the desired elapsed time. Then, the time to remove the film from the developer can be checked in total darkness simply by feeling when the minute hand passes under the rubber band.—John H. Jones, Cove, Ark.
MAKE YOUR OWN TRANSFORMER

By Harold P. Strand

PART I—DESIGNING

DESIGNING and making small single-phase transformers, such as the electrical experimenter and radio technician require, is an interesting and educational project. Although transformers of standard voltage rating can be purchased, it is often necessary to obtain special voltages for experimental work or new apparatus. It is far more economical to make the transformer yourself than to have one built to order.

An elementary transformer consists of a laminated iron core on which a coil of insulated wire is wound. The coil may be a single winding with taps, such as an auto transformer, or one with two separate coils as in Figs. 1 and 5. The latter, being the most widely used, will be discussed in this article. As indicated in Fig. 5, one of the coils is called the primary and is connected to the current input. The other coil, from which current is taken, may have more or fewer turns than the primary and is called the secondary. The core must be built up, or laminated, from thin sheets of silicon steel, because the constant reversal of the alternating-current flux sets up eddy currents in a solid iron core. Therefore, the use of a solid core would result in excessive heating of the transformer. Laminating tends to break up these eddy currents.

Briefly, the theory of transformer operation is as follows: The line voltage sends a current through the primary coil, setting up a magnetic flux—invisible lines of force—in the iron core. As the core also encircles the secondary coil, the flux, which rises and falls in step with the alternating current, cuts through the turns of the secondary and, by the laws of magnetic induction, induces a voltage in this winding. If the secondary circuit is closed by adding a load, a current will flow in the secondary. The voltage induced in the secondary is in direct proportion to the number of turns in that winding as compared to the number of turns in the primary, except for a slight loss which will be explained later. For example, with 100 turns in the primary coil and 200 in the secondary and with 100 volts
applied to the primary, 200 volts are delivered at the secondary. The transformer also automatically controls itself. When the line voltage is applied to the primary, a counter E.M.F. (electro-motive force), or voltage, is induced in that winding, which is practically equal to the line voltage at no load. With the secondary open, this back voltage prevents all but a very small amount of current from flowing in the primary. Thus, at no load a properly designed transformer draws practically nothing from the line. This current is called the exciting current and serves to produce the flux in the core.

When a load is placed on the secondary, the current flowing in that coil must, in accordance with Lenz’s law, flow in such a direction as to oppose the flux in the core. This opposition tends to reduce the value of the flux which, in turn, causes the back E.M.F. to be reduced. As it is due to the latter that the current is held in check, it is obvious that more current will be allowed to flow in the primary to satisfy the demands of increased load on the secondary. Thus, a transformer acts much like an automatic regulating valve.

The first step to consider when designing a transformer is the core size and its relation to some value of volt-amperes or size rating. For the benefit of the amateur designer, the table, Fig. 4, can be used as a general guide. This does not mean that the table must be followed to an exact degree because, when less iron is used in the core, more primary turns are put on to offset it. Note in the formula, Fig. 6, that the relationship of core area to turns is maintained so that a safe flux density is kept in the core. However, it is not good practice to use an excessive amount of either iron or copper, if losses and efficiency are to be considered. Although transformer cores can be made from straight strips of silicon steel, standard E-type laminations, Fig. 3, which may be purchased or salvaged from a discarded power transformer, are more convenient to use. The principal core dimensions important to any transformer design are the height of the stacked laminations, measured as in Fig. 2, the width of the center leg, A, Fig. 3, and the area of the window space.

The problem that usually confronts the amateur is the number of turns and size of wire required for use with a core on hand to produce a certain voltage output. Suppose, for example, that the width of the center leg of the laminations on hand measures 1¼ in., a window opening to one side of this leg measures ¾ x 1¾ in. and also that there are enough laminations to stack tightly to a height of 1½ in. The area of the core is the width of the center leg
(1.25 in.) multiplied by the height of the stack of laminations (1.75 in.), A and B, Figs. 3 and 5, which equals 2.19 sq. in. Using the table, Fig. 4, we find that this falls in a class of about 125 volt-amperes at 60 cycles, the current input required. Were the transformer to be used on a 115-volt line and required to deliver 230 volts at .5 amperes at the secondary leads, we would multiply 230 x .5. This gives 115 volt-amperes which is well within the range of the 125 volt-ampere rating for the core.

To find the correct number of turns for the primary winding, the formula, Fig. 6, is used. Substituting the proper values, the problem condenses to:

\[
\frac{10^8 \times 115}{4.44 \times 60 \times 2.19 \times 65,000} = 303 \text{ turns}
\]

In the above, 10^8 is taken for 100,000,000
115 is the primary voltage
4.44 is a factor
60 is the frequency
2.19 is the core area
65,000 is lines per sq. in. of flux density

The result, 303 turns, can be made an even 300. The next step is to divide 300 by the line volts (115) to get the turns per volt. This will be about 2.61. The secondary turns for any output voltage desired are figured by multiplying 2.61 by the desired voltage. In this case, 230 volts are wanted, so 230 x 2.61 = 600 turns.

Iron and copper losses both enter the picture, but the addition of about 4 percent in turns will take care of them. Regulation, or the condition which affects output voltage from no load to full load must also be considered. Usually, about 2 percent more in turns will take care of this condition. So, by adding 6 percent to the 600 turns calculated or a total of 636 turns, the full 230 volts should be obtainable with a .5-ampere load.

The table, Fig. 7, shows the cross-sectional area of copper wires. If the decimal point in the column of circular mils is moved three places to the left, it is possible to quickly determine the ampere capacity of each size. The secondary is to carry .5 amperes and from the table, No. 22 wire at 509 circular mils is the nearest size. To determine the current in the primary, divide the volt-ampere rating, 115, by the primary volts, 115, which gives 1 ampere. Since transformers never run at 100 percent efficiency, an addition of 10 percent or a total of 1.1 amperes is a good estimate. No. 19 wire at 1288 circular mils is the nearest larger size.

(To be continued)
Drilling True Burr-Free Holes In Thin Sheet Metal

Radio servicemen and tinsmiths will find that a twist drill ground as shown is especially helpful where it is necessary to drill holes to exact diameter in thin sheet metal. As will be seen from the details, the cutting edges are ground square across at right angles to the axis of the drill. The radius of the grinding wheel automatically gives the necessary back clearance to each lip. Ordinary drills up to 1 in. dia. can be ground in this way and all sizes will cut clean, true holes without leaving a burr on the bottom edge. Prick-punch the work lightly to start the drill.

J. Vincent Smith, Silver Spring, Md.

Nail Perforates Heavy Directory To Permit Hanging on Wall

To prepare a telephone directory or heavy catalogue for hanging from a wall rack, it is not necessary to make a hole at the corner by perforating a few pages at a time. Just take a hammer and drive a nail of suitable length through the corner of the volume.—Leon Henry, Tacoma, Wash.

Labeling Transformer Leads

Leads and terminals on transformers and other electrical equipment can be labeled for quick identification by attaching paper tabs with cellulose tape. Print the information on the paper tab, press the tab face down on the adhesive side of a piece of cellulose tape, and then wrap the tape around the lead or press it against the surface of the part. The label will remain legible indefinitely, but can be removed easily when desired.

Walter E. Burton, Akron, Ohio.

Filing Corners of Square Bolt Head Adapts It for Hex Socket Wrench

If a square-headed bolt must be driven in a hard-to-reach place, a hex socket wrench may be used by filing or grinding down opposite corners of the bolt head. After this is done, the bolt head will fit in the hex socket as shown in the left-hand detail. A 12-point socket wrench also will do the trick if the fit is snug and pressure is applied lightly.

Charles H. Hardy, Los Angeles, Calif.

Farm Gate Offset From Highway Affords Safe Parking Area

Stopping a truck or car on a busy highway to open the gate to the farm lane is dangerous, especially if the gateway is on a curve of the road or on a hill. One farmer solved this problem by building an offset in the fence deep enough to permit driving his truck off the highway before stopping to open the gate. The offset is formed by building wings at an angle to the fence line as shown in the sketch. The gate, of course, is hinged to swing either way.
This bale loader is constructed almost entirely of discarded car parts and stock sizes of both angle iron and sheet metal.

BUILT BY Lem Shaw and George Hammersechmidt, California ranchers, this efficient bale loader, coupled to the side of a truck, picks up individual bales from the field and elevates them high enough to enable one man to build a six-tier load on either a truck or trailer platform.

Fig. 1 pictures the offset hitch by means of which the loader is coupled to the side of the truck. The manner in which the loader is towed to and from the field behind the truck or trailer is shown in Fig. 2. Figs. 3 to 15, inclusive, detail the construction and assembly of the unit. First, note in the top view, Fig. 4, that the loader axle is offset to bring the loader as close as possible to the truck. The offset hitch is shown assembled for attachment to the side of the truck.

Above, an adjustable offset hitch of special design couples the loader to the side of the truck frame. Below, the loader coupled behind truck for transport.

The neat, trim lines of the bale loader, shown above in operation, will appeal to every farmer who likes to build efficient, labor-saving equipment in his shop.
Lugs on the pickup chain are curved slightly to release bale. Those on the elevator chain are straight.

Frame. The parallel spacing bars are adjustable so that the loader can be located to suit the width of the truck platform. The long member of the hitch, top detail in Fig. 3 and also Fig. 11, serves the dual purpose of tow bar when the loader is towed on the road and that of push bar when the hitch is assembled for operation of the loader in the field. The three views of the drive mechanism, Figs. 13, 14 and 15, show the assembly of the drive unit. Note that the offset axle brings the drive sprocket, Fig. 14, in the center of the elevator bed. This position lines up the sprocket with the channel for the elevator chain, Figs. 4 and 5.

Two Ford Model-A rear axles are assembled to form the drive as in Figs. 13, 14, 18 and 21. One axle, with the housings removed, is mounted on the end of the torque tube of the second axle which is used intact, including the radius rods, Fig. 15. The open ends of the upper differential housing are closed with steel plates, welded on. One plate extends to form a mounting bracket, Fig. 13, and is bored and slotted for mounting bolts and for the drive-sprocket shaft. The throwout clutch mounted on the end of the torque tube between the two differentials is assembled from stock parts as in Fig. 12. In addition to the large drive sprocket, Fig. 14, five small sprockets of 3½-in. pitch diameter are required to carry the elevating chain and the pickup chains. The pickup chains travel in steel channels welded into the lower end of the elevator bed as in Fig. 5. The pickup sprocket assembly, with fixed and adjustable bearings, is detailed in Fig. 7, and is also pictured in Figs. 16, 17 and 19.

