

BREMEN PILOT'S OWN STORY  
JULY PAGE ONE 25 CENTS

JUN 7 1928

MECHANICAL  
GENERAL  
1874

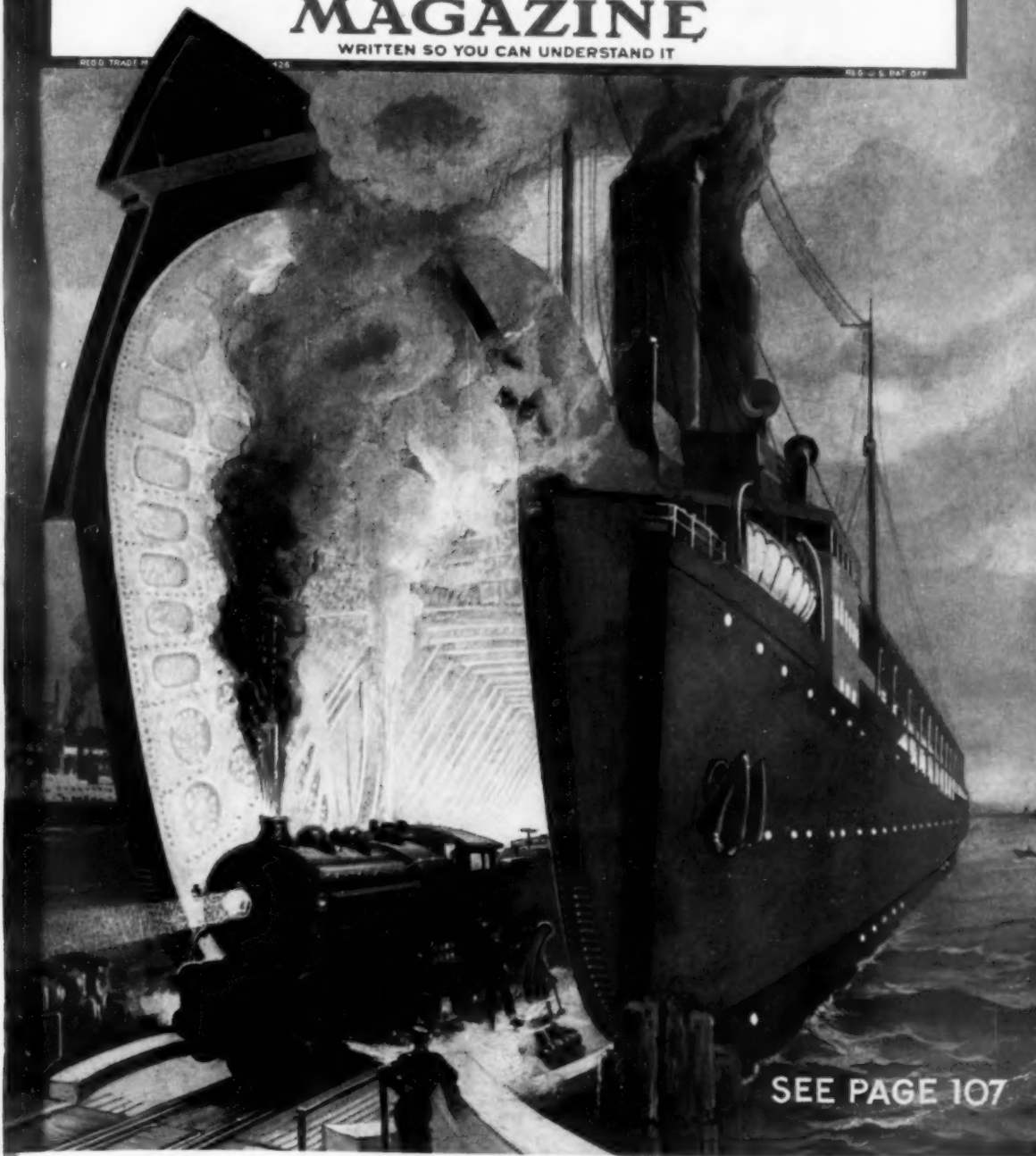
# POPULAR MECHANICS

## MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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SEE PAGE 107

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# Popular Mechanics Magazine

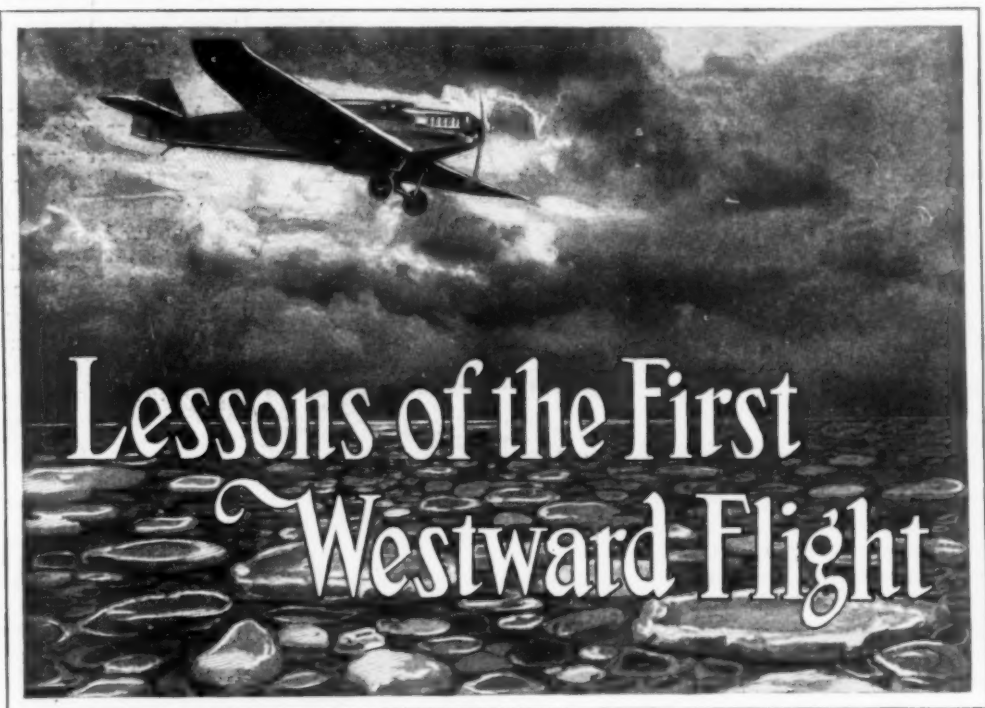
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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 50

JULY, 1928

No. 1



The Junkers Plane "Bremen," First to Cross the North Atlantic from East to West, Succeeding Where Nungesser, Coli, and a Number of Other Brave Airmen and Women Failed

By CAPT. HERMAN KOEHL

Chief Pilot of the "Bremen" on Its History-Making Flight

**B**EHIND the great acclaim which greeted the "Bremen" flight, there was one thought always uppermost in my mind. And that was—what did our flight mean for transatlantic flying in the future?

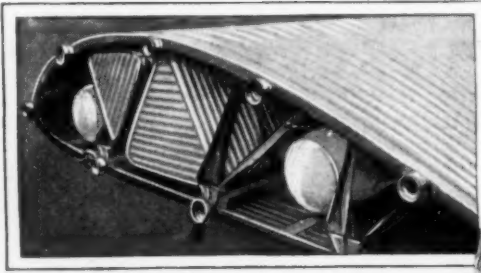
I hope that our flight will contribute in a large measure to the success of transatlantic flying and that those who endeavor to cross by air in the future will profit by our experience and findings.

As I took turns as pilot and navigator of the "Bremen" on its voyage from Baldonnel, Ireland, to Greenly island, on the North American continent, I made constant observations, some on paper, others in my mind. The best way in which I

can explain the various phases and problems which confronted us is to take you step by step on the journey, encountering the difficulties as they arose.

The weather, of course, is the most important thing at the start. On the morning of April 12, we learned that a high pressure was forming over the greater part of the ocean. The winds of the preceding days were fast diminishing, but we knew that the atmospheric conditions were going to be our chief enemies.

The most dangerous region, we figured, was the low-pressure area between Greenland and Canada. Flyers in the future must be prepared to cope with the situa-



Section of the "Bremen's" Wing, Showing Gas Tanks and Bags to Keep Plane Afloat in Case of a Descent at Sea

tion prevailing there.

At the time of our hop-off, there was a fresh south wind. That was suitable for the start in the most favorable direction. Of course, every little detail in the weather had to be reckoned with and we had to worry about the motor—would it carry us through?

Well, at 5:00 a. m. we climbed into the "Bremen," after Baron von Huenefeld and Major Fitzmaurice had made a last and thorough examination of the ship. Strong hands seized the propeller and swung it around, and on the third revolution it started to whirl, not to stop until the "Bremen" reached another world.

As I sat at the controls, I felt that the motor was in good running order. The propeller was making the required 1,375 revolutions per minute. I shut off the gas and, on my fingers, counted and checked the levers that had to be tried. I found the gasoline worked all right, and in a little while I knew we would be headed for the North American continent, fame or death.

At 7:05 we were passing over the mountains and approaching the ocean. I was making notes of everything, the wind, the consumption of gasoline from the different tanks, and observing how the "Bremen" was taking the air. Soon we

were flying from thirty-five to fifty feet over a calm ocean. We were going at an average speed of 105 miles per hour.

Now the smoke bombs which we brought along were to come into use for the first time. By throwing over the side two of them, we discovered that we were riding with a southeast wind that was traveling at ten miles an hour. So we rose to 14,000 feet to take full advantage of the favorable easterly current.

Another hazard we had to face was the clouds. I managed to cross their margins always, but even as we skirted along, the air from them was icy-cold. Woe to the pilot who dares to penetrate into the thick of those clouds, especially in the



Here Is the Wing Tip of "Bremen's" Steel Propeller, Bent in Landing on the Ice of Greenly Island



Looking Forward past the Huge Gasoline Tanks Built into the Cabin Walls; the Two Pilots Rode Side by Side at Dual Controls





The "Three Musketeers" of the North Atlantic, Baron Gunther von Huenefeld, Major James Fitzmaurice, and Captain Herman Koehl, Three War-Time Enemies Now United

darkness. I kept constant watch over the atmospheric dials. I noticed that the wind had increased and changed the course fifteen degrees further north.

From 5:30 to 9:35, we were flying on gas coming from two right cabin tanks. Then we turned on the four wing tanks. It was smooth flying through the day. At 7:20 that night, I noticed that the gas in the gauge sank. Trouble was lurking somewhere. The control wheel had stopped functioning. It was a time for quick and efficient action. The cabin tanks were turned on. The necessary gas was pumped into the tank by two hand pumps, and three minutes later it was running fine.

I figured to fly fourteen hours on the amount of gas which remained. While this hope was surging within me, I gazed off, at the suggestion of my companions, and, lo, we noticed a white line on the western horizon. There were dark shadows. It looked as if we three were riding on to a certain death.

All of this I mention as a part of the history of our flight. I hope it will be a guidance to airmen of the future who will try to navigate these same passes of the sky. The dark line on the horizon was one of threatening stretches of clouds from north to south. This was now the

most perilous region, I think, in the east-to-west flight. It was here that we would have to combat the low-pressure enemy.

I wondered, as we approached that dark line, would the "Bremen" make the grade? Would it stand the test? It was going to be a moonless night where we had hoped for a clear sky beyond that dark curtain. There was no turning back now. We were about 300 miles from Newfoundland.

### GREATER SPEED IS NEEDED

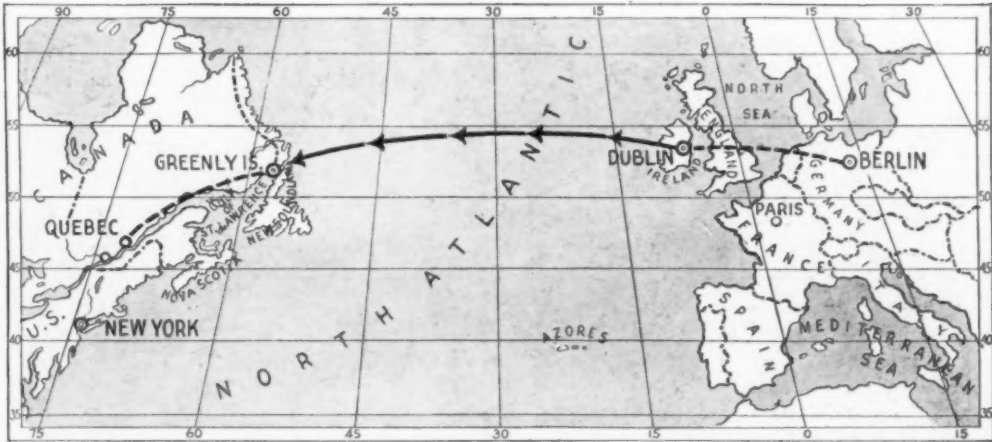
By BARON von HUENEFELD

THE western flight over the Atlantic has shown that an airplane can conquer the winds and that we have learned lessons that will be of great value in the future.

I believe that passenger service will not be made use of so much at first as the mail transport. However, if we are in possession of motors which will enable us to cover 180 miles or more an hour, the dangers caused by changing weather will be lessened and the passenger service will gain favor in the public's eye.

I have no doubt whatsoever but that such motors will be constructed in a short time, and we can confidently expect successful developments in this direction in the next few years.

*Baron v. Huenefeld*



From Berlin to Lake St. Agnes with Two Stops, in Ireland and at Greenly Island, This Is the Route the "Bremen" Flyers Took; at Greenly, They Were Far to the North of the Newfoundland Course

At this point, the fight which is the flyers' greatest enemy in transatlantic flying began—it was the battle against the elements. We rose 4,750 feet over those sinister clouds. And away we sped to the west. But we ran into another avalanche of clouds in this higher region. Our only salvation now lay in sinking into the fog beneath us.

So we came down and felt our way above the surface of the water. It was our first fog, but we managed to pull through it. The fogs, I think, will never be much cause for worry. It is the clouds and the storms which are to be feared.

When we sank away from the second bank of clouds, we came down to within seventy-five feet of the water. We were

so close that the spray of the waves beat through the half-closed window. The "Bremen" shook in all its joints. The wings were bending and the steering wheel received blow after blow of unusual violence. It was man's duel with the mighty powers of nature.

Now, the thought comes to my mind that only the most capable of pilots should ever be engaged in this hazardous transatlantic flying. I can foresee the day when there will be special schools of aviation which will specialize in training pilots for ocean flights. And I can see where existing aviation schools will, if they haven't covered the ground already, include this study in their courses.

The compass, of course, played a great part in our voyage. Navigation consists solely in watching the compass. When we approached that doomful, dark lining on the horizon, I found we were still high enough to keep my direction between the dark clouds and the high waves. But when the waves began beating up against us and the plane began tossing, the compass was reeling and staggering.

It was with great difficulty that I was able to tell in what direction we were going. To make matters worse, the light which revealed the compass dial was put out of commission. I had to use a pocket light to read it. It was at a time when we were flying through a fog. The best I could do now was to fly straight ahead.

At this point I began to appreciate the great value of radio. We did not take

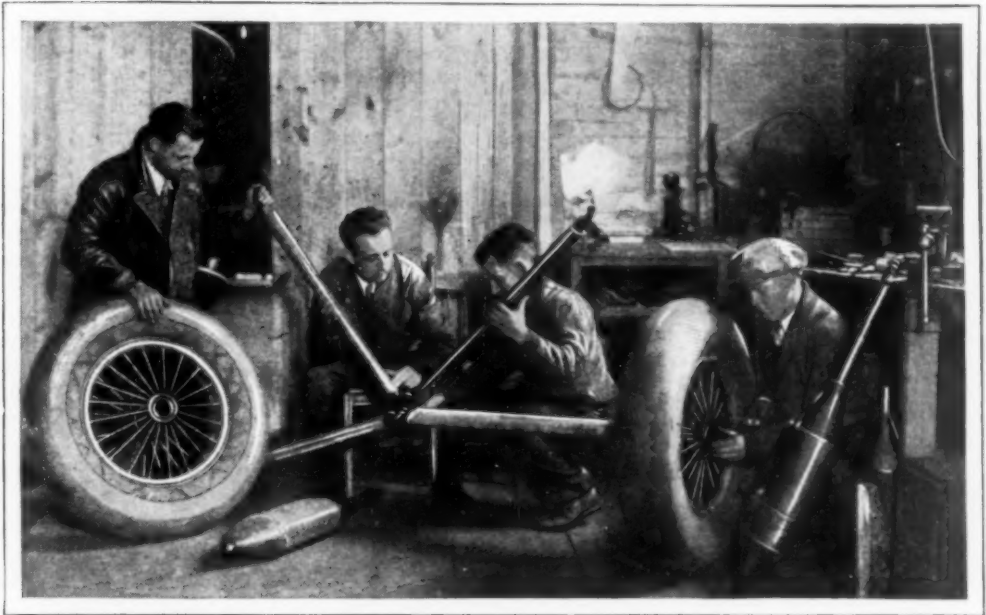
## LOOKING TO THE FUTURE

By MAJOR FITZMAURICE

AS a representative of the Irish Free State Flying Corps, one of the world's youngest flying services, I welcomed the opportunity to come to America as co-pilot of the "Bremen" not only for the honor of helping fly the first plane across the North Atlantic from east to west, but because of the impetus our successful flight will give aviation in my native land.

The location of Ireland as the nearest point in the Old World on the great-circle course to the New World will make it the crossroads of Atlantic aerial navigation in the future.

*John B. Fitzmaurice*



Assembling a New Landing Gear for the "Bremen" from Spare Parts in the Junkers' Hangar on Long Island; Fred Melchior, Second from Left, Later Left to Recover the Transatlantic Plane

wireless equipment with us. Now that we were in peril, with the compass failing, the only instrument to save us from destruction would have been the radio.

Although we realized that the radio would have been a vital aid at this juncture, we knew that before we started out, but we decided that the apparatus would have been so heavy that it would not have been worth the risk. But now I can say with certainty that the radio will figure prominently in future flying over the ocean.

When the compass trouble developed, I was piloting through a fog. Gradually we were flying better and better. One gets used to the fog and can soon learn all there is to know about flying in it.

Aside from the compass, if I were to mark the next vital instrument on the "Bremen," I would say it was the altitude meter. To keep a steady altitude is not an easy matter by any means. I came to know this when I turned the wheel over to Major Fitzmaurice and I took the post as navigator.

Then, I sought the Pole star. I found it easily. But when I compared it with the compass I found that it had gone mad. The compass pointed in quite another direction. We had gone too far north. But we couldn't positively verify this. We

maneuvered a southwest course by the Pole star.

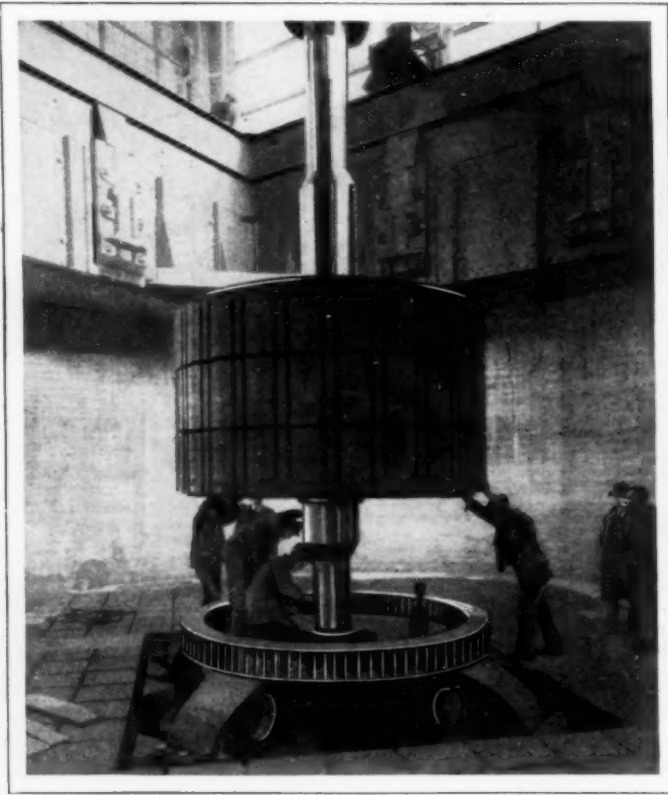
Major Fitzmaurice threw over some light bombs. You see, we were prepared for every contingency. Our only mistake was that we omitted the radio.

With the light bombs glaring, we discerned forests and snow below. Soon we were dodging mountain tops. A little while later I looked at the altitude meter and found that we had descended to only thirty-five feet to glide along these mountain tops. We knew we had reached the North American continent. Our joy was unbounded.

The great lessons from the "Bremen" flight center around the combat of the atmospheric conditions with a rugged plane and proper instruments. That the day is not so very far off when many others will be following our trail from east to west over the Atlantic there is no doubt in my mind. The "Bremen" flight taught me that.

(Signed)

(Koehl)



Courtesy General Electric Co.

Inside the Rotor-Testing Pit Where the Big Units Are Whirled at High Speeds to Discover Any Hidden Weakness

### ROTORS TESTED IN DEEP PIT TO PREVENT ACCIDENTS

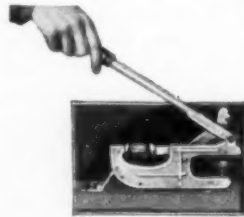
Double speed tests on the rotors of big turbine generators, some of them weighing as much as 500 tons, are conducted in a deep pit at an eastern plant so that, in case of failure of the wheel, no one would be injured by the flying pieces. The pit is a circular chamber, thirty feet in depth and surrounded by two concentric walls of heavily reinforced concrete, between which there is a cushion of sand. Over the top, is placed a cover, eight feet thick, of concrete and steel plate, and around the rim are two ring girders, each two and one-half feet deep. The pit is housed in a large brick and steel building in a field a quarter of a mile from the nearest factory building. Such precautions are necessary, according to J. D. Harnden, in charge of the testing operations, for when the rotors are running at high speed,

the centrifugal force is extreme. For instance, one going at twice its normal speed, produces centrifugal force approximately four times the usual value. The velocity of the rim of a forty-foot rotor, at double its normal speed would be about five miles a minute. The tests are of importance, for they show whether or not the rotors will stand the strain, should they be allowed to run away after installation in the power houses. An observation building stands 300 feet from the pit and is connected to it by electric cables that enable the engineers to control the speed of the rotors at all times. Means are also provided for taking pictures of the vibrations set up, and the tester "listens in" with a microphone to determine if the piece is behaving properly. The motors that whirl the rotors

range from 1,000 to 3,000 horsepower, and at the bottom of the pit is a large vertical roller bearing capable of sustaining the weight of the largest rotor to be built.

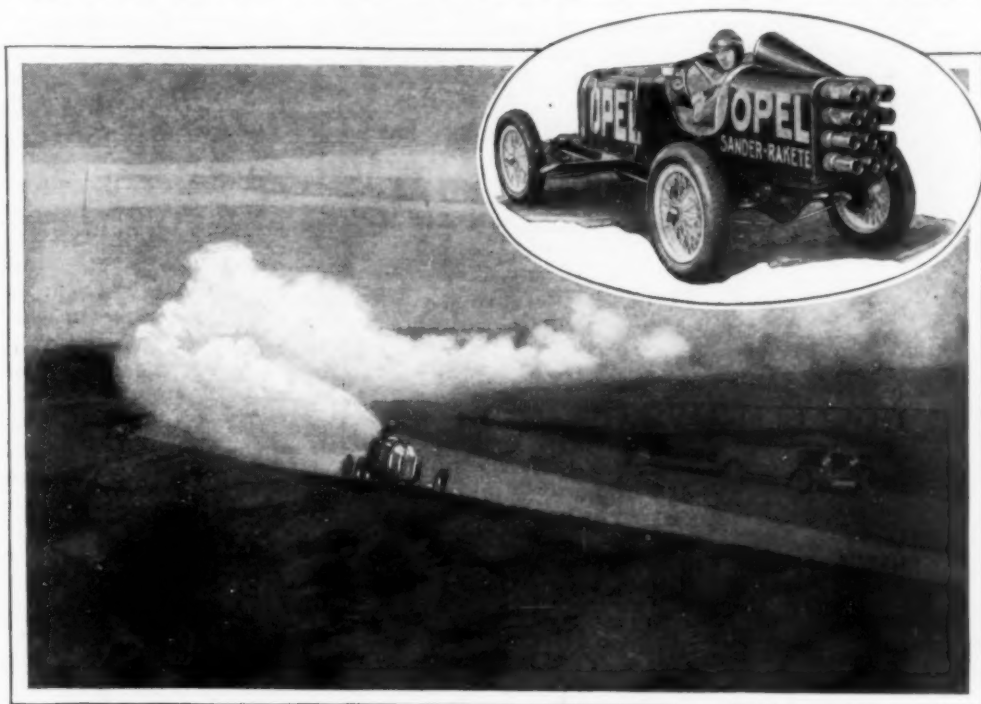
### PECAN-NUT CRACKER PREVENTS BREAKING THE MEATS

A pound of pecans can be cracked in about two and one-half minutes, it is claimed, with a special cracker a southern inventor has devised. The nut is held in a small socket and force applied with a lever that splits the shell the long way, helping to remove the contents in an unbroken condition. There is no danger of injuring the fingers and shells are not thrown about the room.





## "SKYROCKET" AUTO IS PROPELLED BY GUNPOWDER



Close View of the Rocket Automobile and Glimpse of It in Action; Speed of More Than Sixty Miles an Hour Was Developed within Eight Seconds in the Trial Test

Automobiles propelled like sky rockets may be the next development in transportation. In a recent test in Germany, a car operated on this principle developed a speed of over sixty-two miles an hour in eight seconds. The usual motor is replaced by chambers in which charges of powder are exploded. The force is communicated directly to the axles. It is believed that this principle may be adapted to airplane motors.

### SPECIAL PAINTS FOR AIRPLANES TO PROMOTE SAFETY

To provide greater visibility and, therefore, increased safety for aircraft, a special series of colored paints has been developed. For polar flying, a scarlet vermilion shade has been devised after

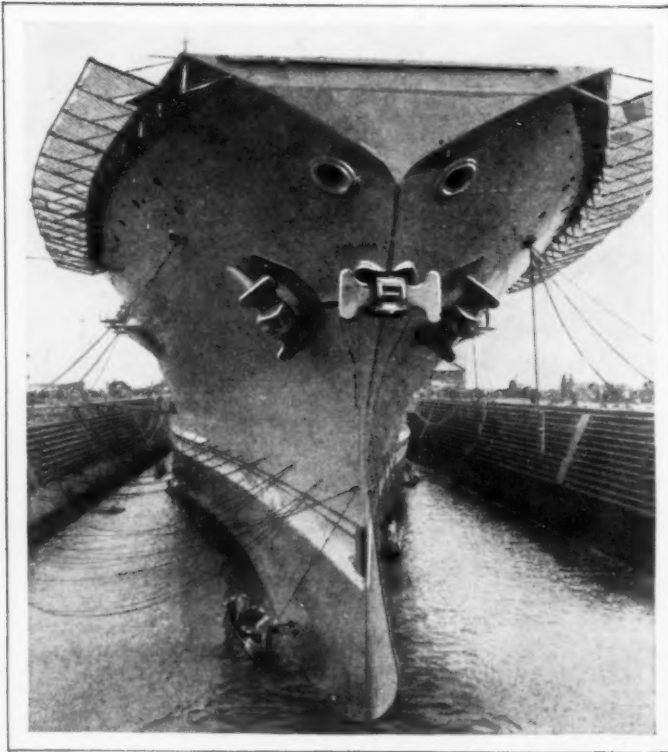
numerous experiments, as it has been shown that it has the highest visibility in snowy regions. The tests were made by observing samples of the shade against a white background at various heights.

### AUTOMATIC FISHLINE REEL AIDS IN BAIT CASTING

A fishing reel that automatically retrieves the line after a cast, has been introduced. This is accomplished by a spring which is wound as the plug on the line travels through the air. Sufficient tension is produced to wind the reel back again. Casts of forty to sixty feet may be made after a little practice, and there is a lever control to release the spring and to stop it so as to prevent backlash.



Reel Which Automatically Winds Up the Line After Cast Has Been Made



Prow of the "Lexington," Huge Airplane Carrier of the U. S. Navy, in Dock at San Francisco Preparatory to Trials

### AIRPLANE CARRIER GIVEN BATH BEFORE OFFICIAL TRIALS

Visitors at the dock in San Francisco had a good look at the "fighting face" of one of the most recent additions to the navy, when the "Lexington," giant airplane carrier, was washed and prepared for its official trials off the California coast. The tests were to determine the speed and other factors of the huge unit, while planes were to practice landing and taking off from the broad deck. The navy has devised special braking equipment for the aircraft so that they can be halted quickly after alighting on the deck.

### "MAGIC LOG" FOUND IN JUNGLE AT RISK OF LIFE

After risking his life in the steaming jungles of western Panama, G. Proctor Cooper, war veteran and forester, has found two "magic logs" of cacique wood, a rare variety, to which marvelous cura-

tive powers are attributed by the Panama Indians. Until Cooper's find, made for the Field Museum of Natural History, Yale university, the New York Botanical Gardens and the United Fruit company, under whose auspices he was traveling, only a small fragment of the wood, about the size of a man's finger, was known outside of Panama. It is ruby and black in color and, in some lights, is suffused with a golden sheen. It is found, not in the live tree, but in rotting chunks and logs in the jungle, being the almost imperishable heart of a fallen trunk that the ants and worms have picked clean of bark and sapwood. Before he found the precious wood, Cooper traveled through treacherous swamps, infested

with fever, crossed rivers that carried the mules yards below the landings, and endured many other hardships. One of the logs will be exhibited at the Field museum and the other at Yale.

### SILVER GUITAR AMPLIFIES TONE THROUGH DIAPHRAGMS

Three specially constructed diaphragms within the body of a silver guitar, are said to greatly amplify the tones of the instrument and emphasize their beauty.



Silver Guitar with Diaphragms Which Are Said to Amplify and Otherwise Improve the Tones

The silver is proof against rust and not so susceptible to changing weather conditions as wood.

## QUARTZ LIGHT TUBES HELP SIMPLIFY TELEVISION

Rods of fused quartz, through which light will flow, even around bends, like water through a hose, are used by C. Francis Jenkins, the Washington inventor, in the newest system of television, demonstrated recently through the radio transmission of a movie film from his laboratory to his home. The quartz rods made it possible to replace the large disk, which had been the most bulky part of previous television receivers, with a small drum barely seven inches in diameter. Quartz has the peculiar property of passing light through itself without losing any through radiation along the sides. In the Jenkins machine a series of neon-light units are mounted in a globe in the center of the revolving drum, and from them the



Francis Jenkins with His Scanning Drum, Filled with Quartz Rods as Light Conductors, and, Below, the Receiver, Loud Speaker and Picture Apparatus, Showing the Receiving Lens and Mirror

little quartz rods lead out to the edge, terminating in a series of small holes arranged in a helical row. The drum spins at 3,600 revolutions per minute, a commutator making contact with the neon lights as the signals are received from the transmitting station. The points of light, carried through the quartz rods, are passed upward through a hole in the top of the receiver cabinet, which is a standard size table-type radjo-receiver box. Above the outlet hole is a mirror, set at an angle of forty-five degrees, to deflect the vertical light beams into a horizontal direction, thus forming a vertical picture. In front of the mirror, a large oval reading glass magnifies the small image on the mirror,

so that the eye sees a relatively large picture. As in all television receivers, the motor of the drum must run in unison with the motor of the corresponding disk at the sending station.

### STAINS KEPT FROM LINOLEUM WITH AUTO FINISH DOPE

A preparation, whose base is the same as that of modern auto finish, is now being used to protect linoleum from fruit stains, ink spots and other blemishes. It fills the pores of the material, preventing the absorption of fluids, and produces a surface finish which both reduces wear and makes the linoleum easier to clean.

## OSTRICH HUNTERS IN AUTO CATCH BIRDS ALIVE



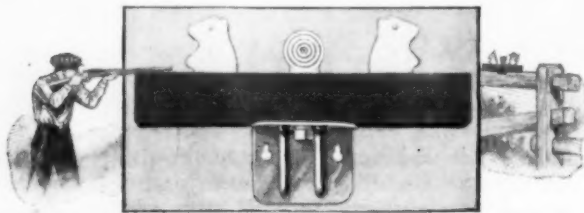
© The Illustrated London News

Artist's Drawing of the Ostrich Hunt from an Automobile; as the Car Overtook the Birds, They Were Grasped about the Neck and Pulled Aboard, Too Exhausted to Struggle

Two ostriches were captured alive in an Arabian desert by a party of hunters who pursued and overtook them in an automobile after shooting four others. At first, the birds outdistanced the cars, but they soon tired and as the auto approached alongside, a hunter stepped on the running board, grasped the first ostrich about the neck and pulled it into the car. Its companion was caught in the same manner. The birds were too exhausted to struggle.

#### ANIMAL TARGET FITS ON FENCE AND IMPROVES SKILL

Many of the thrills afforded in a shooting gallery are offered by an automatic animal target for .22-caliber rifle practice in the home or yard. On each side of the



Small Shooting Gallery for Rifle Practice; the Figures Fall When Struck but Reappear if Center Target Is Hit

center mark are small figures of animals. These fall back when struck by the bullet, but bob up again when the smaller target in the center is hit. The unit weighs but three and one-half pounds.