The bottom of the elevator bed, or "flight," is covered with galvanized sheet metal and the sides are built up and braced as in Figs.
Sheet metal forms the floor of the bale platform at the top of the elevator bed, Fig. 20. The sheet-metal guide, or fender, which forms one side and the end of the bale platform, is curved to turn the bale as it slides onto the platform. A layout pattern for cutting the sheet-metal part to correct size is shown in Fig. 8, and the detailed pattern for the bottom of the platform is shown in Fig. 4. Note that a “beading” of 1/4-in. pipe is welded to the top edge of the platform fender, Fig. 15. The wings, or gatherers, Fig. 16, are made up for both right and left sides as in Fig. 6. A shoe is welded to the bottom of each wing to carry the lower end of the elevator. It is important that each shoe be welded parallel with the line of travel, otherwise it will wear rapidly and may cause side draft.

The lugs, or dogs, welded to the elevator chain are straight while those on the short pickup chains are curved back as in Fig. 3. This backward curve is important as it permits the lugs to disengage freely from the bale as they pass downward over the idler sprockets. Tension on the pickup chains should be sufficient to prevent buckling. Chain tension can be changed by adjusting the idler sprockets, Fig. 7.

After the frame and elevator assembly has been completed, the axle assembly is trial-fitted in the frame and mounting lugs are welded onto the axle housings as in Fig. 15. Bolts passing through holes drilled in the lugs and the horizontal members of the frame hold it firmly in position. The upper end of the drive unit is bolted to a lug welded to the platform frame. Slots in the differential lug, or plate, Fig. 13, permit adjustment of the drive sprocket to the proper height with relation to the chain channel. The elevator chain need not run tightly as the weight of the chain ordinarily will give sufficient tension to prevent buckling. Note in Fig. 15 that the tires specified are of the airplane type and are mounted on 16-in. wheels. While tires of this type are satisfactory under ordinary field conditions, it may be necessary at times to use tire chains or casings with high-traction lugs in order to prevent slippage. The truck, or tractor pulling a trailer, should be driven at uniformly slow speed and the unit guided so that the pickup chains engage the end of the bale. To save time, bales which are dropped from the baler crosswise of the line of travel should be straightened before being picked up by the loader. As designed, the loader will pick up the standard size bale either flat or edgewise, depending on how it is dropped. If the larger, three-wire bales are handled, the elevator flight should be made correspondingly wider. Keep the drum and clutch units well lubricated to prevent undue wear on the parts.
Floor-Model Drill Press Improvised From Hand Drill and Pipe Fittings

From Hand Drill and Pipe Fittings

Continuous-Flowing Poultry Fountain Is Supplied by Elevated Water Tank

Desiring a means of providing his flock with a continuous supply of fresh, cool water, a California poultryman came up with this novel drinking fountain. It is supplied from an elevated tank and consists of a horizontal run of \( \frac{1}{2} \times 12 \)-in. pipe nipples joined to tees. The nipples are screwed into each of the tees and an elbow is turned onto the end of the last nipple in the run. Then short nipples are screwed into the tees and into the elbow. Individual drinking cups are formed by screwing \( \frac{1}{2} \times 2 \)-in. reducers onto the short nipples as in the detail. By cracking a valve installed in the pipe line, the individual drinking cups fill and overflow continuously. A raised wire floor is placed under the fountain and directly over a sloping slab of concrete leading to a drain. Thus, the overflow is drained away continuously, preventing the spread of waste water and also the incidence of diseases due to dampness. If desired, the fountain can be located at the side of the poultry house and fitted with a hinged cover which can be lowered in stormy weather.

Hi Sibley, Nuevo, Calif.

Stool Utilizes Cultivator Disk

Mounted on legs of \( \frac{1}{2} \)-in. pipe, an old cultivator disk provides an all-purpose stool for use on the farm or in the shop. The legs are welded to the convex side of the disk and are braced with two lengths of \( \frac{3}{8} \)-in. rod, as shown.
Large Fruit-Juice Cans Provide Electrode Carrier

Three large fruit-juice cans bolted to a pipe handle form a handy carrier for an assortment of welding rods. The carrier is lightweight and may be set on the ground or hung by the bowed handle from most any convenient projection. Holes are punched or drilled through the sides of the three fruit-juice cans, using the dimensions given in the detail. Then the two parts of the handle are cut from %-in. pipe and welded together. Note that the lower end of the handle is drilled with staggered holes at 120-deg. intervals to register with the holes in the sides of the cans. This allows clearance for the %-in. stove bolts which are used to attach the cans to the handle. If the holes are carefully located, the bottom of the cans will form a flat base for the carrier.—Evan Wright, Topeka, Kans.

Spring Holder for Threading Tool Results in Mirror-Bright Finish

This spring threading-tool holder will meet the requirements of the critical machinist who is satisfied with nothing less than a mirror-bright finish on his work. A spring holder of this type is practically chatterproof, making it especially useful when cutting Acme threads or when using the angular thread-cutting method with a side-cutting tool. Form the body of the holder and the clamp lug either by milling or by sawing and filing the stock to shape. Drill, tap and slot the body and lug as shown. Use a fillister-head machine screw for convenience in tightening the clamping lug. The spacer which is placed between the lug and the body of the holder should be of the same size as the cutting tool. When using a holder of this type, take up backlash in the cross-feed and compound screws and be sure that the compound slides are gibbed up snugly. These precautions will prevent the tool from digging in and spoiling the thread during the finishing cuts.—H. Bergstrom, Evanston, Ill.

Portable Welding Torch Cuts Tie Wires to Speed Removing Wall Forms

To facilitate removing the wooden forms from poured concrete walls, one contractor uses a portable arc welder to cut the tie wires. This does the job in a fraction of the time necessary when using a hacksaw or wire cutters. The ground lead from the welder is clamped to the wire to be cut and a %-in. welding rod, which serves as an electrode, is simply touched to the wire at the point where it emerges from the form. A man working on the opposite side of the wall can quickly move the electrode from wire to wire. After the form boards are taken down, the cutting process is repeated to cut off the protruding ends of the wires flush with the surface of the concrete wall. — C. A. Lewis, Saskatoon, Sask., Can.
A reservoir squared 3"2 on A forms pentine ring touching a needlelike or putty is camphor handy to brought one placed around the reservoir and lubricating agent. Turpentine or camphor oil can be used and you'll find an oil can is handy for keeping the reservoir filled.

Sounds difficult, but like most jobs it's all in knowing how. Ralph E. Moore takes you through the steps in drilling both small and large holes and lets you in on the tricks of the trade that make it so easy.

DRILLING holes in glass sounds like a job strictly for the local glass shop. But in most cases, the tools used are common ones to be found in the average home shop. It's all in how the tools are handled that makes the difference. Drilling holes up to \( \frac{1}{2} \) in. in diameter does not require a special glass drill. In fact, the cutting tool is made from nothing more than a common three-cornered file. The file, of course, must be properly ground and extreme care used to avoid drawing the temper. This requires that the grinding be done on a slow-speed wheel, rotating in a water bath to prevent burning the tip of the file. The speed of the wheel should be about 300 r.p.m. and it should rotate in the direction indicated in Fig. 5. A sponge rubbing against the wheel will keep it wet and prevent splattering. In grinding the file, hold it lightly against the wheel and start grinding about 2 in. from the end. Use a sort of stroking motion, pulling the file toward you each time. This is done to each of the three flat faces and will gradually bring the tip to a needle-sharp point. After this, the point is squared off by deftly touching one corner of the file to the wheel. Note the arrow in Fig. 3. The squared tip should not be less than \( \frac{1}{16} \) or more than \( \frac{3}{8} \) in. wide. If the tip of the file discolors during grinding, it should be broken off at least \( \frac{3}{4} \) in. from the end and reground. Otherwise, the temper will be drawn and the tip will not cut. A long taper point, as shown in Fig. 2, provides faster cutting and permits better control in enlarging the hole to the desired size.
Now, let's test the cutting ability of the file. Take a piece of ¼-in. plate glass and place it on a flat surface. Holding the file vertically, press down with about 10 or 15 lbs. pressure and twist. If the tip breaks through the polished surface of the glass and makes a gritting sound, it's a good sign that the file has not lost its temper. However, if the point merely wears down without cutting, it must be reground. A file when properly ground will cut 15 to 20 holes before it needs resharpening. Where the job calls for a countersunk hole for a flat-headed wood screw, a tool is made by breaking a large-size file at the center and grinding the end according to Fig. 4. Turpentine or camphor oil is used to lubricate the file when cutting a hole. To retain the liquid, a small dam is formed of putty and placed around the hole to be drilled. Chuck the file in a regular auger brace and start rotating the brace with a firm but light downward pressure. When the drill point pierces the surface of the glass, add the turpentine, Fig. 1. An oilcan is excellent for this purpose. Rotate the brace using about 5 lbs. pressure, swinging it by the top with one hand. The needle point of the file will finally pierce the underside of the glass and when this happens use less pressure and rotate the brace more slowly. Let the glass overhang the edge of the table and continue through. If the point is allowed to embed in the table, you are apt to chip the glass on the underside. Some glaziers recommend finishing the hole from the reverse side as soon as the point of the file breaks through.

Thin glass, such as single and double-strength window glass, should be placed on a heavier piece of glass to provide a good flat surface and drilled with a minimum of pressure, little more than the mere weight of the brace. This is especially necessary when the point of the file is about to break through the work and when a hole is being drilled close to the edge of the glass.

Drilling large holes in glass requires a different technique and tools. The cutting tool required is homemade, Fig. 6, consisting of a length of brass tubing with teeth formed at one end and fitted with an acutely centered shaft for chucking it in an electric hand drill or drill press. The notches are formed with a hacksaw, the pieces are broken out with pliers and then squared up with a fine file. In using this cutter, the glass is clamped between two wooden guides, Fig. 8. A hole the same size as the cutter is made in the top piece, while the hole in the bottom piece is made larger as shown. In addition to guiding the cutter, the top hole serves as a well which is filled with two tablespoonfuls of silicon carbide or emery dust and enough water to nearly fill the hole. The drill is held vertically as in Fig. 7, using from 5 to 10 lbs. pressure, and the cutter is lifted about ½ in. every few seconds so that the emery dust has a chance to work under the teeth of the cutter. As the cutter advances, less pressure is applied. The same cutting agent is used when a drill press is employed to cut the hole, but the wooden guide is dispensed with and a dam of putty is substituted as before to retain the emery compound. A speed of 1500 r.p.m. is recommended for holes 5/8 to 1½ in. in diameter, while a slower speed of 800 to 1000 r.p.m. is required for holes of larger size. The teeth of the cutter will dull slightly in use and require touching up occasionally with a file.