#### "BLIND SPOT" IN ARCTIC SHRUNK TO SIZE OF TEXAS

The unknown area in the Arctic has dwindled to a region about the size of Texas, according to the National Geographic society. In his last flight, Capt. Wilkins surveyed most of the Arctic ocean between the "Norge's" path in 1926 and the outpost islands between Greenland and Hudson bay. The chief "blind spot" still remaining is along the Siberian coast, a stretch of some 900 miles 400 miles wide. The Wilkins-Eielson hop over the pole in twenty hours, gives encouragement to the hopes for short air routes across the pole. London and Tokyo will benefit chiefly by such a short cut. By the Mediterranean, Suez canal and Indian ocean, the distance is 13,033 miles. By the trans-Siberian railroad, 7,500 miles. The air-line distance by way of North



Cape, Norway, and Nova Zembla is 6,300 miles. Airplanes would thus effect a saving of 1,200 miles and during the spring and summer daylight reigns at the pole, an additional factor to encourage flights.

### ODD SOURCES OF COLORS

Real carmine is prepared only from the bodies of a certain species of small insects and Prussian blue is made from horses' hoofs and other animal matter, by fusing with potassium carbonate. Turkey red comes from a small plant that grows in Hindustan; raw sienna and raw umber are obtained from natural earths in Sienna and Umbria, Italy. India ink is manufactured from camphor, and the Chinese are the most expert in making it, according to reports.

### SUMMER HAT WITH EYESHAD ELIMINATES SUN GLARE

The front part of the brim of a summer sport hat for women is a transparent eye-



Sun-Visor Sports Hat Shields the Eyes and Face and Has Adjustable Band to Make It Fit

shade, to shut off the glare of the sun. The hat is light in weight and has a band with buckles with which it can be adjusted to fit any head.



© Henry Miller

Turning Crank of the Curious Hammer-Drum That Is Used Instead of a Church Bell in Some European Villages

### BIG DRUM BOX SERVES AS BELL IN CALL TO CHURCH

In some European villages, a curious drum arrangement is employed as a substitute for a bell in announcing church services. It is modeled after the same plan as the "noise makers," the whirling hand devices, seen in this country at football games and other occasions. As a crank is turned, a series of hammers strike against the top of the drum which is shaped as a large box. The sound is amplified in the chamber and as the drum is usually placed on the roof, the clatter can be heard for a considerable distance. A young boy is usually employed to operate the crank.

### RUBBER LINING IN FURS HELPS DRIVE AWAY MOTHS

By substituting a lining of rubber and wool for the natural skin of furs, an English expert is said to have found a way to protect the articles from moths. The insects are attracted only by the skin, it is said, and when they cannot find it, they do not molest the rest of the fur. Important details of the process are being kept secret, but the method involves freezing the fur, shaving it from the skin and then, while the ends protrude, pouring coatings of liquid rubber to form a new skin. The wool is added for warmth.

Combination Outdoor Gymnasium for Children Has Several Exercising Units for Ready Use and Four or Five Youngsters May Play at the Same Time



### OUTDOOR GYM FOR CHILDREN SIX UNITS IN ONE

Swing, teeter-totter, turning bar, trapeze, turning rings and parallel bars are combined in a single compact gymnasium unit for children. It is intended for outdoor use but may be installed inside, and four or five youngsters can play upon it at once. The different parts are made ready for use in a few seconds and the whole outfit occupies but little space. The apparatus weighs about seventy pounds and is four feet wide and seven feet high.

### GUARD HOUSES FROM TORNADO WITH VENTS IN SIDES

Making holes in the side of a house to reduce the likelihood of damage from tornadoes is the plan proposed by L. V. Teesdale, of the U. S. forest products labora-

tory, and he has an interesting reason. Property damage caused by tornadoes is due principally to two causes, the explosive effect and flying debris. By the explosive effect, walls are blown outward, due to the sudden change in air pressure, a quick lowering on the outside with consequent inner strain that causes the building to collapse outward. By arranging vents that would open automatically in case of a tornado, this internal strain would be relieved and the structure spared from possible damage, it is believed. Special windows, panels or doors could be arranged so that they would fly open, it is suggested, and skylights might be installed in the same manner, on the principle of "panic" doors in theaters. Buildings already erected could be equipped with vents fashioned in this way.

### HANDHOLE IN AUTO SIDE WINDOW FOR SIGNALS

Arm signals can be made from the closed automobile, without lowering the window, through a hinged door over an opening. The installation can be made in a few moments and is not difficult. The aperture also affords an effective means of ventilating the interior of the car.



Hinged Section in Auto Door for Making Arm Signals; Opening Also Is Aid to Ventilation

### SEEK GLORIES OF OLD ROME IN CIRCUS RUINS

Work has been started in Rome on clearing the site of the Circus Maximus, once capable of seating 350,000 persons, and said to be the place where the conflagration of the city in Nero's time was started. Engineers believe that ten years will be required to finish the task, which was begun April 21, Rome's birthday and the Italian Labor day. While many art treasures and fragments already have been taken from the area, it is hoped that even greater trophies will be found in the excavations. According to legend, the big fire that Nero witnessed was started by applying torches under wooden steps which led to superstructures of marble and wooden beams with extensive hangings. The blazing amphitheater, in turn, served as a gigantic torch to ignite houses on the heights near by. The site, until now, has been an eyecore.

### AIR-FED MINNOW BUCKET KEEPS BAIT ALIVE SEVERAL DAYS



Fresh bait is assured the fisherman by a minnow bucket now on the market and supplied with air to keep the minnows alive for a considerable time. This is attained simply by an air chamber at the bottom and a pump on the side, which

needs to be worked only once a day or so, to make air bubble through the water.

### X-RAY SEARCH FOR TREE ILLS TO HELP SAVE FORESTS

Ailments of trees are now being studied with the aid of the X-rays. Trunks which apparently are sound, may be decayed inside, X-ray photographs disclose. This manner of examination does not damage the tree and is more certain than some other methods, experts declare. The rays distinguish clearly between sound wood and decayed and also reveal other details.



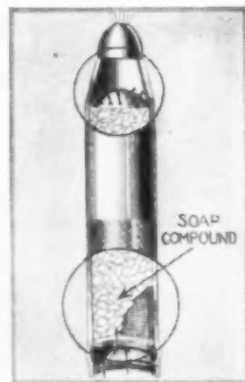
Outer Pocket for Swimmers, and a Close View Un-attached; It Is Handy for Cigarets, Etc.

### WATERPROOF PACK FOR BATHER KEEPS VALUABLES DRY

For the convenience of swimmers, a small pocket, attached to the bathing-suit belt, keeps cigarets, matches and valuables dry. It also prevents loss and holds the articles where they may be reached with the greatest convenience.

### HOSE NOZZLE THAT HOLDS SOAP SIMPLIFIES WASHING AUTO

Rubbing and the use of rags are eliminated in washing the automobile with the aid of a special nozzle. It has a chamber for soap inside. When this is filled and the nozzle attached to the hose, water is applied in the usual way until the soap is all dissolved. Then the car is rinsed with clear water and allowed to dry. By this method scratching of the finish is avoided and a considerable saving in time is attained.



## HOW ANIMAL ILLS ARE BEING CURED BY



Failing Eyesight in Your Pet Dog No Longer Need Go Uncorrected, For He Can Be Fitted with a Pair of the Spectacles Made Famous in the Movies and Will Be the Envy of All the Dogs on His Street; Below, When a Young Lion Gets Sick He Is Very Sick Indeed and Readily Submits to Nursing; Giving Medicine to Some Animals Is a Difficult Job, but with the Meat Eaters, the Pill or Capsule Can Always Be Concealed in an Incision in the Day's Beef, in Hope That the Unsuspecting Patient Will Swallow the Dose



A Brown Bear in the Hagenbeck Zoo, at Stellingen, Germany, Goes In for a Course of Electrical Treatment, Top, and a Valuable Horse Gets His Forefoot X-Rayed to Reveal the Source of a Hidden Trouble That Has Been Making Him Limp; Most Animals Are Docile When in the Doctor's Hands, Seemingly Understanding That an Effort Is Being Made to Relieve Their Distress; Doctoring Animal and Human Patients Does Not Differ Much, Except That the Former Get Wholesale Doses Corresponding to Their Size, Which Makes the Elephant's Pill the Grandfather of All Nostrums



LATEST APPLICATIONS OF MEDICAL SCIENCE



This Fox Terrier Lost His Forefoot in a Street-Car Accident, but in the Hands of a Skillful Veterinary His Wounds Are Not Only Healed, but He Is Fitted with an Artificial Leg; Animals and Birds Quickly Learn to Adapt Themselves to Artificial Limbs and, after a Few Trials, Are Able to Get Around with Almost the Ease and Grace of One Completely Equipped as Nature Made Him



A Convalescent Dog Lies in the Nurse's Lap While Taking an Artificial Sun Bath in the Hospital at Cologne, Germany; Treating Valuable Show Animals and Beloved Pets Is a Lucrative Business in Most Any of the Larger Cities

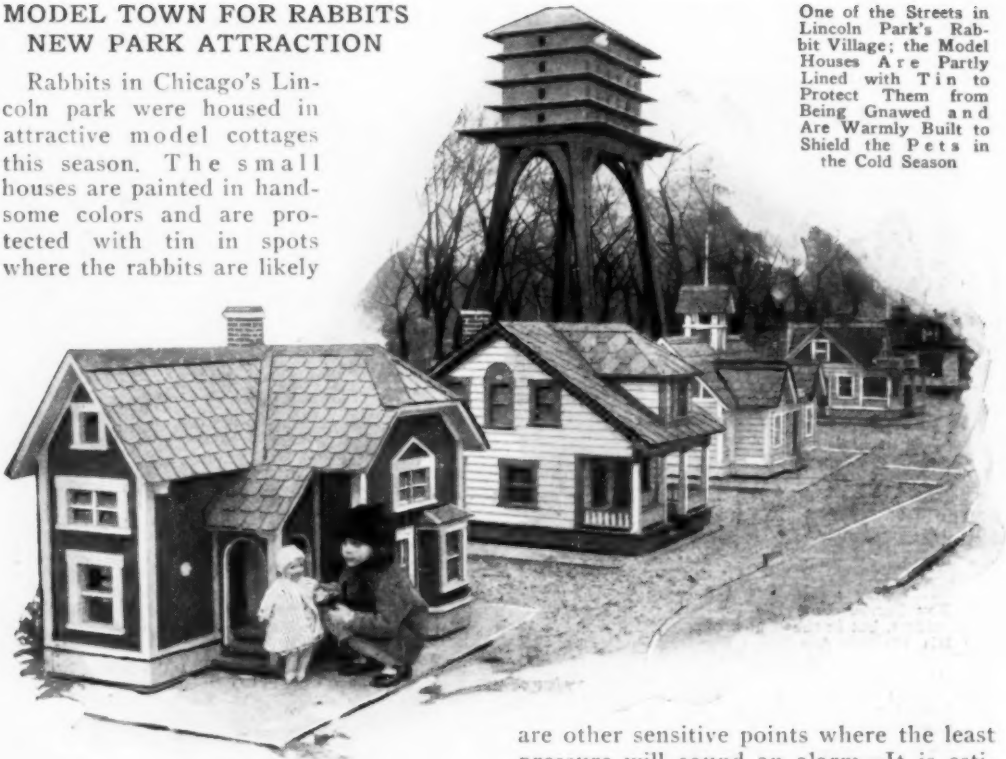


In Vienna, the Society for the Prevention of Cruelty to Animals Operates a Fleet of Autos Equipped with Cage Bodies; They Not Only Gather Up Stray Dogs and Cats from the Streets and Seek to Find Them Good Homes, but Likewise Remove the Ailing Pets to the Hospital for Treatment; at the Right an Elephant Is Being Treated for a Chill, Almost as Serious to Him as a Sore Throat to a Giraffe



### MODEL TOWN FOR RABBITS NEW PARK ATTRACTION

Rabbits in Chicago's Lincoln park were housed in attractive model cottages this season. The small houses are painted in handsome colors and are protected with tin in spots where the rabbits are likely



One of the Streets in Lincoln Park's Rabbit Village; the Model Houses Are Partly Lined with Tin to Protect Them from Being Gnawed and Are Warmly Built to Shield the Pets in the Cold Season

to gnaw. The village includes seven houses and a "district school," arranged along small streets, the entire assembly being surrounded by a high wire fence. An old-fashioned mill for lettuce and carrots is to be erected later.

### EIGHTEEN-TON STEEL DOORS GUARD BANK OF ENGLAND

Concrete walls, eight feet thick, steel doors weighing eighteen tons each, electric locks and an intricate system of sensitive alarms are among the protective barriers about the vaults of the new Bank of England, being completed in London. The main vault is fifty feet below the surface, a room twenty yards square and so constructed that experts declare it could not be entered by exploding ten tons of dynamite or the use of the most efficient oxyacetylene apparatus. A glove or a pocketbook dropped in an unlikely spot, would instantly sound a half dozen electric alarm bells and along the winding stairs and passages leading to the vault

are other sensitive points where the least pressure will sound an alarm. It is estimated that it would take 100 cracksmen a year to get into the main vault and then their work would just be begun, for they would be confronted by a double door of two-inch bars of the most resistant steel known, and beyond it are two other big doors, each weighing eighteen tons, secured by special locks. In addition to all these safeguards, the entrance to the treasure chambers is constantly watched by relays of detectives.

### FISHLINE IS CASIED IN RUBBER FOR BETTER CASTING

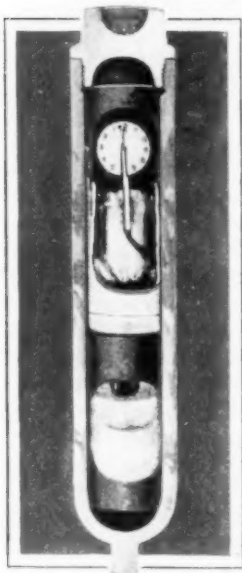


Longer casts and elimination of most of the backlash are features claimed for a braided-silk fishing line incased and impregnated with rubber. It is said to uncoil or reel up much more smoothly and lies lightly on the water, being suitable for fly or bait casting.

### AIR USE SPREADS IN ALASKA

Alaska may be considered still somewhat on the frontier, but that it is not far behind the rest of the world in the most modern form of transportation, is evidenced by recent reports of an airship company there. Its planes have flown 300,000 miles, carrying 1,000 passengers and 30,000 pounds of freight and baggage, all without loss or injury. Considering that the territory over which the planes are operated is rugged and wild, that temperatures of fifty degrees below zero are encountered and that there is constant danger of severe storms, the performance is regarded as unusually creditable.

### TIME BOMB TO SHOOT OIL WELL REDUCES HAZARD



Likelihood of a premature explosion is reduced in shooting oil wells by using a time bomb a western engineer has devised. It is set off by means of an alarm-clock mechanism at any interval desired, from one to eleven hours. This gives the operators ample time to pull out the casing before the shot goes off. The bomb itself is of cast iron, eighteen inches long, and contains slightly more than a pound of dynamite which explodes the shot previously lowered into the well.

☐ Out of every 100 persons about 96 are color-blind.



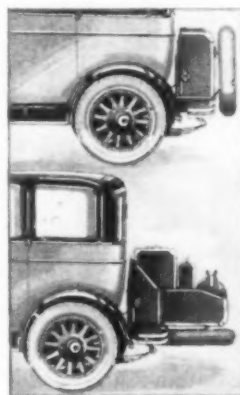
Retrieving Golf Ball with the Extension Net, the Handle of Which Collapses for Carrying in the Bag

### GOLF-BALL RETRIEVER SAVES LOSS AND PLAYERS' TIME

When the golf ball drops into the water hazard, it is easily recovered with the aid of a collapsible retriever now on the market. This is simply an extension metal handle with a small net on the end. When not in use, it telescopes into such length that it can be carried without difficulty in the caddy bag. It is fashioned as one piece, adds but little to the weight of the equipment and is always in readiness for instant service.

### FOLDING AUTO LUGGAGE TRUNK HOLDS BIG LOAD

Barrels, cans and other bulky objects may be carried on the rear of the automobile when a folding trunk is opened up. It provides several additional square feet of space and has a capacity of 400 pounds. When closed, it becomes a neat trunk with room for the spare tire on the back. A canvas cover is provided to protect the carrier and its load from mud, dust and rain when it has to be kept open.





# Avigation

flew to Hawaii. For the navy, Comm. John Rodgers also became expert in avigation, and now the science is taught in the advanced flying courses of both the army and the navy.

In flying over land, the airplane pilot picks up landmark after landmark and thus finds his course by constantly comparing the terrain below him to the explanatory charts he carries with him in the cockpit. Occasional fog or storm may drive him down or obscure his vision for short periods. At night he flies by means of beacons mounted at convenient locations. Avigation concerns him very little.

Over the sea, however, he finds no marks which could be set down on a chart, and he must actually navigate his craft precisely as do mariners

on the surface of the sea beneath him. Furthermore, his observations must be taken more frequently and often his celestial observations must be taken in the full sweep of the slip stream, and his sextant and other instruments may be almost torn from his grasp. His horizons may be clouded, and at all times he is subject to countless and capricious wind eddies and currents.

In addition, the avigator must work in a very confined space; he has no commodious and capacious chart room in which to develop the mathematics of his work as has the sea-level navigator—and yet, under the compulsion of almost con-

Lieut. Arthur Gavin, Winner of the 1927 Schiff Trophy, "Shooting the Sun" with an Aircraft Sextant

By G. K. SPENCER

**A**VIGATION, the science of navigating in the air, as a result of recent long-distance flights over water, has been brought dramatically to public attention, and already a number of schools devoted exclusively to the teaching of aerial navigation have been established.

Realizing that the time must come when air and seaplane pilots would be operating over portions of the earth on which they could observe no familiar landmarks, the army and navy first began the study and teaching of avigation to small classes of senior pilots. Of these classes, two of the earlier graduates were Lieut. Lester Maitland and Albert Hagenberger, who



Swinging Ship to Correct the Compass of a Huge Twin-Motored Flying Boat; Note the Compass Points Laid Out in Radiating Lines on the Concrete Base to Guide the Correctors

stant avigation from the moment he leaves land until he again reaches it, he arrives at his objective. How does he do it?

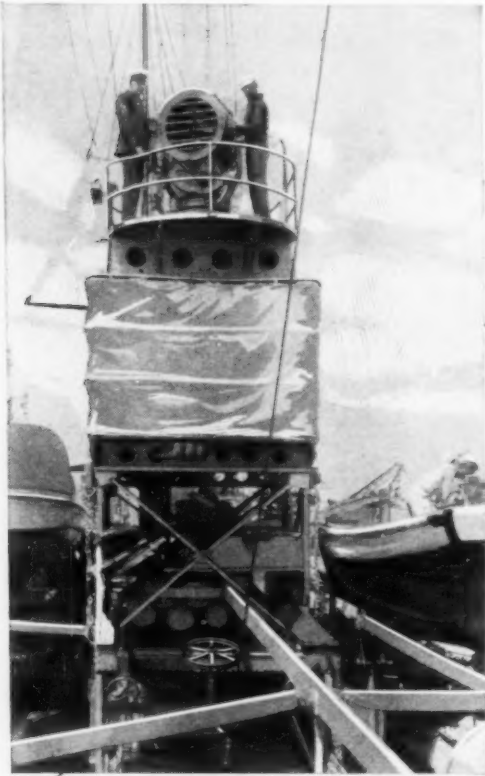
First, the avigator employs practically all the instruments of the navigator, with the addition of the earth-inductor compass and methods for computing drift, that is, the movement laterally of a plane off its course due to air currents. These must all be compensated for in the avigation of the craft. Owing to the varying magnetic values of an airplane due to static charges of electricity gathering from the air on metal braces and connecting rods, magnetic compasses in aircraft are given to erratic behavior and, consequently, wide variations.

Avigation in each individual case must begin long before a flight is made. The avigator prepares himself with all the available charts, and plots his course. He

then ascertains, by a study of known meteorological data, the proper time to begin his flight, and if he is obliged to fly regardless of weather, he studies the meteorological data to discover just how he may avoid unfavorable conditions.

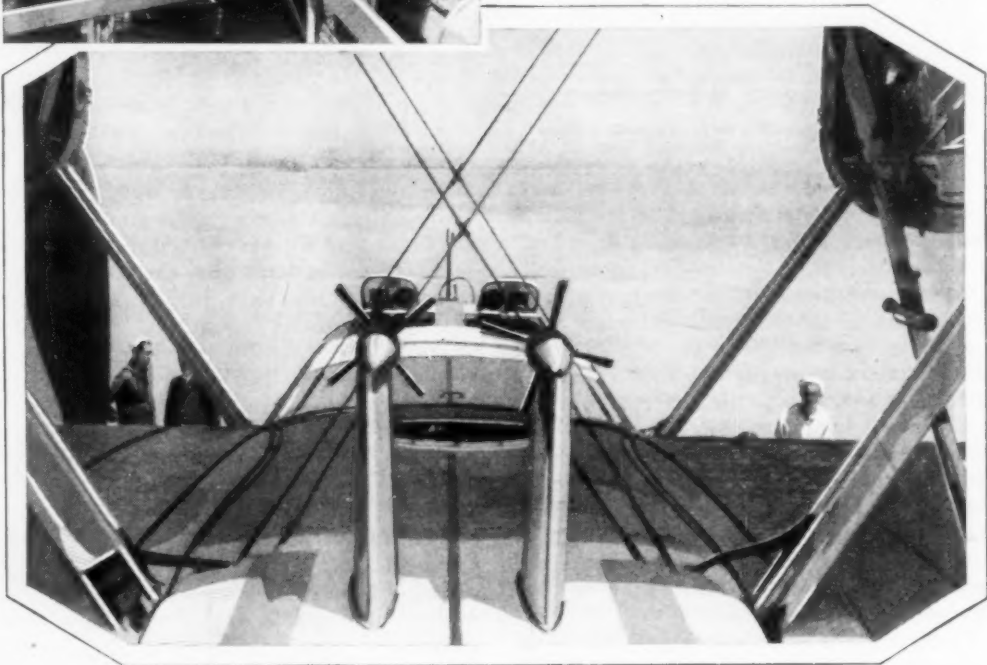
Once in the air, however, he begins to employ his navigating instruments. Before the flight, his compasses have been "swung." That is, the plane has been set on the ground, whether it be land or sea-plane, and moved around a pivot in a circle, while the compass is carefully checked to see how it reads at each point of the compass. A chart is made of its reading on each point. Due to the metal in the motor, and other parts of the plane, the compass varies its readings in certain directions because of magnetic distortion. After this chart is made, and the plane is in flight, if the avigator sees his compass



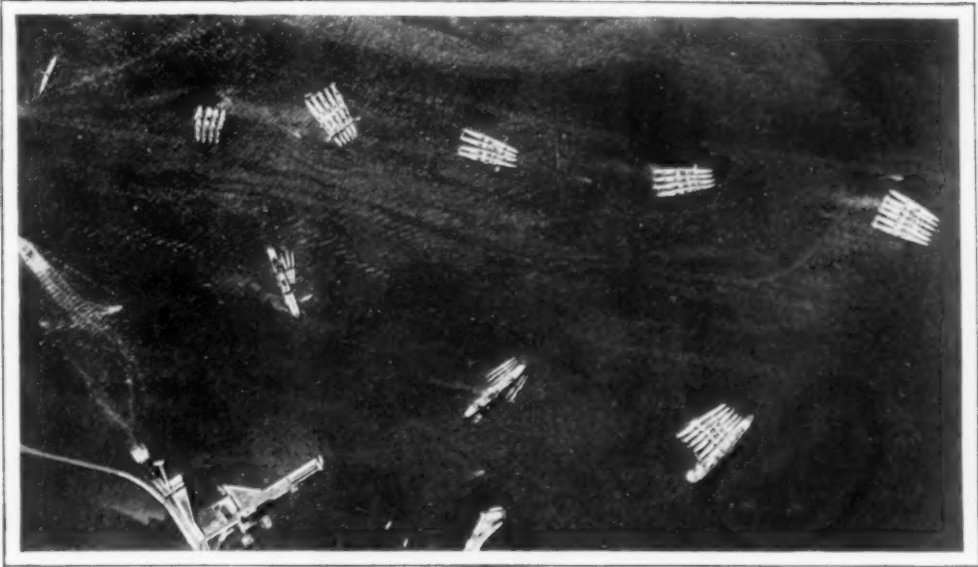


reading due north, and his chart says that on this reading the instrument is two points off, he knows that he is really not heading due north but that much off. This is the purpose of swinging ship, whether it be a plane or a seagoing vessel. They swing ship in order to get a characteristic history of the activity of their compasses. Every time a new metal addition is made to a ship, and every time she takes on metal cargo to any great extent, she must be swung anew, for the metal affects the compass readings and these must be charted for the benefit of the avigator or navigator.

Everyone knows the principle of the electric generator. A coil of wire is swung at right angles to powerfully charged electromagnets, and a current is thus induced in the coil. This current flows forth and is made to serve a useful purpose. If the powerful magnetic poles of the generator are kept charged, and if the central swinging coils are not moved, they tend to take up a position parallel to the lines of force from the magnets, in a position in which no current is induced. It is only when



Aircraft Beacon on a Destroyer, Top, and View Looking Forward on a Navy Plane; the Two Propellers Drive the Radio Generators; Pilot's and Avigator's Seats Are in the Ship's Nose



This Is the Way Squadrons of Destroyers, Submarines and Submarine Mother Ships Look When Photographed from 20,000 Feet; There Are Two Mother Ships with Subs in the Center

they are forcibly and mechanically moved about in the lines of force that they develop a current of electricity in themselves.

This principle is made to serve a useful navigational purpose in aviation. The earth is a great electromagnet, with lines of force moving from the south pole to the north pole, along the lines of longitude. Therefore, if a coil of wire, with a central magnetic core, is delicately balanced on a pivot, and charged with electricity from a battery, it will tend to get into a parallel position with the lines of force of the earth. By placing this device in the form of an instrument in an aircraft, and adjusting it so that the indicator must retain a certain position in relation to the course to be followed in flying to some far-distant overseas objective, it is possible to follow a true course straight to the destination, by merely keeping the needle or indicator on the spot desired by constantly heading the plane in such a direction that the indicator will continue to read the course on which it is set. Naturally, the course is also corrected from time to time for drift, the earth's curvature and for magnetic errors in the compass itself, which were found when the plane was swung just before setting out on the long flight.

Avigation by compass, either of the

magnetic or the earth-inductor type, is known as dead reckoning. There are, however, two other forms of avigation, and these, with the addition of compass navigation, must all be used together. By a combination of fortunate circumstances, it may be possible to reach a far objective by dead reckoning alone. The element of chance has much to do with that kind of navigation. In fact, chance is an element in any navigation or avigation, but it is reduced to a very minor factor when to dead-reckoning avigation is added astronomical navigation and radio navigation. The former treats of the stars and the latter of the radio beam or direction finder.

For use in aircraft, a sextant has been developed which can be held while the operator stands in the slip stream. This is the stream of air thrown back by the propeller and it makes difficult any attempt to hold the ordinary sextant. Inasmuch as it is often necessary to take frequent and long sextant observations in order to decide the position of the plane as to latitude and longitude, when the horizon is obscured, the sextant used in avigation possesses long grips and can be held firmly in a violent gale. In a long flight, there will generally be from two to three earth-inductor compasses and from two to four magnetic compasses, including a master

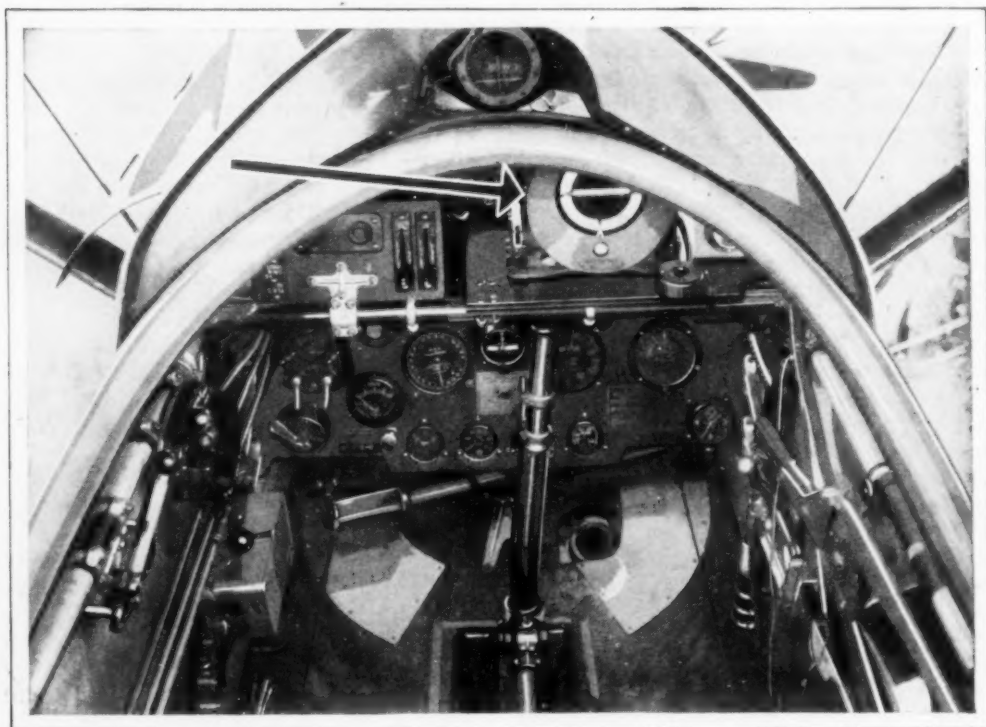


Destroyer Radio Operator Sending Out a "Sea Beam" to Aircraft; the Instrument in Front of Him Is the Standard Navy Radio Phone

compass mounted in a non-magnetic tripod in the compartment of the aviator.

Because of the fact that various metal parts of the plane may become magnetized in flight from the action of air and moisture, a pelorus is carried to check on the compasses. This instrument is designed merely to give the bearing of the plane from any object. When the sun can be seen, it is only necessary to take a pelorus bearing to get the plane's true heading.

To obtain the drift of an aircraft, or the rapidity with which stray wind currents are driving it off its course, it is necessary in the day time to use smoke bombs and



Cockpit of a Douglas Transport Plane; the Arrow Points to a German Bank-and-Turn Indicator Loaned the U. S. Government in Exchange for Aviation Information from This Country

at night bombs which give off light. After passing these bombs as they float on the surface of the sea, the avigator takes a bearing on them from the plane, and thus estimates his drift. Of course, he also reckons his total drift every time he can obtain a "fix" with his sextant, placing him exactly over some part of the earth's surface.

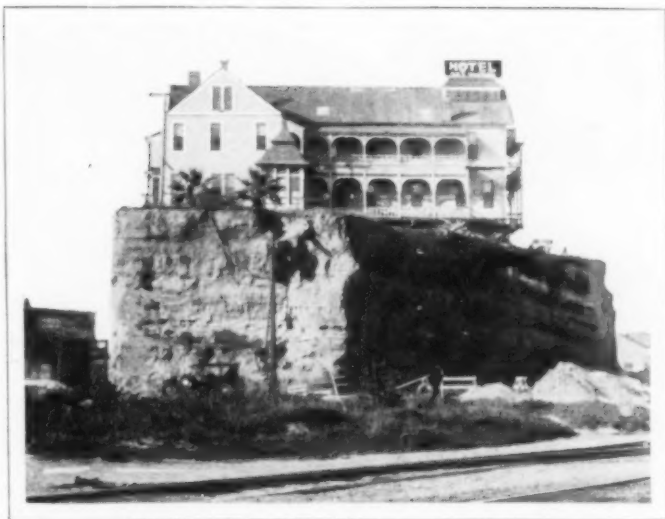
With the radio loop, operated from the point of destination, the avigator holds his plane always pointed toward the direction from which the radio signals come. In the path of such a beam, or "beacon," as it is more properly called, the plane may be kept headed in the proper and desired direction to safely complete its flight, but the method is not as yet as perfect as it might be, and thus all the three major forms of avigation must be used to keep on the safe side.

Though not strictly avigational equipment, the air-speed meter and bank-and-turn indicator in the pilot's cockpit of modern aircraft are of great value in fixing the position of a plane from the avigator's point of view.

If, having obtained the celestial bearings he desires, the avigator finds himself flying over a sea and under an interminable cloud layer, he may plot his position fairly accurately by obtaining his rate of drift by the smoke-bomb method, computing his air speed and the approximate velocity of the wind against him, and taking his course into consideration. A clever avigator will make only a slight error under such a contingency, and this error may be almost entirely the fault of the compass.

### TEAR GAS TRAPS MURDERERS IN JUNGLE VALLEY

Tear-gas bombs were effectively used in catching a number of natives of the Solomon islands who had murdered white officials. The refugees were cornered in a small valley and quickly surrendered.