FEBRUARY 1950
Silage Truck With Flanged Wheels
Rolls on Elevated Track

Four flanged wheels found in the junk yard were put to good use by one farmer in making a novel feed truck to run on an elevated track built on top of the feed bunks, which are placed end to end in the feed lot near the silo. The truck box, or hopper, can be any convenient size for holding measured portions of bulky, dry feeds. An adjustable slide covers an opening cut in the bottom of the hopper. By adjusting the slide, the size of the opening is varied to assure even distribution of the feed as the cart is rolled along the track over the bunks. The track is made from 2 x 2s spiked to the tops of the bunks and must be spaced to a uniform gauge throughout its length. The wheels turn free on full-length axles and are held in place with washers and cotter pins.

Board Tied to Neck Tames Buck

Having purchased a buck that had lost his fear of man and had become unruly, one farmer controlled him by hanging a piece of 2 x 6 from the animal's neck. A length of rope knotted at one end is passed through a hole drilled in the center of the board, and then the rope is tied around the buck's neck. The rope is just long enough so the board rests on the ground when the animal stands normally, but when he runs, it interferes with his front legs, slowing him down without harming him.—Kenneth R. Imig, Watseka, Ill.

Funnel Prevents Spilling Powder When Filling Bottles

Waste is held to a minimum when pouring powdered chemicals into bottles if a wide-mouth funnel is used. The powder is either shaken through the funnel spout or worked through with a glass stirring rod.

Index Plate for Wood Lathe

Requiring an indexing plate for an older-model wood lathe not fitted with this handy built-in accessory, one craftsman turned out a simple one-piece pattern from wood and had a special plate cast in aluminum. The casting has a raised section, or boss, which fits into the recess in the large step of the lathe cone pulley. The outer face of the plate is indexed with one row of 32 holes and another of 8 holes. Both rows of holes are equally spaced on 360-deg. circles scribed on the surface of the plate. The plate is fastened with four machine screws which are passed through body-size holes drilled in the bottom of the V-groove of the largest step of the cone pulley. The screws turn into tapped holes in the boss as shown in the sectional detail. The index pin is mounted on a spring bracket attached to the lathe headstock with a small bolt.

Herbert E. Pott, Victoria, B.C., Can.
POWER-TOOL STANDS

IF YOU want to economize on the cost of power tools by making your own machine stands, here are two sturdy ones that cost little and are simple to build. The one detailed above is particularly suitable for a tilting-arbor saw, the open front providing a handy shelf on which to place the miter gauge or the fence whenever one or the other is not being used. However, if the stand is made to support a tilting-table saw, a belt slot can be cut in the top for driving the machine from below. The legs are lengths of angle iron which are bolted to a thick wooden top and made exceptionally rigid by plywood panels on three sides. Note how the upper ends of the angle iron are drilled, cut and bent for attaching.

The legs and lower framework of the stand at the right consist of 3/4-in. pipe, the legs being flared at the bottom for added stability and welded at the top to an angle-iron framework covered with plywood. This particular stand is made to order for a tilting-table saw with a hinged motor mount being employed. A lower shelf provides a place to lay accessories, and rubber crutch tips fitted over the ends of the legs reduce vibration. The angle-iron frame supporting the plywood top is formed from one piece, a V-cut being made at three corners to permit making 90-deg. bends.
Trick Faucet Is Interesting Display

Seeking a means of attracting prospective customers to a special window display, one hardware dealer devised this novel attention-getter. He suspended a water faucet in the window by means of fine threads and directly under this he placed a box. The latter houses a small motor-driven centrifugal pump and supports a metal pan containing water. Holes are drilled through the bottom of the pan and the top of the box and two glass tubes are cemented in the holes to form the inlet and outlet to the pump. Both tubes project about 2 in. below the bottom of the pan and they are connected to the pump with rubber tubing. The glass outlet tube extends from the bottom of the container upward into the faucet spout as shown. When the container is filled with water and the pump turned on, water is drawn through the inlet tube to the pump where it is forced upward through the long tube into the faucet spout. From there it gushes back into the pan in a most realistic fashion. The descending stream of water completely conceals the glass tube when the unit is in operation.

Fred Barnes, Ann Arbor, Mich.

Estimating Number of Wall Studs

When it is necessary to estimate the number of studs required for a wall, I use this simple formula. Divide the length of wall in feet by five and multiply the answer by four. Add extra studs needed at the corners and you have a close estimate, providing, of course, the studs are 16 in. on centers.—Ward Skeen, Larned, Kans.

Bottoming Short Bolt in Acorn Nut

In cases where an acorn nut is used to lock a wheel or other movable part on a bolt or threaded shaft, the nut will soon work loose if the bolt is too short to bear tightly against the bottom of the nut. This can be remedied by placing BB shot in the hole in the nut. Then, as the nut is tightened, the shot will be mashed, holding the nut in place. If there is insufficient play for the movable part when the nut is tight, add BB shot until the proper clearance is attained.

Audible Brooder Warning System Signals Temperature Drop

Requiring a low-temperature, audible warning signal on an older-type coal-fired chick brooder, one poultryman devised a simple warning system using a temperature regulator from an old incubator as the actuating unit. The regulator, which consists of a “wafer” thermostat with contacts arranged in a frame as shown, is mounted on a low stand at the edge of the hover and wired to dry cells and a buzzer, or doorbell unit. The latter is located in the house to give warning at any time, day or night, should the fire in the brooder stove burn low or go out. The contact points are carefully adjusted to make contact and ring the warning buzzer, or bell, when the temperature falls below 75 degrees.
TV PICTURES PROJECTED ON HOME MOVIE SCREEN

THROWING a 3 by 4-ft. image through a lens in the front of the chair-side cabinet to the screen, this Protelgram-equipped television set, shown in photo A, is one of several big-picture sets now available. The set controls are conveniently placed to be handled from your chair.

Component parts of this television system are illustrated in photo B. The high-voltage power unit is at left; the projection-tube assembly with its focusing coils in the center; the "optical box" with its mirror and lens assembly is at extreme right. This system employs a cathode-ray TV projection tube with a face diameter of only 2½ in., no larger than the compact held by the young lady in photo C.

Diagram D shows how this projection system provides large images that may be thrown on a viewing screen or wall. The picture on the 2½-in. face of the projection tube is reflected from the concave mirror to the plane mirror, then to the cabinet mirror and, finally, to the screen.
PHONE TRANSMITTER FOR

By Stan Johnson WØLBV

PART I

BEFORE the war the 160-meter phone band was one of the busiest amateur bands of all, mainly because it was ideal for contacts up to 1000 miles or so, with a reasonable amount of power and a rather simple antenna. This band has been recently reopened for amateur use, a fact which caught many an old-timer, as well as newcomers, with no gear that would work on the band. To provide a practical way to get on 160 meters with a rig which is easy to build, yet operates at 120 watts input, the transmitter illustrated and described was designed. It is assembled on four standard-size chassis bases, and can be installed in a simple wooden rack, as shown in photos A and D.

The construction of the R.F. transmitter and modulator units is complete in Part 1 of this article; the separate power-supply units will be described and illustrated in Part 2 in the March issue. Although built on a metal chassis base only 3 x 7 x 15 inches, the transmitter is a full three-stage unit, with a Pierce oscillator, buffer and final amplifier. For the last stage, a pair of 1625 tubes was chosen as this is a type of tube that many hams have in their junk boxes since they have been widely available from surplus at very low prices. However, they are identical with the 807 tubes except for the tube-base arrangement and

FIG. 1
the filament voltage, requiring 12.6 volts. If desired, the builder can substitute 807 tubes in both the R.F. transmitter and modulator units with no circuit changes, by merely changing to five-prong sockets and lowering the heater voltage to 6.3 volts.

Thanks to the use of the Pierce oscillator, the transmitter has only two tuning controls. The first tunes the plate circuit of the 6L6 buffer; the condenser and coil combination used in this tuning circuit (see Fig. 1) is such that the buffer can be tuned to both 160 meters and 80 meters simply by rotating the variable condenser. This makes it possible to shift to 80 meters simply by changing the plate coil in the final amplifier. To obtain a reasonable "Q" in the amplifier tank circuit, a split-stator variable is used, and the coil so arranged that for 160 meters the two halves of the condenser are connected in parallel across the coil. For 80 meters, only one half need be used; the other half "floating."

(Continued to page 234)
Radio and Television Today

A—All-glass rectangular television bulb designed to receive 100 percent of the transmitted TV picture. It parallels the picture shape of modern motion-picture film; relation of width to height, 4 to 3

B—Twin-stylus variable-reluctance phonograph cartridge capable of playing conventional and micro-groove records. Changing from one stylus to the other is done by depressing and turning the knob

C—Truly a dual-purpose radio, this a.c.-d.c. five-tube set has a built-in antenna and will serve in any room in the home as a table model. Then for personalized listening, it may be mounted on the head of your bed and the speaker may be removed from the cabinet as shown and placed under your pillow

D—Television "juke box" permits customers in booths to see 3 minutes of television for 5 cents. Each booth set is a "slave" unit operating from a master set

E—Twin-lead lightning arrester protects television receiver. It can be installed either inside or outside as shown, without wire stripping or cutting

F—Portable prospecting unit detects and measures both beta and gamma rays emitted by uranium and other radioactive ores, instead of gamma rays alone

G—Valceraser renews dictating-machine records. Disks may be "erased" and used as many as 50 times
Less than $50...a fine Kodak Enlarger

THE NEW KODAK "HOBBYIST"

"Cold light" protection for your negatives—at the touch of a button, the circline fluorescent lamp flashes on. "Integrating-sphere" type lamp house and its special inside coating give uniform light distribution.

"Squeeze action" control smoothly elevates or lowers the enlarger head. You can enlarge negative areas up to 7 times.

Enlarging is swell fun ... ask anyone who does his own work. So see the new Kodak Hobbyist Enlarger at your Kodak dealer's now. It's a great performer at a modest price.

EASTMAN KODAK COMPANY • ROCHESTER 4, N.Y

As for focusing, what could be quicker than a turn of the lens. The Kodak Enlarging Ektanon f/6.3 89mm. Lens, with click stops, is velvet-smooth—accurate to a degree.

New negative carrier simplifies loading—for negative sizes through 2½ x 3½ inches. Kodak Combination Negative Carrier A, masks, and roll-film cups are available accessories.
Care and Feeding of Engines

WHY CLEAN RING GROOVES?
A ring set is like a football team. If a tackle lets the opposing guard come through to tackle the halfback before he gets a pass away, the whole offense bogs down. If the top compression ring gets stuck in a dirty groove, it can't seal off the combustion chamber. Gases go past and tackle the second ring. This means compression lost, power lost, high temperatures and rapid wear.