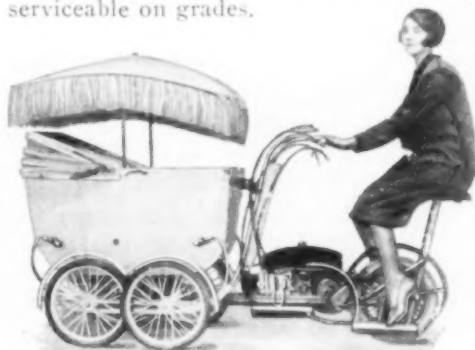
Where Part of the Town Used to Be; Hotel in San Pedro, Calif., Stranded on Old Street Level

### HOTEL LEFT STRANDED ON HILL SHOWS CITY'S CHANGE

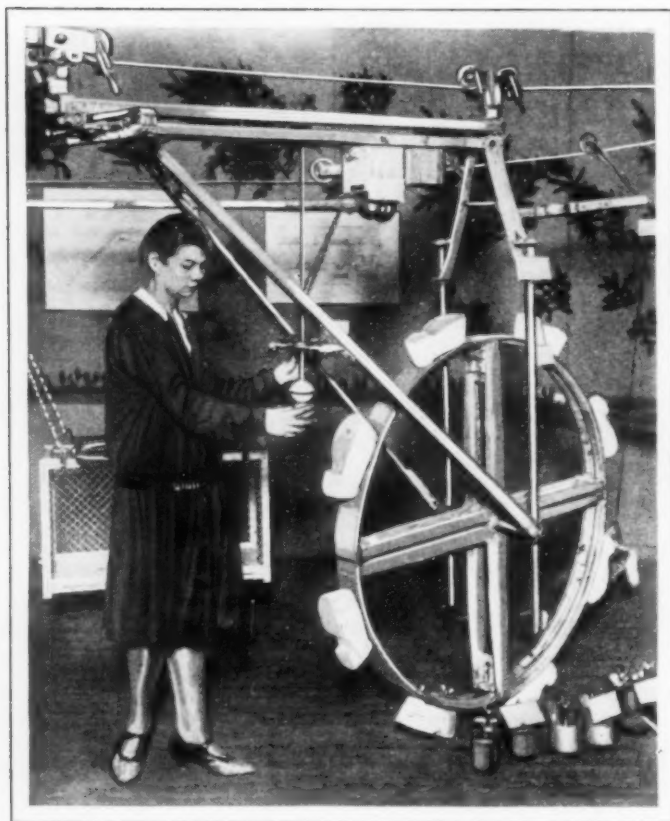
For several years, engineers have been engaged in removing hills to make the streets more level in San Pedro, Calif. The vast amount of earth that has been dug away can be visualized from the accompanying illustration of a hotel which stands on the old level.

### MOTOR BABY CARRIAGE SAVES NURSE MAID WALKING

Pushed by a motorcycle that has a speed of only a mile and one-half an hour, a baby carriage introduced in England allows the attendant to ride. It is large enough for two infants and is especially serviceable on grades.



Now the Nurse Maid Also Enjoys a Ride; the Motorized Baby Carriage in Use



"Walking Wheel" for Testing Dogs' Manner of Following Trail; It Was Run on Cable to Eliminate a Human Attendant

### WALKING WHEEL TESTS DOGS IN FOLLOWING TRAIL

That dogs do not depend wholly upon the sense of smell in following a trail has been demonstrated in Germany by means of a curious "walking wheel" that produced imitation footsteps from models of shoes. The wheel was rolled along the ground, imprinting realistic tracks. In several tests, the dogs demonstrated their ability to follow these artificial footsteps.

### SYNTHETIC WEATHER DECIDES QUALITY OF PAINTS

In a relatively few days, men at the bureau of standards determine the quality of paint samples by subjecting them to artificial weather tests. The experiments quickly achieve what would require weeks or years to do under natural conditions. A carbon arc produces the effect of the sun's

rays, and water spray and ozonized air duplicate the action of rains and time. According to the investigators, the results of these accelerated tests are strikingly like the effects produced under actual exposure. Instead of trusting to a visual inspection of the breakdown in the paints, means have been developed for measuring the extent of failure by other methods.

### ICE MACHINE FOR TOURISTS RUN BY AUTO

Automobile touring can now be enjoyed in greater luxury through the introduction of a refrigeration unit on the trailer. The compressor is run by means of a gear and belt drive from the trailer axle. When a sufficiently low temperature is reached, the gear is thrown into neutral. The unit will hold its cold for twenty-four to forty-eight hours, insuring refrigeration for two days while camping. When a longer stop is made, the machine is driven by attaching an extension shaft with proper pulley to one rear wheel of the automobile and using a belt to the trailer.



Trailer and Car on Journey, and Method of Connecting Ice Machine to the Axle



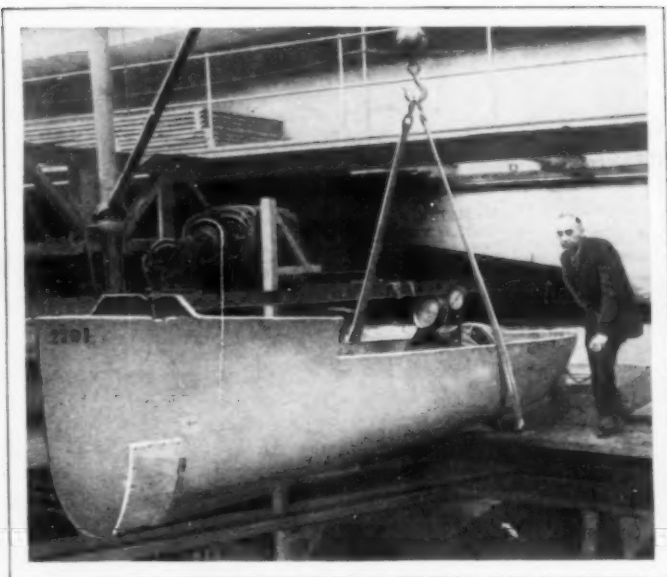
### LENGTH OF PLANTS' WORKDAY SPEEDS THEIR GROWTH

By subjecting them to batteries of powerful electric lights from five to twenty-four hours at a time, various kinds of plants have been grown at an unusually rapid rate at an eastern experimental institute, and interesting facts have been learned concerning their behavior under these artificial conditions. It was found, for instance, that the tomato would not stand twenty-four-hour continuous illumination, but red clover grew well, lettuce and radishes flowered on day lengths greater than twelve hours and buckwheat on all day lengths from five to twenty-four. The percentage composition of starches and sugars manufactured by the plants increased with day lengths usually up to a nineteen-hour working day. In a few plants, it increased up to a twenty-four-hour day.

### KEYLESS TUMBLER DOOR LOCK HELPS PREVENT THEFT



Designed on the principle of a bank-vault lock, a combination unit for the house, garage or other door has been introduced. It has no key, is said to be pick-proof and is simple to operate. Although it may be set to any one of many combinations, there are but three numbers to remember and the lock may be opened in four seconds or less. An additional feature is that it may be easily manipulated in the dark, as the audible "stops" of the mechanism enable the operator to turn it properly and a notch permits finding the neutral starting position without difficulty.



Model of Fast Steamer That Is Expected to Make Trips across the Atlantic in Four Days

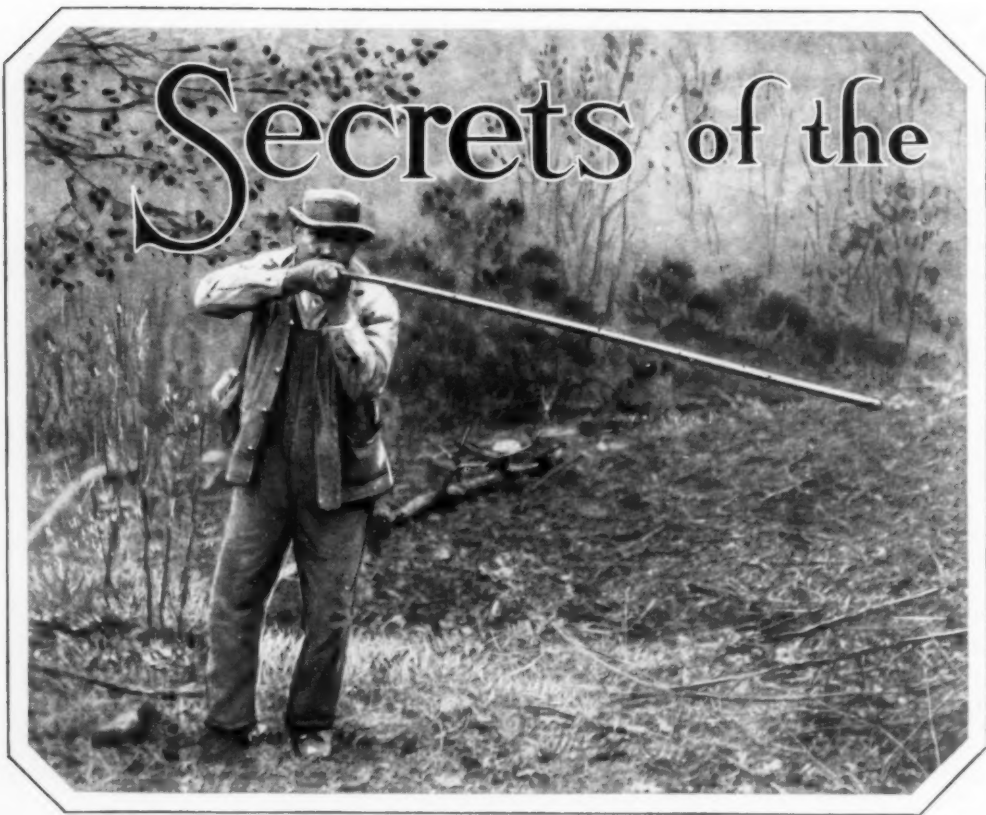
### MODEL OF FOUR-DAY LINER TESTED IN TANK

Voyages across the Atlantic in four days are expected in fast steamers now being planned by an eastern company. Each ship will be able to carry 800 first-class passengers and will have a speed of thirty-three knots or about thirty-eight miles an hour. A model of one of the steamers was tested recently at the Washington navy yard.

### SCRUB BRUSH OF STEEL WOOL SIMPLIFIES CLEANING PANS

Long strands of steel wool have been fashioned into a brush for scouring pots and pans. Since the points of the wires are applied to the surface to be cleaned, a more effective performance is assured than when the wool is employed flat, as in the ordinary sponge arrangement. As the strands become worn, they may be pulled out from the holder until they are entirely used up.





A Cherokee Indian of the North Carolina Smokies Shooting an Arrow from a Ten-Foot Blowgun; the Older Indians of the Proposed National Park Cling to the Ancient Weapon

By BOB BECKER

**I**N the Great Smoky mountains of North Carolina persists a remnant of primitive Indian culture which better than anything else shows what advances have been made in the mechanics of firearms. This throwback to savagery is the Cherokee Indian blowgun, a curious and little understood weapon which had its origin (in the western hemisphere) in the Indian tribes of South America.

The blowgun is just what its name implies. As made by the Cherokees of the Great Smokies, it is a long hollow tube of bamboo cane, usually nine to ten feet in length and bored out and polished so that the tube will offer little friction to an arrow. Through this weapon the Cherokees blow slender missiles ranging in length from eighteen to twenty-four inches. They are feathered with thistle-down. No tips are fitted to these arrows.

The Cherokees simply whittle them down to a sharp point, and they are ready for use. The average layman, viewing this strange outfit whose efficiency depends on a healthy pair of lungs, cannot believe that small mammals and birds can be shot by the blowgun, and at first thought, it does seem strange that kills can be made by anything so fragile and apparently so devoid of shocking power. But the fact remains that the Cherokees have been using this blowgun over a period of several centuries as a weapon of the chase, and many a rabbit, squirrel, dove, grouse or other small game has gone into their cooking pots via the blowgun route, even though the mechanics of blowing an arrow with enough force to kill still is something of a mystery.

The Cherokee blowgun is in a perfect setting, as far as the wilderness and the

# Great Smokies

primitive are concerned, for the eastern band of Cherokees who use this weapon live in one of the least known, least traveled and possibly least appreciated areas of the United States. The motion-picture director assigned to film the story of the Cherokees would call the atmosphere perfect, the locations superb and the scenery almost incomparable because these eastern Indians live on the North Carolina side of the Great Smoky mountains, an exquisitely beautiful range which Uncle Sam is going to take over as a national park. The last stand of the eastern wilderness, a natural wonderland with seven peaks higher than Mt. Washington in Vermont, a hundred square miles of virgin timber, numerous picturesque streams, rivers and waterfalls and scenery comparable with that in our national parks of the west—the Great Smoky national park will have, as an additional feature, the presence of 2,800 Cherokees and their curious blowguns. A bit of the old in a rare setting of the primitive.

Bryson City, N. C., is the natural gateway to the Indian reservation where you find Cherokees who own and use such guns. This little town of 1,200 people is fourteen miles from Indianland. Trailing the blowgun, we first visited the store at Cherokee in the reservation, a central meeting place of the Indians from which news and messages can be sent by the grapevine route to members of the tribe living back in the mountains. Here we met Jack Gloyne, the white storekeeper, who put us in touch with various Indians owning blowguns and who secured a guide and interpreter for us, as many of the old Cherokees do not speak English.

At Cherokee, you are in the beginnings of the Great Smokies. The only roads are those which wind and twist through the valleys. Above you are the hill and mountain crests, round-topped and forested. Log cabins of the Cherokees perch high up the mountainsides, some hidden away

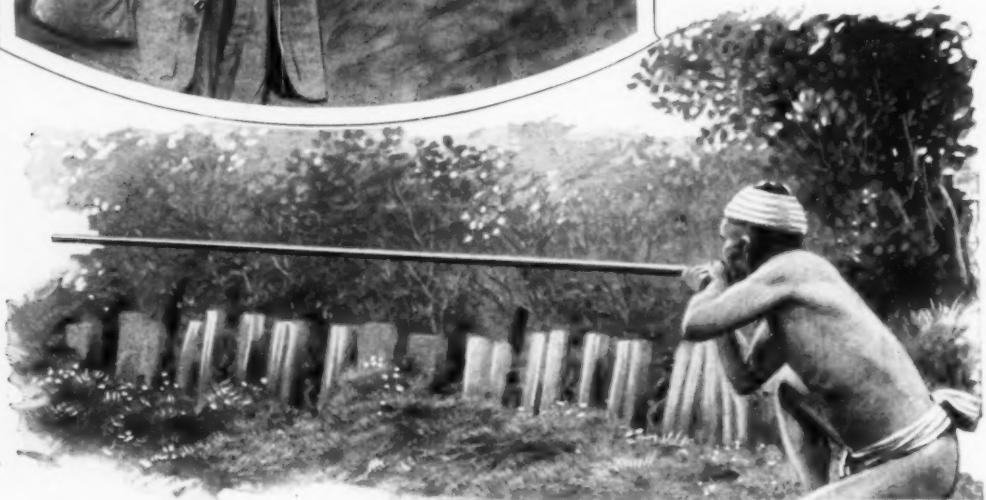


An Indian of the Great Smoky Mountains with His Bamboo-Cane Gun, through Which He Blows Arrows Feathered with Thistle-down, to Kill Small Game

in "hollers" (valleys), so that you need a guide to find them; others quite lost in the timber far from the auto highway or well-beaten paths. Occasionally the valleys are broad enough to give the Cherokees a flat piece of land for their cornfields. But horizontal fields are not the general rule. The blowgunners will clear a steep mountainside and on the slope they will plant their corn in long, looping horizontal rows, much like the Aymara Indians of Peru till the mountainsides overlooking Lake Titicaca. Agriculture is not

easy down there in the Great Smokies. We had to walk a number of up and down miles (mostly up) to get our first glimpse of a blowgun. With Jim West, our guide and interpreter, we started north from Birdtown—a small Indian settlement on the reservation—following an ever-ascending trail past small cornfields, cabins whose shy occupants gave us no chance for conversation, across small clear brooks and then straight up through the forest to the home of Samson Welch, a sixty-year-old Cherokee who is a famous

blowgun shooter. Samson was building a corncrib on the mountainside. Although poor in worldly wealth, many a white man would give thousands for this Indian's view of valleys, forested slopes and mountain ranges, as we could look from Welch's lofty perch for miles across the Smoky country. Welch brought out his old blowgun and two arrows to show us how the weapon worked and to demonstrate his skill. The gun was so old that the yellow tint of cut bamboo cane had turned to a rich brown or mahogany color. On a former hunt, the gun had



Half the World Apart, but Using the Same Technique; Above Is a Cherokee of the Carolina Mountains and Below a South Sea Islander, Both Using the Same Hold to Aim Their Blowguns

been cracked, so the Indian had wrapped it with stout twine. Notwithstanding this fracture, the gun shot perfectly, as was then demonstrated.

We set up as target a piece of paper, five by two inches, and asked the Indian to shoot at it. For the moment we almost forgot our curiosity in the speed or accuracy of an arrow, because our attention was taken by the position assumed by the Indian in shooting. You would imagine that the right hand should grasp the gun at the breech while the left hand stretched out to take hold of the gun much like a rifle shooter by the forearm. But no! Welch pressed both hands close to his mouth, took a deep breath and—plup!

—the small arrow feathered with thistledown shot from the blowgun and struck the target in the center. He was standing forty feet from that piece of paper. By way of proving that the first shot was no fluke, he slipped the second arrow into the breech of the gun (slightly



larger in diameter than the muzzle), drew another deep breath and then blew sharply through the gun. Plup!—quicker than the eye could follow, the second arrow whizzed through the air and struck the paper target within an inch and a half of the first.