With that kind of a strain, the second ring is likely to get stuck in its groove, and away goes your old ball game. Cleaning oil ring grooves, of course, is just as important—particularly the oil holes. You must provide for a full flow of oil through these holes.

DON'T LET IT HAPPEN!
Rings must slide smoothly and freely in clean grooves. All the carbon deposits, all the sticky, lacquer-like substance known as "varnish" must be cleaned out before fitting new rings.

Figure 1 shows a ring groove cleaner in use. This is the way to clean the bottom of a groove. It won't do a thorough job on the sides. For the sides, the best tool you can use is a piece of an old, broken compression ring. Use the square end and scrape both sides of the groove all the way around, twisting the piece of steel to get close contact.

CHECK CLEARANCE
After cleaning grooves, check clearance with a feeler gauge (Fig. 2). If there is less than .0015" rub ring on emery cloth laid on a face plate to reduce thickness. Clearance should not be more than .004. Special caution! Sealed Power Piston Rings are the best rings made. Sealed Power MD-50 Steel Oil Ring, the only ring with the full-flow spring, does the world's finest job of oil control, even in badly tapered and out-of-round bores. It gives you double the drainage with half the drag. Your dealer has Sealed Power rings or can get them for you.

Phone Transmitter
(Continued from page 231)

The coil L1 used in the final is homemade, being wound on a 2-½-in. ribbed form. Coil L2 is wound on a 2-¾-in. form. The turns are glued together with china cement and the form removed. If a complete manufactured 150-watt coil is used instead, it should be a type with a variable end link. Enough turns should be removed from the coil so that the amplifier tunes with the condenser fairly well "in." Because the transmitter will probably be used at most stations as an auxiliary to other equipment, no meters are built in. However, meter jacks are provided as will be noted in photo C. J1 is for measuring the 6L6 buffer cathode current; J2 for the amplifier grid current and J3 for amplifier cathode. The latter serves for most of the metering, as it is roughly equivalent to a plate metering spot (includes screen and grid current, of course).

Photos B and C show rear and front views of the transmitter unit. All parts are specified individually for this transmitter unit in diagram Fig. 1 and its resistor chart; the bottom view appears in photo G. Chokes R.F.C.-1 consist of 17 turns of No. 20 d.c.c. wire wound on 1-megohm, 1-watt resistors. Because the 1625 tubes, like the 807 tubes, are easily overdriven, a variable condenser is used to provide excitation control. This condenser, C7, is operated with the knob on top of the chassis, and when once set to give maximum output it can be left alone. The frequencies which are available in the 160-meter band are different in certain parts of the United States. Therefore, be certain that you know which apply to your part of the country before buying crystals. In operation, the transmitter should be loaded until the cathode milliammeter shows about 220 ma. The 1625 or 807 tubes will take this input with ease. Photo A shows

(Continued to page 236)
SALESMEN!

SALES GOING CRAZY!

Work hard for 7 months...then LOAF the rest of the year!

AMAZING Underground SPRINKLER SYSTEM-

Retails for ONLY...$49.50

...SWEEPING SALESMEN INTO THE BIGGEST MONEY OF THEIR LIVES! "GOLD MINÉ" FOR DISTRIBUTORS!

Last year, EVERSPLAY created a nationwide sensation — poured spectacular profits into the laps of salesmen everywhere.

This year, the NEW, Improved EVERSPLAY is going to make last year's earnings look like small change! Because this year, we offer Salesmen TWO spectacular order getters until now unheard of in the history of Direct Selling.

1. A COMPLETE DEMONSTRATOR you carry right in your pocket.
2. An Everspray SYSTEM complete in every detail that you can spread out on a prospect's lawn and have in full operation IN LESS THAN 10 MINUTES!

This year — right before a prospect's very eye — you can show him exactly how his Everspray Underground Sprinkler System is going to work when it's installed in his lawn!

With either one of these two amazing demonstrations you clinch a sale 9 times out of 10. Every home owner who takes a speck of pride in his lawn will want to install an Everspray as quick as it can be delivered to his door!

CUSTOMER INSTALS IN FEW HOURS without damage to lawn!

Now, for the first time in history, any home owner — anywhere — can get an Underground Sprinkler System at a price he can afford. Now his lawn can be sprinkled like a million-dollar estate. And look! Everspray is all solid brass and copper. Nothing to rust or wear out. No pipe furring to do. No plumber's bills to pay. No repairs. No inspection. No maintenance. No freezing because Everspray drains itself — automatically — every time it's shut off. No wonder home owners by the thousands are rushing to buy Eversplay!

No wonder Ray J. Eckenrode says: "EVERSPRAY works like a charm. On the strength of this installation, a neighbor asked me to purchase the same layout for him."

EVERHOT PRODUCTS CO. (Everspray Division)
2001 Carroll Avenue, Dept. 2-B, Chicago 12, Illinois

FEBRUARY 1950
use of a loop and flashlight bulb for tuning the final.

Undoubtedly, some hams will use this R.F. transmitter with modulation equipment that they already have. Others will build the simple and highly efficient 120-watt modulator unit illustrated in photos E, F and H. The complete modulator-unit circuit with individually identified and specified parts appears in diagram Fig. 2. Self-powered except for 400 volts from a separate well-regulated power-supply unit, this modulator will furnish about 60 watts of audio which is plenty to modulate the transmitter. However, it is so designed that by simply increasing the plate voltage to 750 watts it can be used to modulate a 240-watt rig. A little care is advised in wiring the first two audio stages to make certain that the microphone jack is completely shielded, and shielded wire is used for the “hot” leads of the stages—or a.c. hum may be a problem. A small metal can is used for shielding the “mike” jack as will be noted in photo H. Any unused leads in the power transformer should be carefully taped to avoid accidental shorts. The chassis base for the modulator unit is 3 x 11 x 17 in.

The class-B modulation transformer should be a 125-watt adjustable type for

(Continued to page 248)

Remember Weldwood Glue when you need dependable wood-to-wood bonds. Quick and easy to mix with cold water... tremendously strong... stain-free... rot-proof... and permanent. At paint, hardware, variety stores and lumber yards. 15¢, 35¢, 65¢, 95¢ and larger sizes.

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Showoff acceleration proves nothing and is extremely wasteful of gas. Normally this type of driver has to slow down a moment later. Drive steadily—you will arrive at your destination safe and sound.

Gas mileage goes down drastically as speeds go up. Table above is based on actual tests of six-cylinder medium-priced cars. Make a habit of driving at conservative legal speeds because it pays.

Have your spark plugs tested, cleaned, adjusted regularly, replaced every 10,000 miles. One missing plug in a set of six wastes up to one-sixth of your gas—to say nothing of impairing starting, performance and dependability. You can rely on your Champion dealer for dependable service.

A Champion driver cultivates driving habits that will increase the pleasure, the performance and the economy of his car throughout its useful life. As one of the most important investments you have, it deserves the best in service and equipment. When you need spark plugs, follow the experts—race drivers, master mechanics, airline and fleet maintenance men, who insist on dependable Champion Spark Plugs . . .

**FOLLOW THE EXPERTS—**

Guy Lombardo, famous for "the sweetest music this side of Heaven" and equally noted as a motorboat racing champion says, "I always use dependable Champion Spark Plugs to get the sweetest music out of my engines."

**CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO**

*Listen to the CHAMPION ROLL CALL . . . Harry Wismer's fast sportscast every Friday night, over the ABC network*
Five Roads to Doomsday

(Continued from page 85)

stars and, as we know, the sun is not one of these. Furthermore, we have learned by keeping our eyes glued to telescopes that the same stars become novae again and again. If our sun were going to blow up, it would have done it already. It has had some 3 billion years to make up its mind.

Of all the possible doomsdays, two are bound to happen because they depend on the running down of the universe—a one-way, inexorable process. The earth is slowing down at a rate of $\frac{1}{3000}$ second per century as a result of friction. As it loses motion, the sun gains rotational motion, and the moon moves out from the earth. Eventually, the length of each day will be increased to a month, and about that time the moon will begin to return earthward.

You’ve already seen what’s liable to happen when that occurs. The chances are that no one will be around to witness it. Way before days become a month long, everyone will be well charred from overdoses of sun, or dead of exhaustion from running around the world to avoid it.

Incidentally, the moon can never crash into the earth, so don’t give that another thought. The barrier is known as Roche’s limit. It’s about 10,000 miles above the earth’s surface, and is the point at which gravitational forces will be so great that the moon will be torn asunder by them.

More certain than anything, according to planetarium astronomers, is that the sun will burn out. It’s bound to, since its energy is being burned up daily. This, of course, will be a gradual process. An ice age will freeze everything solid, and perpetual snows will drift across a forlorn world.

But here again, scientists know, there probably won’t be anyone around to witness the interesting change. In his book, “The Birth and Death of the Sun,” astronomer George Gamow has spoiled the dream of anyone with hopes of freezing to death due to the sun’s demise.

Instead of being frozen, he says, life on earth will probably burn up anyway, since all stars that burn out give one last burst before they go, and the sun at that stage will leap 20,000 or 30,000 degrees.

When will all this happen? Well, barring collisions, the sun is good for another 20 billion years at least. Planetarium officials love to recall the aged woman spectator who, after hearing this, came up to the narrator when the show was over and asked, “Did you say 20 million years?”

“Twenty billion,” replied the narrator.

“Oh,” said the woman with a sigh of huge relief. “I thought you said 20 million.”
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**Trimming Grapevine**

Q— I have an old, neglected grapevine growing on an arbor which has deteriorated to the point where it must be replaced completely. I can rebuild the arbor easily as it is located in the open, but how can I prune the vine without injuring it? Some of the branches are 15 to 20 ft. long.

D.R., St. Louis, Mo.

A—The first step in reclaiming an old, neglected vine for ornamental purposes is to remove all the dead branches and the small weak shoots with dead tips. Do not cut any of the main branches near the trunk unless they are dead. Remove long, slender branches which make a few canes near the ends. Then reduce the number of medium and large branches, taking out only those which have the least number of canes. Finally, shorten the length of all the branches left by at least 25 percent. This procedure is only general and applies exclusively to ornamental vines trained on large arbors. Arbor training of a neglected vine should proceed over a period of several seasons. It is not advisable to remove more wood than outlined in the above procedure the first season. When too much wood is removed from an old vine it may produce a great number of weak new shoots from adventitious buds (buds which form at random on the trunk and larger main branches). The vine may be pruned at any time during the dormant period but perhaps the best time is in the late winter or early spring before the sap rises. Never prune the vine during the growing season.

**Painting Stained Shingles**

Q—My house is covered with wooden shingles stained a dark brown. I do not know, but I assume this was a creosote stain. At any rate it must have been applied some years ago, as the lower edges of the shingles are beginning to weather. I would like to paint the house white but I'm told that the stain will cause discoloration of the paint. If this is true, is there a sealer available that will prevent this trouble?—J. P., Springfield, Mass.

A—Bleeding of the stain through the oil paint is quite likely even though the stain is old. It is generally safer to seal the surface by using any of the various sealers made especially for this purpose.

(Continued to page 242)
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(loss extensions)
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NOW...a bench saw and jointer-planer combination at a price that makes it a cinch for you to own! Big DUNLAP 8-in. Bench Saw with side-table extensions has 23%-x16-3/16-in. working surface, 2-3/4-in. depth of cut. Table tilts 0 to 45°. With 8-in. combination rip and crosscut blade, accurate miter gauge, rip fence, adjustable guard and splitter. CRAFTSMAN ball bearing Jointer-Planer planes wood 4-3/4-in. wide; rabber cuts 3/8-in. deep. Removable guard; rip fence tilts 0 to 45°. CRAFTSMAN 1/2-H.P. 1750 R.P.M. ball bearing capacitor motor (110-120 volt 60-cycle A.C.) has 1/2-in. double-end shaft; 8-ft. cord; plug. New CRAFTSMAN steel Power Tool Bench, 30 in. long, 16-3/4 in. wide; height adjusts 22 to 32 in.; with slide-rail supports and 2 jointer mounting plates. Complete with 3-in. motor pulleys and 2 V-belts. Compare this power tool combination with any you've seen...and you'll KNOW what an unbeatable value it really is at SEARS amazing low price!

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In applying any sealer, follow the manufacturer's instructions in all details, as the sealer cannot be fully effective unless it is properly applied. Although we could not recommend it as being better than many prepared sealers, aluminum paint also will serve this purpose. One coat would probably be sufficient if it can be applied uniformly to cover all the surface to be painted. If the shell is rough and badly weathered in places, the sealer would probably be best.

Basement Flooring

Q—Would you like to lay a wooden floor over a concrete floor in a part of my basement. I've been advised by a friend that: to do this because moisture will collect under the wooden floor, rotting the wood and causing dampness. How about it? Should I forget it, or can the job be done?

E.Z., Seattle, Wash.

A—Although a wooden floor installed over concrete in the average basement cannot be considered permanent, the wooden floor can be made to give several years of satisfactory service if it is properly laid. The concrete should first be coated with hot tar and then 2 x 2-in. nailing strips (sleepers) are attached to the floor with lag screws turned into masonry fasteners which are set into holes star-dilled in the concrete. Level the strips with a straightedge and jointer plane. The nailing strips are placed about 10 in. apart and should have 1/2-in. holes drilled through each piece about 12-in. apart to permit air circulation under the floor. It's a good idea to coat the strips with tar. Next, lay a subfloor, using tongue-and-groove pine flooring stock. Coat the back of each board with tar as it is laid. Finally, lay a waterproof building paper over the subfloor and nail the top floor over this. Be sure to leave openings at the edges where the wooden floor meets the basement walls. Finish the top floor with varnish or paint. If an automatic dehumidifier is used during the summer months, a floor built in this way will last for many years.

Peeling Paint

Q—I live in a frame house about 25 years old, and two years ago I had it insulated and painted. Now I notice that the paint is cracking and peeling on the outside window casings. What causes the other painted surfaces to be affected? What causes the paint to peal only on the casings?

W.W., Madison, Wis.

A—Probably the most likely cause of the trouble you describe is condensation of moisture in the window-weight pockets at each side of the window frames. The moisture comes from the inside of the house, not from the outside. In older house construction there usually is a crack between the inner casing and the plaster and also between the plaster and the pulley stile. Moisture enters the weight pockets through these cracks and condenses somewhere on the bare surfaces of the boards, where it is absorbed by the wood. It also can enter under the apron beneath the window stool and thus find its way into the space under the sill. Eventually it will penetrate to the back of the paint film on the outside casings. Presence of moisture at this point will loosen the bond of the paint to the wood, causing the paint to crack and peel as you describe. One practical way to minimize this trouble is to reduce the humidity in the house. Sealing the space between the inside casing and the plaster with caulking compound or a prepared crack filler also will help to cure the trouble. Scrap off the peeling paint to the bare wood, and then reprime and repaint.
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GRINDS, ROUTS, DRILLS, POLISHES, ETC.
Moto-Tools, Kits and Accessories should not be confused with "bargain offers." Compare Dremel Products, feature for feature, with other similar equipment. If ours are not superior in quality, design and performance, we don't want you to buy.

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- Dynamically balanced armature eliminates vibration
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This 12" high, precision drill press is ideal for model making, wood carving, routing, etc. Utilizes No. 2 Moto-Tool.

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DREMEL Electric Sander Polisher-Massager

Say goodbye to hand sanding and polishing! This miracle machine is so easy to handle, a child can use it. Crafts men and housewives find (1) As a sander, it takes the effort out of sanding walls, woodwork, furniture, workshop projects, etc. Its straight-line, non-rotary action will not burn or scratch surfaces. (2) As a polisher, it does a professional job on waxed surfaces of cars, furniture, etc. (3) As a massager, it's ideal for tired or sore muscles.

LOOK AT THESE DREMEL FEATURES

Dremel Sander delivers 1,400 strokes per minute, weighs only 2 1/2 lbs. It's foolproof (has only two moving parts...never needs oiling). Dremel Sander operates on 110-120 Volt AC. Hundreds and thousands of satisfied users prove its value.

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Dremel Sander comes complete with 6 sheets assorted grade Garnet Paper for sanding, plus felt pad and sheepskin for polishing. If your dealer cannot supply you, use coupon to order direct from factory. Money back if not delighted after 5 days' trial.

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- Drill $16.50
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FEBRUARY 1950
from entering the streams to spawn. The service wants the food fish to have free access to spawning areas, but not the lampreys. How this difficulty will be solved is yet to be learned.

In addition, scientists are worried that lampreys, if prevented from entering spawning streams, may lay their eggs on the lake bottoms. That hasn't occurred yet, as far as is known, but adult lampreys have been caught more than 500 feet below the surface in Lake Michigan. If the killers can adapt themselves to life in fresh water after living in the adult stage for centuries in the ocean, what's to prevent them from changing their spawning habits? And as an additional headache, up to now scientists can't tell the difference between the eggs of a sea lamprey and those of the harmless local species.

Of extreme importance in this underwater war will be the discovery of some natural enemy of the sea lamprey. So far, none has been found.

Chemicals or combinations thereof have been discovered that will kill injurious insects without harming the plants upon which they feed. Along that line scientists and research technicians of the Fish and Wildlife Service are not overlooking the possibility of turning up a poison that will ring down the curtain on lampreys yet will not harm the fish. Efforts will also be made to discover some biological parasite which will have the same effect.

Science is determined to win this war. If the slaughter by sea lampreys isn't halted, our vast inland seas soon may be as devoid of fish life as the Mojave Desert and lake trout may become specimens in aquariums.

17-Acre Bargain Counter
(Continued from page 173)

old bed springs, but not for sleeping. Cowboys of Arizona wire them together to make fences.

Other items that have gone to the highest bidder include stovepipes, an alcohol blowtorch, an Erector set, precision instruments for surveyors, a complete set of plumber's cutting dies, a canvas swimming pool used by a movie company and two magic lanterns in vogue around 1900, with slides of Niagara Falls and other scenes that appealed to the young ladies of that day. Auctioned off was a coffee grinder of 1914 vintage, the kind once seen in country stores.

Some mechanical contrivances have not (Continued to page 246)
The finest low-priced drill presses in America are ready for your inspection! New improvements, added to the known quality and performance features, make Atlas drill presses better than ever.

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This is not difficult—no schooling—no experience needed. Sanders are easy to operate—and you can start making money the first day your machines arrive! Earnings of $25 and more a day are not uncommon! Hundreds of prospects everywhere in your community—new and old homes. Original investment small—no large overhead—you need no elaborate offices, workshop, storeroom or heavy trucking equipment. Many men operate from their own homes and use regular passenger car to transport equipment from job to job. Pleasant indoor work—steady year 'round—a real opportunity to MAKE MONEY and be your own boss! Send for "money-making" booklet entitled "Opportunities in Floor Surfacing"—use coupon and enclose 25c in coin or stamps to cover handling.

Focus on the Crash!
(Continued from page 167)

brush marks on an automobile which has struck a pedestrian may indicate whether the pedestrian was thrown from the point of impact to where he landed many feet away—or whether he was carried by the car. Debris on the pavement—mud or dirt from fenders, or pieces of metal and glass, or skid marks—usually marks the point of impact.

Night photos of traffic accidents can be made best with flash equipment. Because background will be lost in darkness, your night photos won’t tell as much of the story, but they’ll be much more valuable as evidence than no photos at all. You may be
Choose the motorcycle of the champions, the favorite mount of the racing stars! Experience for yourself the unequalled thrills of champion performance... acceleration that shoots you ahead like a rocket... power that makes steepest hills seem like straightaways... comfort that lets you ride all day without tiring... quality that gives you years of service. Fascinating fun and friends are yours at exciting race meets, hillclimbs, gypsy tours, club events and parties. There’s no sport like motorcycling, no motorcycle like the world-champion Harley-Davidson! And you can own one on easy terms! See your dealer today. Mail the coupon now.
able to round out your set by taking pictures of the location by daylight next day, showing some details which can be seen also in the night photos.

If your pictures go to court, you may or may not be called to identify them. Before pictures can be admitted to evidence, they must be identified. If entry of the pictures is unopposed, such identifying is simple—the attorneys stipulate that the pictures correctly show the state of things at the accident scene at a certain time.

If entry of the pictures is opposed, however, a foundation of sworn testimony must be laid to establish facts about the pictures. You, the man with the camera who took the pictures, probably will be called to testify.

You must be able to prove the photograph is not in any way a fraud—a "doctored" picture or some other kind of fake. The original negative must not be in any way retouched or changed; if retouching is necessary to bring out faint details, such retouching must be done on a copy negative or on a print.

It is common practice in courts for a police officer who was present at the accident to identify pictures offered in evidence. For that reason, you should take care to include the investigating officers in one or more of your pictures. The officers can be located and identified long after the accident; their names will be signed to the investigation report. Asked to identify one of your photographs plainly showing them at work at the accident scene, the officers can prove they were present at the time the pictures were made and can testify that the pictures correctly represent the scene at that time.