The Cherokee then explained, through the interpreter, one or two of the tricks of this curious weapon: First, a smooth bore, and, because this smoothness is desirable, an old gun which has seen considerable use and has been kept clean is almost preferable to a new one. Second, feathering of thistledown thick enough to completely fill the bore of the gun, so that you cannot blow around the arrow. Third, a dry barrel and a dry arrow, for the blowgun of the Cherokees is pretty much of a fair-weather gun. Fourth, a quick blow through the tube; in other words, exhaling a deep breath quickly and with all your lung power gets force and distance. As Welch explained, the ordinary killing distance of the blowgun is around forty, fifty or sixty feet. He told us that just once in his life had he



Making a Blowgun Dart; First the Thistledown Is Bound in Place, Then the Loose Ends of Fiber Are Burned Away; Center, the Finished Product



bagged a turkey with his gun. As a rule his game is squirrels, rabbits and partridges.

Inasmuch as Indian arrows are usually finished with feathers, the Cherokee blowgun arrows, feathered with thistledown, represent a unique departure in the manufacture of Indian hunting equipment. To make an arrow, the Cherokee proceeds as follows: Removing the outer covering of the pod of the thistle, the silky material is held in one hand while, with the other, he plucks out the seeds. Then, after manipulating the packet of down so that it can be wrapped around the shaft of an arrow, he fastens the down to the shaft by means of stout thread, wrapping the latter round and round the base of the down. The first installment tied on, another chunk is laid on the shaft just above it, and so on up the shaft, until five or six inches of this fluffy, silky feathering is on the arrow. A twist of the arrow to shake out the loose thistledown, and the dart is ready.

Although the art of making blowguns and the old-time skill of the Cherokees in using this primitive weapon have been on

the decline during the past few years until there is grave danger that blowgunnery may soon be a lost art in the Great Smokies there is hope for the perpetuation of this accomplishment in the proposed Great Smoky mountain national park. It is believed that, with the establishment of this magnificent eastern playground, plus the presence of thousands of summer visitors to the Great Smokies, the Cherokees will be stimulated into a wider use of the blowgun. The weapon is bound to interest anyone who sees it, and once the Cherokees are shown how the sport of blowgun shooting may be promoted with benefit to their purses, it is more than likely that they will take up the manufacture of this weapon, recover their lost proficiency with it and stage not one but several blowgun tournaments each year, which should attract many visitors.

The Great Smoky range is a notable spot with its many high, forested peaks, some of which haven't even a horseback trail to their wilderness isolation. This imposing range forms the framework for the new national park, half in east Tennessee and half in western North Carolina,



Typical Mountain Cabin in the Great Smoky District, Where a Vast Area of Virgin Wilderness and Magnificent Scenery Is Being Planned as an Eastern National Park

and that the park will be established is practically a certainty, since the Laura Spelman Rockefeller foundation has given \$5,000,000 toward the project. This sum, with the millions which Tennessee and North Carolina are furnishing, will enable the backers of the project to go ahead. And Uncle Sam is not only willing, but eager, to see this eastern wilderness, rich in natural beauty and in history, conserved and at the same time made available as a playhouse for the American people in a section lacking in this respect.

A park containing 428,000 acres of virgin forest, covering a saw-tooth, winding range of mile-high mountains over which a smoky blue haze seems to linger always—this is what the park will be at first. Later, it is planned to increase its size to 704,000 acres. Picture in this great forested area, the ancient home and hunting grounds of the Cherokees and still the home of those interesting whites known as the mountain highlanders, 137 species of trees and 174 species of shrubs; imagine, if you can, the turbulent trout streams, cascades and waterfalls which add their charm to the mountain valleys; picture that dreamy blue haze over peaks and bridle paths that climb through age-old forests; assemble these features—and you can visualize the charm of the Great Smoky range which is going to be the heart of the proposed national park.

#### ANIMALS' EYES TELL THE TIME ON NOVELTY CLOCK

Eyes serve as dials in novel animal-shaped clocks now on the market. The pupils rotate, that of the left eye showing the hours and the one on the right, the minutes. The clocks are hand-carved from natural woods. Marks are used to designate the numerals and the changing expression creates great amusement.



Electric Ice Shaver, for Preparing Drinks and Refreshments at Booths

#### AUTOMATIC ICE SHAVER CUTS COST OF DRINKS

For preparing various kinds of drinks and other refreshments, an electrically operated ice shaver has been introduced. It reduces waste, saves the time of one man and requires practically no attention once it is set in operation, as the block of ice is held firmly against the shaving blades until it is used up. Current is furnished from a lighting socket.

#### STEEL THAT WON'T WEAR OUT TO IMPROVE AUTOS

A new nitrated steel, which is comparatively impervious to wear, is expected to prolong greatly the life of automobiles and other machines. Chrome and nickel steel, compared with the new product, are said to be like putty. According to one test, an automobile cylinder of cast steel showed wear of forty per cent after the car had been driven 18,630 miles, while a cylinder of nitrated steel had worn but two per cent. It is believed that use of the metal will result in the elimination of cylinder linings and saving in oil.



© Dahlgren

The Outboard-Motor Boat, Built with Stepped Bottom on the Hydroglider Principle, Just as It Left the "Springboard" for Its Thirty-Five-Foot Leap

### BOAT LEAPS THIRTY-FIVE FEET IN MOTOR TEST

The power of outboard motors was strikingly demonstrated at a recent exhibition in Winter Haven, Fla. With a running start, a small boat was sped to an elevated platform from which it hurtled through the air for a distance of thirty-five feet. The craft was piloted by an eighteen-year-old boy.

### PARAFFIN ON AIRPLANE WINGS PREVENTS ICE FORMATION

Paraffin oil spread on the wings of the "Bremen" played a large part in the recent air victory over the Atlantic, according to flying experts. The substance prevented the formation of ice, the pilot's most dreaded enemy next to fog, as the plane passed through storms. Besides adding dangerous weight to the flying craft, the ice has a tendency to form a protruding, curving edge on the rim of

the wings. This acts as a fatal guide, tending to steer the plane toward the ground or sea, in spite of the efforts made to counteract its effect. Before the "Bremen" left, extensive experiments were staged to test the efficiency of the oil.

### RADIO AMPLIFIER FOR PHONE LATEST AID TO THE DEAF

Quickly attached to an ordinary telephone receiver, an amplifying unit permits persons with defective hearing to enjoy conversation with much less difficulty. The device is simply a special input transformer with standard radio tubes and batteries. One set of dry cells and a

twenty-two and one-half volt B-battery are said to last approximately one year. In connection with the amplifier, a loud-speaker horn may be used where privacy is not desired. This allows persons with normal hearing free use of both hands while answering the telephone, as it is not necessary to hold a receiver to the ear.



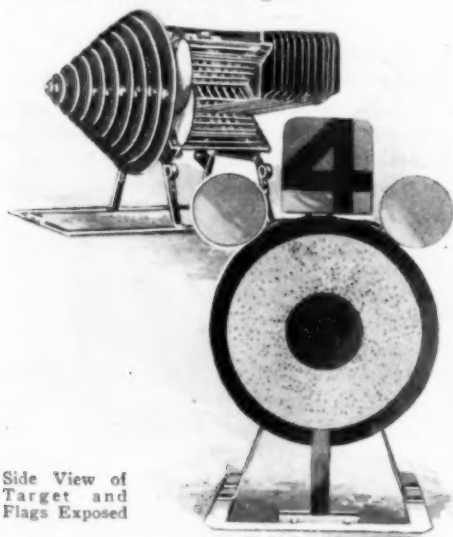
Radio Comes to the Aid of the Deaf in Telephoning; the Amplifying Unit in Use

### RARE METAL IS FOUND IN SUN

Hafnium, an element discovered in Denmark is present in the sun, according to special photographs made of that body. This is determined by examining the light produced by the substance under an apparatus that splits light rays into their constituent colors, or spectrum. Hafnium produces in this a characteristic pattern of bands whereby it can be identified in examining the light from the sun. Although the substance is believed to be more plentiful in the earth's crust than lead or tin, it, so far, has been obtained only in small quantities.

### TARGET FLAGS SCORE AUTOMATICALLY

In addition to showing the score of the shots, an automatic target, being tested by the French army, tells if the bullet strikes above or below or to one side of the bull's-eye. This is accomplished by small flags that spring out from the side of the target. They are actuated by the bullet striking against steel rings back of the mark itself. These rings are so connected to levers that they cause the proper flags to appear at the border of the target.



Side View of  
Target and  
Flags Exposed



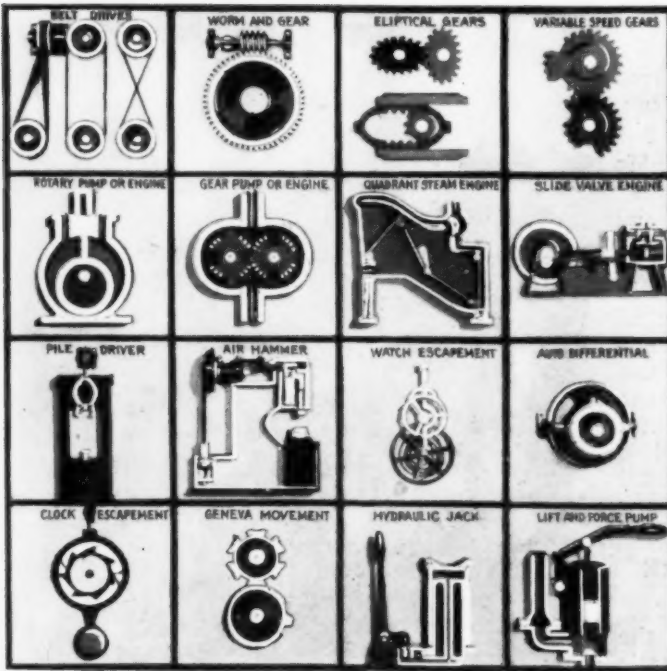
Printing Campaign  
Photographs of Al  
Smith

### RAPID PHOTO PRINTER HELPS POLITICAL CAMPAIGN

Large-sized photographs are printed quickly and evenly in a special reel apparatus devised for turning out pictures in great numbers. The paper is handled as a continuous sheet, like a roll of film, saving the manipulation of small sections. After the reel has dried, the photos are cut and pressed.

### RED DOT ON AUTOMOBILE TIRES GUIDES IN BALANCING

Many persons have been mystified by the presence of a small red spot on the side of balloon tires. The mark looks as though a drop of paint had been splashed on the rubber by mistake, but there is nothing careless about it. In fact it has been placed to show exactly where the valve should be fixed in order to maintain balance in the tire. This is done to prevent "shimmying," the weight of the valve being sufficient to throw the tire out of balance if it is wrongly located. The mark is made on the lighter side of the casing.



One of the Exhibits in the Mechanical Museum; a Display of Models Showing How Various Machines Actually Work

### MARVELS OF MECHANICAL AGE EXPLAINED IN MODEL SHOW

Do you know how the starter starts the car? Exactly how an automobile engine operates? How a steam engine uses the same steam three times? These, and many other interesting questions concerning the working of mechanical units of everyday life are answered in an entertaining exhibit of models, which has just been prepared. The collection is a group of easily understood pieces, accurate in every respect, but minus the complicated features that often perplex the layman. Included in the exhibit are models illustrating the action of different types of gears, the fundamental mechanical principles, clock movements of various sorts, automobile parts, steam engines, and many other articles. The collection will be taken around the country for exhibit in many places.

### HIDDEN RIVERS ARE EXPLAINED BY NATURE OF SOIL

Underground rivers are explained in three ways, according to geologists who have studied these oddities of nature. Some are caused by water seeping through porous limestone rock and running under the surface, to collect and reappear again. Others originate in sandy and gravel districts where the stream sinks through the loose upper strata. The third cause is found in volcanic areas where sections of lava have been submerged and then become porous on cooling. This spongy material allows the water to trickle through the upper layers and flow along natural fissures until it may emerge again as large springs or streams. Such underground rivers are common in Idaho, Oregon and California. Their course is sometimes traced by putting dyes into the water.

### DRIVER CONTROLS REAR SHADE TO STOP GLARE

So that the automobile driver can raise and lower the rear curtain himself to keep out the glare of headlights, a simple cord control has been introduced. It can be installed in any closed car in a few moments, is durable and certain in operation.



Drawing to Show the Shade Cord in Operation, and a Closer View of the Pulley Attached at Front of Car



# DIVING *for* SEA FOOD



Abalone Diver with His Net Basket, Ready to Descend to the Sea Bottom; Most of the Divers Are Japanese; They Pry the Mollusks Loose from the Rocks with an Iron Bar

By H. H. DUNN

**V**ARIED and valuable are the harvests of the sea, some of them a bit weird, such as the cuttlefish, sting rays and sea cucumbers, of which thousands of tons are gathered every year for sale in oriental markets. But diving for shellfish for food supply is one of the most unusual, and is carried on in only one place in the world—Monterey bay, on the coast of California.

In the south seas, and off the shore of Lower California, men in rubber suits, lead-soled shoes and real iron hats, descend hundreds of feet for pearls, throwing away the oyster in which they are found.

At Monterey, similarly equipped divers walk the bed of the ocean, 125 to 150 feet below the surface, prying shells, the size of dinner plates, from the rocks, to sell the abalone "steaks" contained therein for forty to sixty cents a pound, and the pink, green, black and gray shells for \$4,000 to \$5,000 a ton.

From these shells come blister pearls, where the single-shelled mollusk has

sought to protect itself from an intruding worm or bit of gravel. These blisters are of small value, and are sold with the run of shell, but now and again a real pearl, usually pink and of fine luster, is found in the flesh of the abalone. These have sold as high as \$1,000 each, and as low as \$5. So important is the abalone, for food and shell, that the state fish and game commission is experimenting with the planting of the mollusks in suitable places along the rock-bound coasts of central and northern California.

Nearly 3,000,000 pounds of abalone steaks and several thousand tons of shell were taken from Monterey bay in 1927, without visible diminution of the supply, so when I stepped to the deck of a fifty-foot motorboat for a day with the abalones, I moved into as well established an industry as that of the cod fishers of New England. Directed by Americans, the majority of the abalone fishermen are Japanese, including the divers. A sixty-horsepower oil engine drove the motor-



Two Men Watch the Air and Life Lines, While the Diver Is Below, and Pull Up His Filled Basket

boat and, towed behind, were two twenty-five-foot skiffs, each with a small gasoline engine, with emergency oars lashed to the gunwales and a stationary air pump set amidships.

Imato and Gono, divers, lounged aft on the mothership, while, in the wheelhouse, the five members of the crew and the captain were finishing breakfast. Out to sea the captain turned "Anna's" nose, the diving skiffs being dropped more than 100 feet behind on the towline. In a little more than four hours we were a mile off a group of rocky peaks rising like jagged lumps of coal from the sea.

The motorboat stopped, dropped anchor, and pulled the skiffs alongside. Imato and Gono slipped each into a skiff and began putting on the diving suit, first

the eighty-pound rubber combined trousers and shirt, then the shoes, weighing twenty pounds each, and the belt, with 150 pounds of lead hooked to it, like a bandolier full of cartridge clips. Each of these ten-pound weights could be unhooked and thrown away, in case a shark or an octopus became too attentive and immediate rise to the surface would be necessary. Last of all, the two assistants in each skiff fastened on the helmet, all metal and weighing seventy pounds.

The air hose was tested, and the rope running with it carefully hooked into a shoulder plate, so that no strain would come on the small rubber tube at the point where it entered the helmet. The great glass eyes were wiped off, the signal and haul-away lines run out to eliminate kinks, and the air pump started to test the supply which must be the diver's only link with life for four to five hours. To do this,

the small gasoline engine was disconnected from the propeller of the diving boat and hooked up to the air pump.

In the middle of his belt, well back on one side, each diver carried a brass scabbard, packed with grease, into which was thrust a knife with a blade fourteen inches long, two-edged and sharper than the proverbial razor. Thus equipped—and carrying a basket and steel prying bar—Imato descended slowly. A man stationed himself at the steadily running air pump, watching the reserve tank which maintains a steady pressure of sixty pounds, so that, should the pump break down, enough air would be on hand to last the underwater worker until he could be pulled to the surface.

Another man held the signal cord in



Removing the "Steaks" from the Abalone Shells; an Active Diver Will Bring Up a Ton or More of Meat a Day, and the Product Sells at Forty to Sixty Cents a Pound Wholesale

one hand and the haul-away line in the other, while the inch-thick rope, by which the diver would be lifted from the twenty fathoms of water beneath us, lay across a chock in the gunwale, where both men could reach it instantly. A line of bubbles showed the course of the abalone hunter. In a very few minutes, two jerks on the signal cord set a third helper to hauling away on the basket line. In it came, packed with two dozen abalones, none less than eight inches in diameter.

Below, the abalone diver has his troubles. He must pass through forests of kelp, whose "trunks," firmly grown to the rocks, often are more than 100 feet long, tough as leather, resilient as rubber, and seemingly eager to wrap themselves around any moving thing that touches them. This, of course, is all in the diver's imagination, but a man, once entangled in kelp, is in a difficult and dangerous position, from which he has to cut himself free, all the time keeping careful guard that he does not foul his air line, and that, by his active movements, he does not attract the attention of some huge octopus or wandering shark.

Abalones prefer the grassy sides of rock and gravel slopes near the kelp beds, and

often the largest are found in the very midst of the kelp forests, which cover thousands of acres of sea bottom off the California coast. The abalone feeds through six or more holes in the rim of the shell, just above the lip. Having clamped itself to a rock by its huge foot, which covers all the open side of the shell, the mollusk pulls water through these holes, ejecting it the same way and taking out whatever suitable food supply may be carried therein.

Since the shells of all the abalones of commercial size and age are completely covered with barnacles, small plants and sea anemones, the diver must know what he is looking for, and be able to see it amid surrounding rocks covered with exactly similar growth. In the dull light under the water, this is particularly difficult, but the capable abalone diver has no difficulty in earning \$25 or more a day of five hours. Since the open season covers nearly ten months of the year, he is permanently employed, and receives, as annual wages, probably more than any other follower of the deep-sea diving business.

Once he finds an abalone, the diver, with one quick motion, thrusts his pry bar under the thick edge of the shell. If the

shellfish senses the approach of an enemy, and clamps its shell firmly to the rock, the diver might just as well pass on to the next abalone, because this one will not release its grip for several hours. The gripping power of an eight-inch abalone has been estimated at 300 to 500 pounds. One strong man, with both hands caught, provided he could save his fingers, would have difficulty in lifting an adult abalone from its rock without the aid of a bar. With one hand, he has no chance.

Rough water is another serious condition confronting the diver. One would believe that the sea at a depth of 125 to 150 feet would be quiet, but under certain conditions the tides and currents set sand and mud in motion to such an extent that the diver cannot see the bottom, far less pick out grass-grown shells among other ocean-bed vegetation. In such cases, the diver calls for a lift and is hauled to the surface, whereupon the diving boat is moved to another location, often a matter of many miles, since the abalone is never found on sandy bottom, but only on rock and gravel beds.

When the abalones are taken to shore, as we took ours after the two boats had accumulated a little more than four tons, the meat is removed from the shells, averaging about nine pounds of steaks to the dozen mollusks. The shells are then spread out to dry, whence they go to make jewelry, for which there is a large demand; blister pearls being cut out and made into pendants, watch fobs, tie pins and brooches, while the less brilliantly colored parts of the shells are converted into knife and manicure-instrument handles, souvenir spoons, ladles and paper knives. The occasional pearls found go to enrich both finder and cannery owner, since the price usually is divided between the two.

After the meat has been removed from the shell and the foot and other inedible parts are cut away, the remainder is thoroughly washed in fresh water and passed to a long table, where men with sharp knives dexterously separate the white meat, or steak, from the dark. The latter is canned, or dried, largely for shipment to the orient. The white meat is then sliced to proper thickness by a ma-



Abalone Diving Is Done from Small Boats, Towed to the Edge of the Fishing Grounds by a Motor Craft; the Fishing Crew Then Rows In among the Rocks to Drop the Divers

chine. Thereafter it is sent to the pounders. These are men equipped with wooden mallets, with which they pound each steak on a hardwood block until the flesh is soft and tender. It is then packed in ten-pound boxes for shipment to the sea-food restaurants, where demand is considerably greater than supply.

#### FIT SHIPS WITH TWO RUDDERS TO STEER BACKWARD

Big boats for service across the English Channel are now being fitted with a rudder at the bow as well as one at the stern, so that they can be more easily steered out of harbors. The craft are often too large to turn around in the harbor and it is difficult to maneuver them backward. With the bow rudder, however, the task is much easier. When going to sea, the main helm is put amidships, and the ship is steered from the after bridge, employing the rudder at the bow. When out of the harbor, the engines are stopped, the captain and officers go to the main bridge and operation becomes normal. To prevent confusion and reduce the danger of collisions, ships navigating backward are required to carry two black balls on a mainmast yard, as a signal that their usual starboard and port sides are reversed.

#### VISIBLE PULSE RECORD TAKEN WITH ELECTRICITY

A visible record of the action of the pulse for any desired period, is obtained without discomfort to the subject or tedium to the observer with an electrical instrument developed in Germany. Levers attached to the patient's wrist move with the pulse beats, causing an electric circuit to be opened and closed, thereby intermittently actuating the recording apparatus which inscribes the curve on a roll of paper.



Recording Pulse Beats on Paper, for a Longer and More Accurate Study of the Heart



How Man Learned to Use Wings; a Successful Flight Was Made Recently with Lilienthal's Glider

#### FRANCE HONORS EARLY AVIATOR WITH MUSEUM MODEL

One of the original gliders made by Otto Lilienthal, famous German pioneer in aviation, is to be duplicated in a model ordered by the French government for exhibit in the national air museum at Meudon. That Lilienthal was a skilled designer of wings is proved by the fact that

one of the first gliders he made was successfully flown just recently. It weighs forty-four pounds and can be folded up. The daring German kept his balance in the air by shifting his weight. One day, a sudden gust upset the experimenter and he was killed, but his findings contributed much to the later success of motor aircraft.





Testing Special Fire-Escape Ladder, Which Is Held to the Wall to Prevent Swaying

### WALL-GRIPPING FIRE LADDER PREVENTS SWAYING

Greater security is offered in using a fire-escape ladder introduced in England for permanent installation on homes and factories. Its rungs are held firmly to the wall by means of metal projections which keep it from swaying. It is less conspicuous than other forms of fire escapes.

### SPRINGS ON TILTING AUTO SEAT ADD TO COMFORT



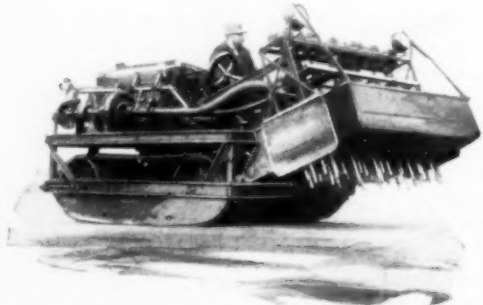
Quickly slipped on or screwed to the bottom of the automobile seat, a set of durable springs adds to riding comfort. They rest on the bottom of the car to take up bumps and vibrations, and can be fitted to almost any type or make of car.

### BROWN EYES WITHSTAND GLARE BETTER THAN BLUE

In a few generations, almost all persons will have brown eyes, a London specialist predicts. He bases his theory on the fact that brown eyes are better adapted to strong lights than blue, and that nature will therefore produce a brown-colored iris in the eyes of people who habitually face the strong illumination of artificial lights. Natives of the tropics have dark eyes, he points out, to shield them from the glare of the sun, while inhabitants of northern latitudes have gray or blue eyes, better suited to the less intense natural light in those regions. The eye was not intended for the uses which civilization demands of it, the doctor holds, and, consequently, a natural change to fit the conditions will occur, or individuals will have to wear goggles with colored lenses.

### SCRATCHER CLEANS FILTER BED TO PURIFY WATER

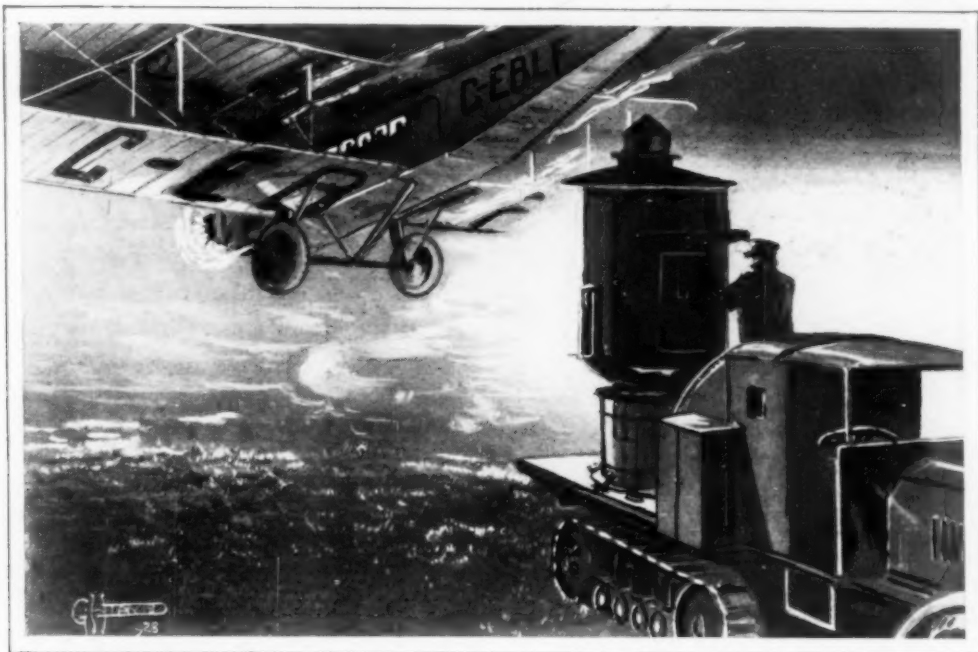
Time and labor are saved in cleaning filter beds that purge the water in an eastern city, by using a special tractor. At its front are a series of rotating heads with sharp teeth that penetrate the filter sand. These heads turn in opposite direc-



Tractor Water-Filter Cleaner, Showing the Long Teeth That Stir Up the Sand

tions as the tractor moves slowly along. The sand, thus stirred up, is further cleansed by drawing off the scum and other impurities in somewhat the same manner as a vacuum cleaner sucks up dust. Only two men are needed to operate one of the tractors. The machine cleans a swath eighty inches wide at a speed of fifteen feet a minute.

## PORTABLE SEARCHLIGHT HELPS AIRPLANES LAND



Courtesy The Illustrated London News

Portable Landing Beacon, Mounted on an Endless-Tread Tractor, Used at Croydon Field, London, to Enable Planes to Land at Night; the Beam Is Pointed into the Wind

A million-candlepower beam of light, moved at will about the field on a truck, enables trans-Channel air liners to land safely at Croydon field, the London airport. The motor truck is driven across the field when a plane approaches and takes up its position at the down-wind end of the runway. When the beam flashes on, the pilot circles around behind the searchlight, and then glides in, coming down with the light behind him and the broad illuminated path stretching, clearly defined, ahead.

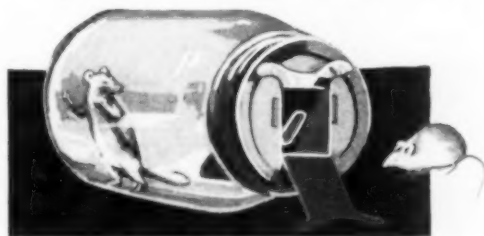
## PUZZLE OF WHEELS IN MOVIES SOLVED BY PAINTING

In moving pictures of a buggy, wagon or similar vehicle in motion, the wheels sometimes appear to turn backward instead of forward or to be stationary. This is due to the fact that the movement of the spokes is too slow to be synchronized with the rapid, separate exposures on the film. The difficulty has been corrected by the simple expedient of painting out groups of spokes. This gives the appear-

ance of greater space between them and enables the eye and the camera to follow them correctly. On buggy wheels, four sets of two spokes each were painted out, using different shades.

## FRUIT-JAR TOP AS MOUSETRAP IS ALWAYS SET

By substituting a special trap lid for the ordinary top, a glass fruit jar may be used effectively for catching several mice. A swing door in the lid falls back, so that the



Fruit Jar Converted into Mousetrap by Attaching Special Top; the Trap Is Always Set

mouse cannot escape, but is in position to catch another. The device is sanitary.



Both Sides of the Newspaper Column Are Cut at Once with This Timesaving Unit

### CUTTER FOR NEWS CLIPPINGS SUBSTITUTE FOR SHEARS

For cutting out newspaper clippings, a double-bladed instrument, somewhat like a pair of calipers, has been introduced as a substitute for shears. It may be set to different widths, there are no parts to get out of order, and an evenly trimmed clipping is obtained.

### METER SHOWS TIRE PRESSURE WHILE INFLATING



vides a convenient rest for the hose when it is not in use.

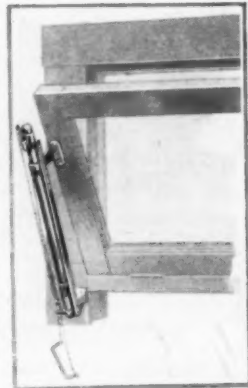
Attached to the air hose where it can easily be read, a meter shows the pressure in the tire and also in the supply tank. This saves using separate gauges, insures greater accuracy and eliminates loss of meters. The top of the gauge is of unbreakable glass, and a hook provides

### AUTO RUN LIKE A ROCKET DEVELOPS HIGH SPEED

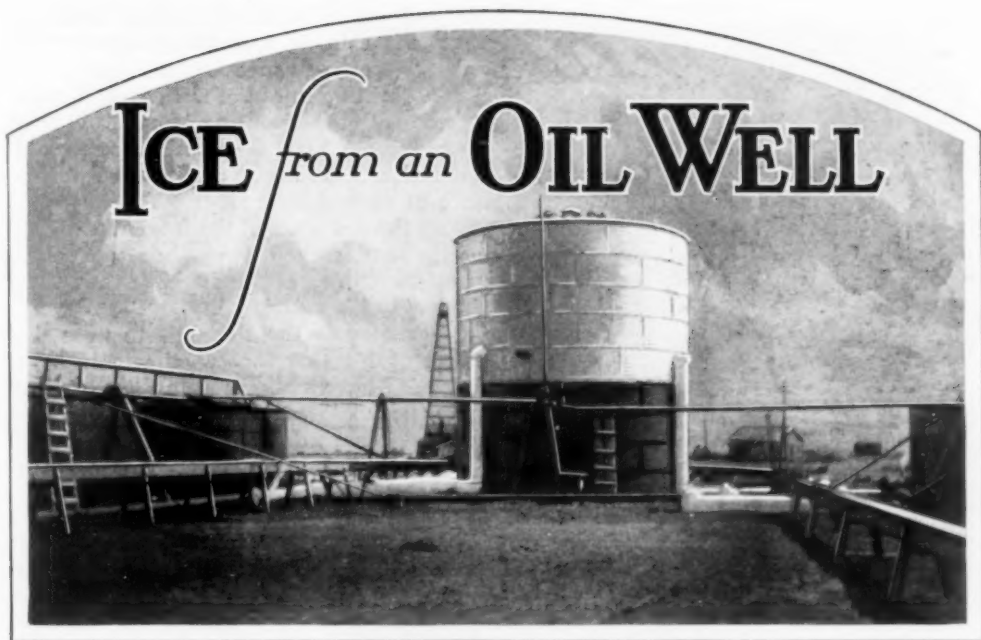
A speed of sixty miles an hour was attained eight seconds after the start, with an automobile propelled on the rocket principle, using the recoil from explosives, according to reports of the tests in Bavaria. Powder was employed as the fuel. Small charges of it were fed into a chamber fitted at one end with a series of plates which allow the gases to escape slowly. The recoil impulse from the entire chamber was applied as power directly to the axles. Engineers see a further practical application of this method of propulsion to a rocket that might be shot from Europe to America carrying mail. Already, rockets have been sent to a height of six miles with a speed of several hundred miles an hour and tests with larger ones, that are expected to ascend sixty miles with apparatus for recording temperature and air conditions, are planned. It is also believed that the rocket idea could be utilized in a motor for airplanes. The engines could be made lighter and flights would not be affected by atmospheric conditions as they are at present.

### TRANSOM ADJUSTED TO CHAIN AND THEN LOCKED

Opening the transom to just the angle desired has been simplified by the chain adjuster shown here. A pull on a handle brings the frame down, and locks it in position when the chain is released. The attachment is easily fitted to most transoms.



☐ The Popular Mechanics Bureau of Information offers its free service to all readers of this magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the Bureau.



Storage Tank and Pipe Lines Coated with Frost at Freak Well Whose Output Has Such a Low Temperature That It Freezes the Water Out of the Air When Brought to Surface

**C**OMMERCIAL ice from an oil well?

In northern Colorado there is one whose output is like nothing encountered by drillers anywhere else in the world. This freak well is the discovery hole on the North McCallum dome, a Jackson county structure being developed by the Continental Oil company, of Denver. On the charts the producer is labeled "Sherman No. 1." In the vicinity it is better known as the "Ice Cream" well.

From its deep bore pours a fozen mixture of gas and oil that reaches the surface at a temperature of 126 degrees Fahrenheit below zero. By a wide margin, the oil holds the record as the coldest that ever came out of the ground.