Phone Transmitter

(Continued from page 236)

different modulator and R.F. loads. To provide the proper load for 1625 tubes operating at 400 volts, the transformer should be set up to give a 3200-ohm load plate to plate on the tubes. Of course, for 120 watts input with 600 volts, at 200 mils, the R.F. load is 3000 ohms. The bias resistor R11 should be adjusted to provide—25 volts, as measured at the center tap of the driver transformer when the plate supply for the modulator is 400 volts. Fixed condensers C8 and C9 may require modification to give the best "communication quality." Their purpose is to limit the band of frequencies passed by the modulator. The antenna design is optional with the builder. Detailed student material list R-386 for the complete phone transmitter is available from our Radio and Electronics department, upon receipt of ordinary letter postage.
Sore Muscles?

When muscles are stiff and sore from unusual exercise or strain, use HEET®, the liniment that's strong yet does not burn the skin. Wonderful relief from muscular soreness comes as comforting HEET quickly starts to penetrate. Just brush it on with the applicator. HEET starts at once to ease muscular pain and keeps on working for hours, warms and soothes the painful area.

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Casite speeds oil to tight spots, protects engine during critical break-in period.

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SAY YOU SAW IT IN POPULAR MECHANICS
Rugged, Multi-Purpose SHOPSMITH is complete power workshop in one compact unit

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SHOPSMITH has precision features found only in highest priced saws, drill presses, lathes and sanders. Four grease-sealed ball bearings in headstock. Induction hardened spindle tip. Centerless ground steel ways. Built-in quality through and through. So compact it fits any 2’ x 5’ space. So ingeniously engineered you can convert from tool to tool in less than 60 seconds.

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complete except for motor.
With special 1/2-hp., ball-bearing, capacitor-type motor
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1. **8” CIRCULAR SAW**

SHOPSMITH saw has capacity and performance equal to or greater than most cabinet shop models. Can cut to center of 8’ plywood panels. Effective table width up to 56”. Depth of cut 2½”. Sturdy tilting table with ball-crank raiser for precise settings. Precision-tooled miter gauge and self-aligning rip fence.

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With extendable quill, 12” cast-aluminum disc can be fed into workpiece for safety and accuracy. Extra-large adjustable table measures 14½” x 17”. Use miter gauge for accurate squaring and mitering; rip fence for super-smooth jointing; tilting table for compound-angle sanding. Operator can face work or work from side.

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Greater capacity than most other heavy-duty lathes. 15” swing, 33” between centers. 4” quill feed. Swivel-arm tool rest always parallel to ways—no need for constant adjusting.

4. **VERTICAL DRILL PRESS**

SHOPSMITH drills to center of 15” circle, has a maximum clearance table to chuck of 27”, floor to chuck of 57”. Jacobs key chuck takes straight shank drills from 5/64” to 3/4” diameter.

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FEBRUARY 1950 251
Probing the Secrets of the Glaciers

(Continued from page 152)

that is constantly replenished from above and constantly dissipated at its terminus. The ice is plastic because the bulk of it is under pressure at melting temperature, just about at the freezing point. Water in a glacier is at the same temperature as the ice. The temperatures inside a glacier seem to remain the same all through the year. Sub-zero winter temperatures penetrate only 40 or 50 feet into the mass.

Some of this information has been known for a long time, some has been mere theory. All of it was confirmed by the Caltech group.

The scientists took the interior temperature of the glacier with electric resistance thermometers that they lowered into holes as deep as 200 feet. To create the holes they used an electric hot point, similar to a soldering iron, attached to the end of an aluminum pipe. Additional lengths of pipe were added as the hole grew deeper. Electricity for the hot point was supplied by a gasoline-driven generator.

Most studies of Alaskan glaciers have been confined to the terminal areas because these have been the easiest to reach. With aircraft, however, the generating or feeding areas between 5000 and 7000 feet in elevation can now be studied. Here the depths of the annual top layers of snow and firn can be carefully measured.

Last year 14½ feet of new snow was found on top of the previous summer’s dust layer on the Seward ice field. This was equal to precipitation of about 80 inches of water. “Last year was a very good year for the Seward ice field,” Dr. Robert P. Sharp and Laurence Nobles, Caltech glaciologists, agree. “The glaciers are in a very healthy condition.”

Expedition members spent days of study clinging to the walls of 80 and 90-foot crevasses. They dug a 50-foot pit through the firn and created much deeper holes with their hot point.

One of the things that they observed about the transition of partly consolidated snow into ice is that the mass gradually builds its own plumbing system—an interior structure of icy bands and pipes. This happens because the melting of surface snow produces water which percolates down through channels into the snow pack. At various levels it spreads out horizontally and freezes, as does the melt water that stands in the percolation holes.

Some parts of Malaspina Glacier are estimated to be almost half a mile thick but accurate measurements won’t be possible
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until a helicopter is used to carry men and equipment to sites on its top. Malaspina is too rough for landings by ordinary planes.

Each expedition used a different seismic technique for taking depth measurements at the upper end of its glacier. Radar looked promising as a way of probing into the ice but the experiments were inconclusive.

The standard seismic method employed in underground mapping was used on the Seward ice field, geophones being used to pick up echoes of gunpowder explosions from the ice-rock interface. The time that elapses between the original explosion and reception of the reflected wave is translated directly into depth. To overcome the absorptive effect of the firn mantle, it was necessary to melt shot holes as deep as 75 feet into the firn. The seismic measurements showed that in its generation area the ice field was as deep as 1975 feet. Correlated with and partly confirmed by gravimeter measurements, the figures permitted drawing of cross sections of the rock floor.

The American Geographical expedition on Taku Glacier used a new technique that was developed by Dr. Thomas C. Poulter, associate director of Stanford Research Institute, during the time he was a member of the second Byrd expedition to the Antarctic. Instead of burying the explosive charges, Doctor Poulter suspend them in the air a few feet above the ice of firn. Random waves and "background" reflections are materially reduced, permitting accurate measurements of the depths of interfaces of even about the same densities. Taku Glacier was found to be from 800 to 1500 feet deep in portions of its generation area.

Examination and study of glaciers is only one sub-branch of a vast program of arctic research that is underway. The Office of Naval Research has established a permanent arctic research laboratory at Point Barrow where numerous other subjects are being investigated. Often a trivial subject can have important implications.

Why can the arctic tern stand on the ice for long periods without freezing its feet? If a tern is placed in a warmer environment for a time it loses this immunity to cold. Its feet freeze when it is placed on ice again. Similarly, how does a polar bear withstand frigid weather? It has a heavy hair coat, to be sure, but very little if any good warm fur. Hair is hardly an adequate protection.

Presumably some natural chemical process helps arctic animals and birds to adapt themselves to extremely low temperatures. If the secret of this natural process can be learned there is a chance that man will be able to take advantage of it. Then he could live in the North without taking the elaborate precautions he must observe now.
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Bone Detective
(Continued from page 125)

skeleton is usually larger than that of a
Texan Indian and that the skeletons of the
Mexican tribes will be smaller still. During
one of Doctor Stewart's jaunts to South
America, he discovered that his 12-year-
old daughter, with him, was as tall as any
Guatemalan Indian.

The condition of Indians' teeth is another
puzzler to the scientists. Does a diet of
corn mean good teeth, or bad? Are shell-
fish superior to corn as a staple item in In-
Indians' diet? These questions, in turn, are
linked to the vital issue of soil quality.
Fresh soil, all agree, produces more nutri-
tious food, while depleted earth will yield
considerably less valuable foods.

Every GI who has done a stint in the
United Kingdom has noted how much
shorter the average Scot, Welsh or English
citizen is by comparison with Americans.
Yet, these same peoples, emigrating to
Australia, Canada, New Zealand or the
United States, will produce progeny ap-
preciably taller than their forefathers. Doc-
tor Stewart finds these items more difficult
to solve than the cases the law officers
regularly turn over to him.

Doctor Stewart refuses to admit to rival-
ing the famed Sherlock Holmes even with
his impressive record. Ever cautious, he
will admit only that if he has a number of
bones, and if the skull is available, his guess
will be "90 percent correct." Before FBI
men can receive his nod, they must satisfy
his most conservative and scholarly in-
stincts. In Iowa, recently, another killer
went to extremes to dispose of the evi-
dence. He broke all the bones and scattered
them over a field. The investigators found
some bones without a great deal of trouble,
but they were returned with the notation
that positive identification was impossible.
Doctor Stewart kept them at their task,
digging and scratching at the earth, until
they had literally sifted the field. Finally,
enough bits were found to satisfy the
Smithsonian's judge. Receiving his assur-
ance that the fragments were human, they
confronted the accused with the bones and
with Doctor Stewart's report. He broke
down, confessed—and another killer went
behind bars.

One of the first questions the federal men
often ask Doctor Stewart is—"how long
has the victim been dead?" This is, again,
a very difficult problem, Doctor Stewart
points out. Much depends on the condition
of the ground, its moisture content, the
acidity of the soil, the temperature, etc.
Not very long ago, two bodies, presumed

(Continued to page 258)
Huy in ft. V. i. Burn tim. San waip-rpron. rbi?ro t. tiTi.

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when the business of counting and classifying people already had grown beyond the ability of simple humans to handle. It was almost time to start the 1890 decennial, and the boys hadn’t finished the 1880 tallies. A bureau statistician, Dr. Herman Hollerith, came up with the idea of punching holes in various places in cards, to represent facts such as “male,” “three children,” “farm family,” etc. Then he rigged a machine that the cards could go through and automatically be counted and classified according to where the holes were. Today, the same basic system is in use—only now it’s almost all electronic, with new and more complex machines appearing all the time. Rows of workers will peck away at 2500 card-punch machines, each one completing the 60 or 70 basic-fact holes in 1000 cards a day. From there the cards go to the sorters and tabulators, which automatically classify and count them according to location of their holes.

These machines are masterpieces of ingenuity. Down in the shops of the Census Bureau there’s a man named Tony Berrinsky, who is busily at work making them more ingenious. "When we finally get a machine to handle 40 columns of facts or "holes" in a card," he says, "those guys upstairs had to go think of 20 more questions they wanted to ask on the next census—so everything is obsolete. This time I'm rebuilding the multi-column sorters to combine the sorting and tabulating operations. They'll handle 80 columns of facts. I hope it holds 'em for a while. It probably won’t, though," he adds soberly.

The inside of Tony's multi-column sorter looks like a vat full of wet, black spaghetti. Basically, the principle is simple enough. The cards move across the top on rollers, pass under a row of 80 microscopic metal brushes, which make contact with the metal roll beneath the card every time they come to a hole. Each contact sets up an impulse which is relayed through a battery of thyrotron tubes where the information is "stored." High-speed relays set off the proper electromagnets, depending on what information has been received. A magnetic trip drops and the card is routed to its proper slot. For instance, if 1500 out of 5000 cards going through the mill represent people who live in two-story houses, and you want that information, then the 1500 cards of two-story people will all land in one slot once the relays are set up. Simple? Tony explains that his reconditioned sorter has more than 10,000 wire connections. He should know; he connected them all.

(Continued to page 262)
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Besides sorting, the machine will reject cards with mistakes on them. “If the little ‘feelers’ register opposing facts,” Tony explains, “—for example, if a card says a certain male is two years old, and another hole indicates he has six children—the circuits won’t take it. The card is routed to the reject slot. Similarly, if a farmer’s card has a hole punched to indicate he got something ridiculous like $35 a bushel for his wheat, the circuits won’t take that either.”

Coming up are census machines that will make the others seem like box kites beside jet flying wings. One such electronic nightmare, being developed for Census through the National Bureau of Standards, is a 10,000-tube affair styled after the Eniac computer which was used during the war to calculate the trajectory of missiles while they were still in the air. This fantastic apparatus has a memory, among other things. Instead of taking data from punched cards, it will work by magnetic impulse from a tape which has been magnetically inscribed with the data to be tallied or computed. If there is an error on the tape, the machine will quit working on that problem, but will go right ahead with the rest. When the mistake has been corrected, the machine will pick up the abandoned computation where it left off, and finish it. The uncanny brain works at such a speed that no way has ever been devised to feed data into it fast enough to tax its capacity. This monster will be ready on a test basis to gobble figures in its maw in time for the 1950 census.

Not quite ready yet, but available for the 1960 census, is another electronic marvel that may well simplify census taking so that final figures will be out in months instead of years. It will eliminate manual card punching. The census taker will carry cards, just the right size for the machines, instead of the huge paper form he now totes. As he asks questions, he will mark the card with a metallic ink. Back in Washington, the metallic marks will be “sensed” by the new machine, and automatically punched in all the right places at once.

The manufacturer of the machine is still experimenting with the ink and trying to solve several problems. Likewise the materials from which the cards are to be made are still under test. The cards, which must all be perfectly shaped and edged to go through all the necessary machines, bent, shrunk or stretched due to weather when conventional paper stock was used. Little by little these things are being straightened out. The ink is better now, and new plastics are being tried for the cards.

Meanwhile, the Bureau of Census will be too busy to dream about the wonders of

(Continued to page 264)
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The disc sander is excellent for roughing, hugging off, removing paint, and for other course sanding. But any experienced craftsman will tell you that these same characteristics prohibit its use for finishing, because of swirling, scratching, gouging and other blemishes caused by the disc sander's high speed.

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THE DU-FAST* SANDER and POLISHER produces quick, easy, perfect finishes at low cost. It requires no special skill or knack. You get an industrial type finish on wood, metal, plastics, plaster and composition materials the first time and every time you use DU-FAST! USE DU-FAST TO REMOVE DISC SWIRLS.

Model BOHU 1 attaches in seconds to either the Home Utility 1/4" Electric Drill or the Home Utility 5/32" Disc Sander-Polisher. (Products of Black & Decker Mfg. Co.) Model SKC fits the Skill Home Shop 1/4" Electric Drill manufactured by Skilstore, Inc.

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Manufactured by

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BOAT KIT AT DOWN-TO-WATER PRICE

- Assemble this handy 8-footer yourself and save half the price of a ready-made boat! Light (65 lbs.) for easy carrying, rowing, towing. Yet, the HAGERTY SEA SHELL is ruggedly built to give you years of fun. Carry on your car top to beach or lake. Holds three adults in safety. Takes a small outboard. Ideal for all-around use. Over 15,000 in service.

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Only ordinary household tools needed. The whole family can have lots of fun assembling the HAGERTY SEA SHELL in a few pleasant evenings. Kit includes pre-cut waterproof plywood and wood parts, screws, oarlocks, cable compound, easy-to-follow instructions. Beam 4 ft., depth 16 ins. Fully guaranteed. Additional kit converts SEA SHELL into lively performing sailboat.

HAGERTY, 112 Front Street, Cohasset, Mass.

□ Please send FREE booklet, name of nearest dealer.
□ Please send SEA SHELL kit, freight collect. Enclosed is $35.

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City

State

1960. They've got plenty of calculating to do. Already they know, from preliminary surveys, what the 1950 round-up of Americans will show. We will have grown in number by a solid 20 million in the last 10 years—30 years ahead of schedule, due to war babies. Women will outnumber the men by a glorious million for the first time in history. The trend is still Westward, and California will top the 10-million mark in population, which puts her up with New York and Pennsylvania and gives her seven more congressmen. Ten percent of the farmers have deserted their farms to move cityward. And we will find that we're not the homebodies we used to be. Some 70 million of us have moved our dwellings in the first seven years of the decade. Most stayed in the same county—but 25 million got clear out of the county or state.

How does the Census Bureau know all this? Because the job never stops. In between decennial jobs, the bureau is taking surveys of housing, business, agriculture. There's never a dull moment at Suitland. What started out in 1790 as a simple population count has snowballed into the world's biggest continual statistical operation. And the big job every zero year is just one more headache.

Miracles You'll See

In Next Fifty Years

(Continued from page 118)

travels westward toward Florida, oil is spread over the sea and ignited. There is an updraft. Air from the surrounding region, which includes the developing hurricane, rushes in to fill the void. The rising air condenses so that some of the water in the whirling mass falls as rain.

With storms diverted where they do no harm, aerial travel is never interrupted. And the Dobsons, like everybody else in Tottenville, travel much more than we do in 1950—that is, to foreign countries.

By 2000, supersonic planes cover a thousand miles an hour, but the consumption of fuel is such that high fares have to be charged. In one of these supersonic planes the Atlantic is crossed in three hours. Nobody has yet circumnavigated the moon in a rocket space ship, but the idea is not laughed down.

Corporation presidents, bankers, ambassadors and rich people in a hurry use the 1000-mile-an-hour rocket planes and think nothing of paying a fare of $5000 between Chicago and Paris. The Dobsons take the cheaper jet planes.

This extension of aerial transportation

(Continued to page 266)
WAR SURPLUS SURPLUSSURPLUS BARGAINS

SHOP by MAIL - SAVE at GRÖBAN'S

LOGAN HEAVY DUTY

GEAR TYPE ALL MANGANESE BRONZE INSECTICIDE PUMP

For Serving 0.075, 2.4-9, Sulphur Compounds, etc. BRAND NEW. contouring, 15 gals. per minute at 2200 to 2700 lbs. per sq. in. or 600 lbs. per minute at 1000 lbs. per sq. in. Mounting brackets. Weight 21 lb. Includes connector. Complete. Size 3 x 4. (

ITEM (250)

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FREE instructions and performance data with each pump.

HYDRAULIC CONTROL VALVE

BRAND NEW control valve with built-in adjustable relief valve, will operate one double-acting hydraulic cylinder or two cylinders as one or two reversible hydraulic motors. Valves handle loaded in neutral position. Made of rugged cast iron. Fully adjustable at will. Open center, operate the pump in neutral position. Throttle control allows operator to regulate speed of movement of the hydraulic cylinder or motor. Has removable mounting brackets with 4 bolt holes. 3 1/2" x 5 1/2". (ITEM 237)

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Logan

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WATEROUS PUMP

Rated 500 gal- tons per minute at 120 lbs. per sq. in. high efficiency pump. Designed for front and main water fills at both ends of cylinder. Snafldia, 4 1/4". Foot mounting. 600 lbs. pressure at 1050 lbs. per sq. in. Overall length 149 1/2". COMPLETE. With full accessory kit including suction and pressure gauges, priming pump, and instruction book. Ship. Weight 163 lbs. Gov't acquisition cost 149.50

LOGAN HEAVY DUTY

HYDRAULIC PUMP

Brand new... for operating hydraulic cylinders or as motors on tractors, trucks, construction machines, and other industrial applications. hydraulic pump, Logra 6.5GPM at 1000 lbs. per sq. in. 14" H.P. 2300 rpm, 15 HP. The unique built to exacting Internal parts specifications, are the answer to your lighting needs! (ITEM 259)

15.00

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Genuine
Stillson

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Long Life
Latest Metallurgical
Improvements
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Home... and Industrial Use Since 1869

Get a Walworth Genuine Stillson. You'll feel the difference immediately. The angle of the teeth and pivoting frame action gives the wrench tremendous gripping strength. Discover the perfect heft (balance) that has made the Genuine Stillson such a popular tool since 1869.

Made of steel that must be up to Walworth metallurgical standards, Genuine Stillsons are given the most exacting tests to insure perfection in strength and uniformity in quality.

The inherent strength and toughness in the Genuine Stillson is an extremely important safety factor.

But discover for yourself why more people use the Walworth Genuine Stillson than any other—get one from your local hardware store today!

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Genuine Stillson Wrenches
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New York, N.Y.
VALVES... PIPE FITTINGS... WRENCHES

Proton microscope under construction in France probably will magnify objects up to one million times

has had the effect of distributing the population. People find it more satisfactory to live in a suburb like Tottenville, if suburb it can be called, than in a metropolis like New York, Chicago or Los Angeles. Cities have grown into regions, and it is sometimes hard to tell where one city ends and another begins. Instead of driving from Tottenville to California in their car—teardrop in shape and driven from the rear by a high-compression engine that burns cheap denatured alcohol—the Dobsons use the family helicopter, which is kept on the roof. The car is used chiefly for shopping and for journeys of not more than 20 miles.

The railways are just as necessary in 2000 as they are in 1950. They haul chiefly freight too heavy or too bulky for air cargo carriers. Passenger travel by rail is a mere trickle. Even commuters go to the city, a hundred miles away, in huge aerial-busses that hold 200 passengers. Hundreds of thousands make such journeys twice a day in their own helicopters.

Fast jet and rocket-propelled mail planes made it so hard for telegraph companies all over the world to compete with the postal service that dormant facsimile-transmission systems had to be revived. It takes no more than a minute to transmit and receive in facsimile a five-page letter on paper of the usual business size. Cost? Five cents. In Tottenville the clerks in telegraph offices

(Continued to page 270)
She'll enjoy your shop and the money you'll save with SHOPMASTER woodworking tools

You can start your home workshop with a Shopmaster Saber Saw, like the one pictured above. The cost is less than $16.00. With it you can cross cut, rip, and do many other complicated sawing operations.

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2. DRILL PRESS WOODSHEAPER. MODEL #80. Heavy-duty shaper. Exclusive pilot bearing eliminates side thrust, chatter, vibration—assures smooth cutting action. Complete, as pictured, with 6 pair blades...

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3. CIRCLE SAW WOODSHEAPER. MODEL #SA-10. Solid steel. Absolutely safe—blades locked in position with screws all the way through. In ordering, state diameter of your circle saw shaft. Complete, as pictured, with 6 pair blades and tool rack...

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4. ALADDIN COLLETS. Special collets convert your spindle shaper so you can use low-cost Aladdin wood-turning blades. (For blades, see photo 11, this page.) As pictured...

$3.00

5. THREE-IN-ONE DRUM SANDER. 1", 2", and 3" drum sander all in one. "Telescoping" diameters easy to change. Pilot bearing eliminates side thrust, chatter, vibration. Complete with sandpaper sleeve...

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6. ALADDIN LATHEMASTER. Foolproof factory method of wood-turning, adapted and priced for the home workshop for the first time! Even beginners can't go wrong because Lathemaster measures as it cuts. Now one wood-turning tool does everything—comes with standard chisel blades as well as a new form cutters. Hardwood handle, chrome-plated shank, interchangeable blades of shaper steel. Complete, as pictured, mounted on attractive wood tool rack...

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7. ALADDIN DA-DALL. Now, thanks to Da-Dall's new micromatic adjustment feature, you can change the pitch of your circle saw blade in a matter of seconds and make accurate ornamental and dado cuts. When ordering, state diameter of circle saw shaft.

As pictured...

$4.95

8. MORTISING FENCE & HOLD-DOWN. AND CHISEL HOLDER. Fence and hold-down (right) make drill-press mortising safer and easier.

Chisel holder (left) eliminates necessity of removing chuck when mortising. No special adapter necessary. Fence and hold-down alone...

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As shown above...

$6.00

9. MORTISING CHISELS AND BITS. For use with your mortising tools, or with Bull Mortising Adapter (see opposite page). 3/4", 5/8", or 1/2" chisels with bits...

$6.00 each. Chisels only (3/4", 5/8", or 1/2"") $4.00 each. Bits only (for 3/4", 5/8", or 1/2"") $2.40 each.

$10. ALADDIN TAPER ADAPTERS. Use in place of drill press chuck for routing, mortising and shaping—wherever side thrust is involved. #1A Morris taper adapter...

$2.00. #3A Jacobs taper adapter...

$1.50

11. ALADDIN WOODSHAPING BLADES. Specially selected shaper steel brought to correct hardness to hold keen edges indefinitely. Exclusive money-saving feature: Aladdin blades are double-ground so you can make two standard cuts with each blade. Note that woodshaping tools...

$50. 60.

#SA-10 and Lathemaster come only with blades pictured with each tool. Use order form for extra blades, order by blade number. All blades shown $1.00 each, ($2.00 per pair) except B-$5 ($7.50 ea.). Ready-hardened blank blade you can grind to shape desired.

All Aladdin Tools are Guaranteed

At your dealer or send cash, check, or money order for prepaid shipment to ALADDIN D. MANUFACTURING CO., INC.
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2. BULL BUFFER. Handy polisher—sander fits any electric drill or drill press! Exclusive swivel action and gear reduction. Powerful... popular—more than 100,000 in use. Complete, with sheepskin bonnet and 2 sanding discs... $9.95

3. BULL ARROW SAW. Your 1/4" electric drill becomes a powerful, portable saw! One-hand operation; exclusive safety yoke; aluminum casting. Complete, with 1 1/2" blades... $9.95

4. BULL HOLE SAW. 1"., 1 1/2", 2" holes—with one hole saw! Fits any electric drill or drill press. Cuts cleanly through any 1/4" stock—wood, metal or plastic. Complete, with 4 blades... $4.95

5. BULL DRIVER. Drives screws home in wood or metal in seconds with any electric drill or drill press or flexible shaft. Automatically centers on screw groove; automatic release. (Left) Model A—for screws up to 1/4". (Center) Model B—for small machine screws. (Right) Model C—hand-centering model with long blade for countersunk jobs. All models available in Standard or Phillips head. Specify model when ordering. $6.95

6. BULL MORTISING ADAPTER. Your 1/4" electric drill becomes a powerful, portable mortising tool that makes the chips fly! Large end of Bull Mortising Adapter chucks into any 1/4" electric drill or any drill press—small end fits any standard 5/8" shank chisel. As pictured... $23.90

7. BULL MORTISING KIT. Complete kit for on-the-job mortising with your drill or drill press! Includes Bull Mortising Adapter and 1/4", 5/8" and 1 1/4" chisels with corresponding bits. As pictured... $29.95

8. SHOPCHIEF BELT SANDER. Convert your electric drill into a powerful belt sander! Handles like a plane. Interchangeable pressure plates and sanding belts do all the work from roughing to finishing. Big, rugged—almost 19 sq. inches of sanding surface! Complete, with 3 sanding belts... $19.95

9. BULL ECONOMY KIT. A bargain—beautifully made! Use your own drill to polish and sand by direct drive with new low-cost kit that includes direct drive adapter. Top quality 3-inch flexible rubber disc, finest sheepskin bonnet and 2 aluminum-oxide sanding discs—all for only... $2.25

10. UTILITY ACCESSORIES. Make your drill more useful with these handy accessories—1/4" Arbor for 1/4" electric drill $0.98 ea... steel wire brush that removes paint, rust and scale $0.98 ea... grindstone $0.95 ea. Complete kit as pictured... $5.95

11. BULL BUFFER HOME KIT. In one kit, everything you need to polish, sand and drill like a professional! Choice of speeds—polish at 600 r.p.m. drill at 1600 r.p.m., sand at 3200 r.p.m. Kit includes (1) 1600 r.p.m. Bull Drill with Jacobs geared chuck (2) Bull Buffer, polisher-sander with gear reduction (3) adapter set for sanding at twice drill speed (4) sheepskin bonnet and 2 sanding discs. As pictured... $29.95

12. ANGLE-HEAD DRILLING ATTACHMENT. Now you can drill at right angles in close places... increases your 1/4" drill to 1/2" capacity. Complete as pictured, with angle-head and Jacobs 1/2" hex key $12.95

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FEBRUARY 1950
no longer print out illegible words. Everything is transmitted by phototelegraphy exactly as it is written—illegible spelling, blots, smudges and all. Mistakes are the sender's, never the telegraph company's.

When the Dobsons are sick they go to the doctor, in a hospital, where he has only to push a button to command all the assistance he needs.

In the middle of the 20th century, doctors talked much of such antibiotics as penicillin, streptomycin, aureomycin and about 50 others that had been extracted from soil and other molds. It was the beginning of what was even then known as chemotherapy—cure by chemical means. By 2000, physicians have several hundred of these chemical agents or antibiotics at their command. Tuberculosis in all of its forms is cured as easily as pneumonia was cured at mid-century.

It no longer is necessary in 2000 to administer the purified extracts of molds to cope with bacterial infections. The antibiotics are all synthesized in chemical factories. It is possible to modify their molecular structure, so that they acquire new and useful properties.

Even in 1950 physicians did not know exactly how a piece of beefsteak is converted by the body into muscle and energy—the process technically known as metabolism. The physician of 2000 knows just what diet is best for a patient. This knowledge, coupled with his knowledge of hormones, enables him to treat old age as a degenerative disease. Men and women of

(Continued to page 272)
70 in A.D. 2000 look as if they were 40. Wrinkles, sagging cheeks, leathery skins are curiosities or signs of neglect. The span of life has been lengthened to 85.

In 1950 little was known about a virus beyond the fact that it could slip through a filter so fine that it would hold back any microorganism visible in the optical microscope. The electron microscope, which magnifies from 30,000 to 100,000 times and which substitutes a beam of electrons for a beam of light, has changed all this. In the viruses, little bodies have been detected with this instrument. They are virtually protein molecules. By tying together what chemists have discovered about the structure of protein and what the pathologists see in the electron microscope, such virus diseases as influenza, the common cold, poliomyelitis and a dozen others are cured with ease.

Even in the 20th century hospitals were packed with instruments and machines. The hospitals of 2000 have even more. Instead of taking electrocardiographs, doctors place heart patients in front of a fluorooscopic screen, turn on the X-rays and then, with the aid of a photoelectric cell, examine every section of the heart.

Cancer is not yet curable in 2000. But physicians optimistically predict that the time is not far off when it will be cured.

The nervous diseases are linked up with electrochemical processes in 2000 in a way that is impossible in our time. Such afflictions as multiple sclerosis or palsy are no longer regarded as incurable. There are electrochemical methods of stimulating and reactivating nerves, so that victims of Parkinson's disease are no longer objects of pity. But these sufferers from damaged or degenerate nerves are somewhat like our diabetics who must take insulin regularly to remain alive. A little battery-driven apparatus must be carried in the pocket to provide the stimulus the nerves need.

Any marked departure from what Joe Dobson and his fellow citizens wear and eat and how they amuse themselves will arouse comment. If old Mrs. Underwood, who lives around the corner from the Dobsons and who was born in 1920 insists on sleeping under an old-fashioned comforter instead of an aerogel blanket of glass puffed with air so that it is as light as thistledown, she must expect people to talk about her "queerness." It is astonishing how easily the great majority of us fall into step with our neighbors. And after all, is the standardization of life to be deplored if we can have a house like Joe Dobson's, a standardized helicopter, luxurious standardized household appointments, and food that was out of the reach of any Roman emperor?
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"At $2.00 a mower the Foley makes me $4.00 an hour and I am still under doctor's care. How many men punching time clocks can earn $4.00 an hour"—FRANK S. RILEY. "Will have my machine paid for and more than $300 clear this season"—says A. W. Bishop.

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FEBRUARY 1950 291
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**HOME-UTILITY**

**6" BENCH GRINDER**

$38.00

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**THE** new Home-Utility 6" Bench Grinder is one of the handiest, most useful tools you can buy for your home or farm shop. It does a whole raft of jobs like keeping tools sharp and clean; grinding minor welding jobs; removing rust, old paint, gummy dirt deposits; preparing surfaces for painting; polishing plated metal surfaces. Comes equipped with medium grinding wheel and wire wheel brush; also drives cotton buffing wheels and other attachments, available at slight extra cost.

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Compressor, pressure tank, air gauge, air chuck, 20-l. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank, 2-way cross and 3 nipples.

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FOR 110-115 AC or DC • WELD-BRAZE-CUT-SOLDER-HEAT TREAT INSTRUCTIONS INCLUDED

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2,200 GALLON CAPACITY

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[Less Motor]

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SPECIFICATIONS
TABLE SIZE: 18 x 20
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KENYA LABS, Dept. 202
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FEBRUARY 1950

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