The well is unusual in several other respects. Its derrick floor is 8,240 feet above sea level. From this elevation the bore goes down 5,130 feet, giving the well the distinction of being the deepest oil producer in Colorado. Another unusual feature is that the oil is straw-colored and so clear that a person looking down into a filled 500-barrel tank may count the rivets on its wall.

This producer is located in a region not particularly inviting to the seeker for oil. Winter temperatures range to 25 below

zero and water lines have to be buried seven feet to get below the freezing zone. Snow often blocks the highways and, in midwinter, the district is likely to be shut off for periods of several weeks, excepting for the train that is supposed to make three trips weekly from Laramie, and quite often manages to fight through the deep drifts.

When the well was brought in, the frozen gas-oil mixture shot high above the derrick and descended in an icy cascade. Soon the derrick was heavily coated by the stuff and the ground near by was covered with frosty heaps.

A week passed before the drillers were able to install high-pressure fittings and put the flow under control. This delay made it possible for residents of the vicinity and visitors from Denver to come to gaze upon the geyser that spouted from nearly a mile below the surface. They speculated with interest upon the strange performance, but arrived at no explanation why the gushing stream should try to imitate a snowstorm.

It was noted that the light-yellowish oil gave the heaps on the ground a creamy tinge. This suggested to some visiting spectators the ice-cream nickname for the



well. Several weeks later, an analysis of the gas in the mixture had been completed. It showed eighty per cent of carbon dioxide, and the presence of a small percentage of helium has caused government chemists to make further tests. The efficiency of carbon dioxide as a fire extinguisher forms the basis of one of its commercial applications.

With the well under control, the producers faced the problem of making use of their peculiar product. It was necessary to evolve an economical process for thawing out the mixture and separating the gas from the oil. There were no precedents. Oil drillers had struck carbon-dioxide gas on a few previous occasions, but never before had it been encountered in combination with oil.

W. H. Price, of Casper, Wyo., finally worked out the successful separation process now in use. The mixture runs from the well head into a 1,500-barrel tank, the leader pipes entering the tank eight feet above the bottom. Into the lower part of this tank other pipes convey live steam under pressure. The ends of the

oil and steam lines turn after entering the tank, causing a swirling motion that aids the thawing process.

The shutting in of the well, even though it stopped the spouting forth of that "snow" from 5,000 feet underground, did not reduce Sherman No. 1 to the appearance of an average gusher. The icy coating on the derrick and the frozen heaps on the ground melted away, but there still remain visible evidences of the "Ice Cream" well's individuality.

No visitor to the site fails to note the jacket of ice that incases the fittings at the well head and covers all pipes leading therefrom and the whole upper part of the near-by separator tank. The ice is as

ever-present as in a refrigeration plant.

Now, a way is being sought to find a profitable use for the carbon dioxide. The quantity of wasted gas is estimated at 30,000,000 cubic feet daily, far more than sufficient to supply all the soda fountains and other users of carbon dioxide in the United States.



The Freak Well, Frozen Valves, and a Cool Seat for One of the Workmen While Resting

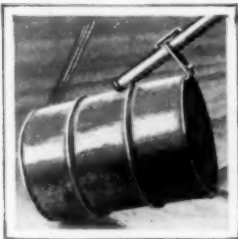


### SHIPS KEEP CATS TO CURB RAT MENACE

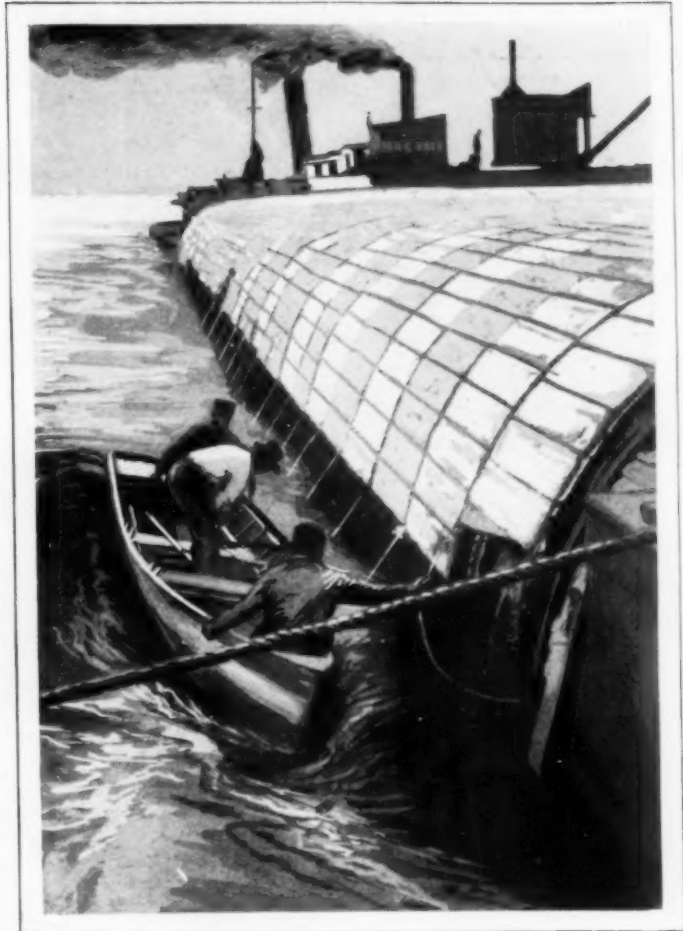
Almost all the larger Atlantic liners now carry a regular force of cats to wage constant warfare against rats and so protect the cargo and reduce the likelihood of spreading disease. The number of cats kept on a ship varies from ten to twenty, depending upon the size of the vessel. The animals are housed in various parts of the steamer and appear on the rationing or feeding books, the same as sailors and passengers. The best cats are allowed anywhere except the run of the first-class cabins, but the slower animals are confined to the hold or steerage. At the end of the voyage, they are given a short holiday and are often seen on deck, basking leisurely in the sun.

### GRIP FOR DRUMS TO PREVENT ACCIDENTS

Metal drums, containing heavy materials and weighing as much as 850 pounds each, are sometimes difficult to handle but the task has been simplified with a special lever-grip pole. To a hickory shaft, five feet long, an adjustable hook has been attached to afford a grip on the projecting rim at the head of the drum. A heel engages one of the annular flanges on the side of the container. With this tool, one man can tip up and handle a heavy drum with little



difficulty and with much less danger of incurring an accident.



Courtesy Engineering News-Record

Shielding a Levee with a Concrete Mattress; a Large Section of Cement Blocks on Flexible Reinforcing

### LAY CONCRETE MATS IN RIVER TO CURB FLOODS

By strengthening the banks and levees of the Mississippi river with concrete mattresses, large sections of slabs connected by wire reinforcement, engineers hope to prevent breaks and consequent floods. The mats are made on special barges from which they are launched and sunk until a protective floor is laid from 200 to 300 feet out into the stream. Sinking crews can place an average of 70,000 square feet a day, or about a mile of river a month. The cost is approximately \$225,000 a mile, somewhat cheaper than willow mats. By this means, river control can be achieved in a reasonable time, engineers believe.

## WHERE HUMAN BEINGS SERVE AS BURDEN CARRIERS



In Lichtenfels, Upper Franconia, the Center of the Basket-Weaving Industry in Germany, Workers Carry Their Products under Canvas Covers to Hide the Patterns from Competitors; Upper Left, a Human "Van" with a Load of Flower Baskets



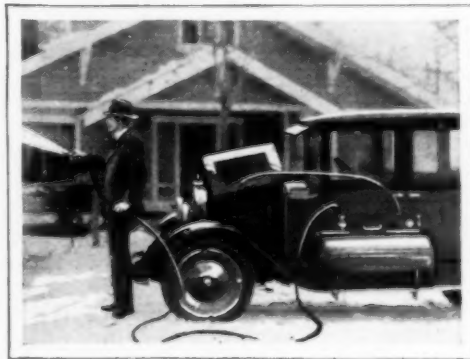
The Load Is Light but Bulky and Requires Expert Packing to Prevent Damage to the Goods; the Man Above Is Delivering an Order to a Wholesaler and, at Right, Old Woman Peddling Her Wares to Country Customers; Nearly Everyone in Lichtenfels Knows How to Make Baskets

### BASS VIOL MADE OF ALUMINUM WARP-PROOF

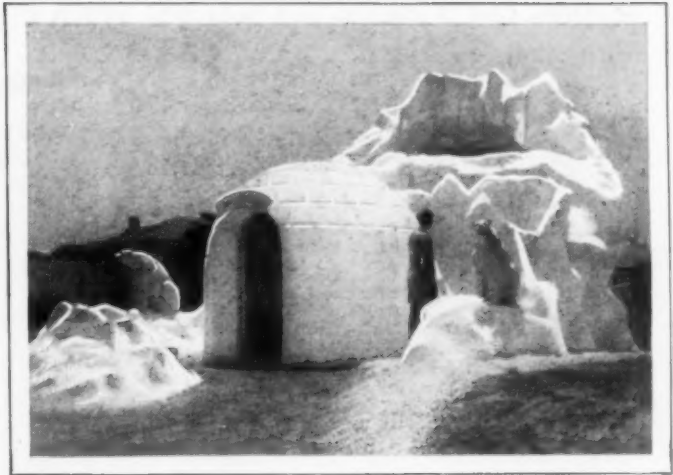
Aluminum is used instead of wood for the body of a bass viol now on the market. The instrument has a deep, rich tone, will not warp or crack, weighs only about one pound more than the wooden instrument and can be handled with less difficulty, as there is practically no danger of breakage. The bridge is of wood and the sound post inside of magnesium. Extensive experimental work was necessary to achieve the proper grade of metal and construction to insure an instrument of satisfactory tone and one that would be more easily kept in tune even under adverse circumstances. A viol of dependable pitch is considered highly important for orchestra work and, for that reason, the aluminum one is expected to overcome many of the difficulties encountered with wooden instruments, especially on tours, when a wide variety of climatic conditions may be met. Metal clarinets and flutes have been introduced with marked success and experiments have been made with metal cellos. Research in this direction is continued.

### SPRAY OUTFIT RUN BY AUTO SAVES EXTRA PUMP

With little trouble, the automobile may be converted into a handy spraying outfit for treating trees, calcimining, roof painting and many other tasks where special apparatus is usually employed. The tank for the liquid is carried on the running board and air pressure is obtained from the engine.



Spray Tank on Auto Running Board and Connected to the Motor to Obtain Pressure



Suggesting Coolness Outside as Well as In; the Ice-Cream Parlor Constructed as an Igloo

### ICE-CREAM STAND LIKE IGLOO HELPS DRAW CROWDS

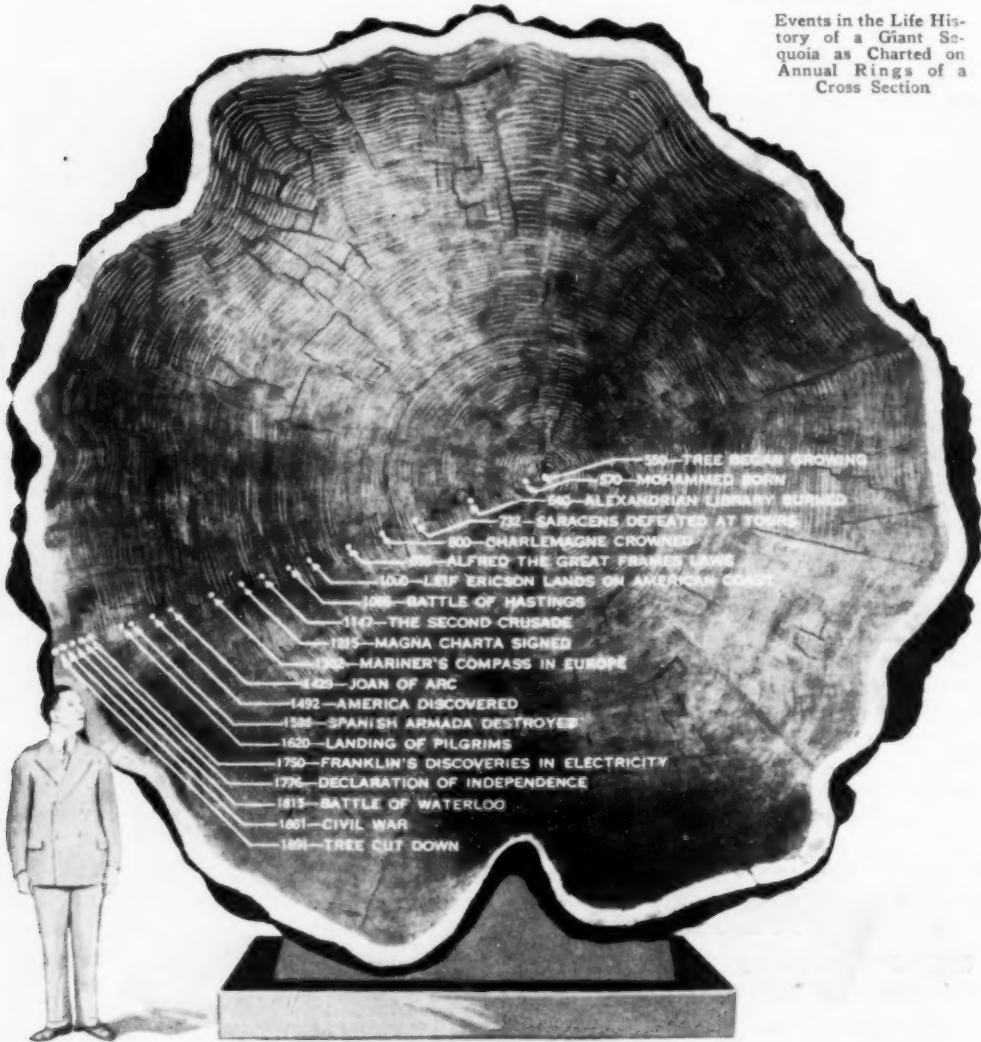
To call attention to the kind of merchandise he handles, a Los Angeles refreshment dealer has fashioned his stand to resemble an igloo. Its white, sparkling exterior and the polar-bear figures at the entrance are visible at considerable distance, attracting attention of passers-by.

### PACK ICE AROUND FRUIT TREES TO FOIL FROSTBITE

By placing ice around the trunks of fruit trees, an Oklahoma grower prevented loss from late frosts. The ice chilled the ground and the roots, keeping the sap from rising and delaying the budding until after the hazard of frost. The experiment, so far, has been tried on a small scale only, but it is believed the plan is suitable for more extensive application where ice is abundant. A trench is dug around the tree, filled with ice and then soil is spread on top to keep the ice from melting too rapidly.

## RINGS OF TREES TO SOLVE WEATHER MYSTERIES

Events in the Life History of a Giant Sequoia as Charted on Annual Rings of a Cross Section



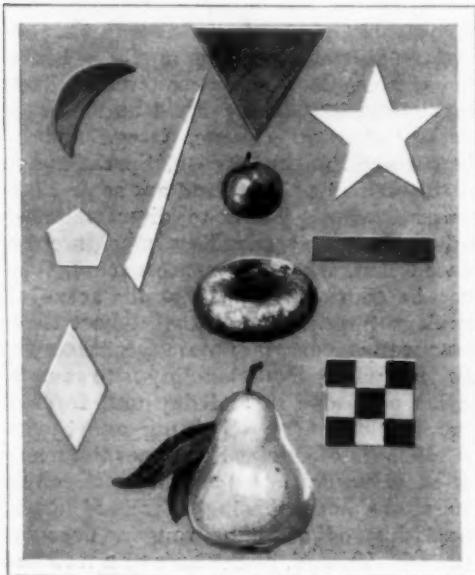
Light on the weather changes of the past is gained from a study of the rings of trees and furnishes a basis for forecasting the fluctuations of the future, according to experts who have spent considerable time in reading the "language of the trees," as revealed in the annual rings. Dr. Andrew E. Douglass, of the University of Arizona, discovered that there was a striking correlation between the rings of a large number of trees he studied and the actual weather conditions as shown by government reports, and his

research has been amplified by that of Dr. Ellsworth Huntington, of Yale, and Dr. Ernst Antevs, of the University of Stockholm, on the sequoias of California. Dr. Huntington and his assistants measured the rings in the stumps of 451 trees, the dates of whose cuttings were known. Nearly 100 of them were 1,000 years old, three had lived more than 3,000 years and the rings of the oldest registered 3,210 years. Trees of this kind, Dr. Huntington declares, were sturdy saplings in the days of the Trojan war and did not reach

old age until they had lived for seventeen or eighteen centuries. From these measurements, the investigator was able to construct a fairly reliable climatic curve back to a time before the days of Christ. While this record applies only to California, he found that the main fluctuations agree with those of a curve of climatic changes in western Asia, which he prepared on the basis of ruins, lakes and other evidence. Some of the larger changes in the ring record appear to correspond with the sunspot cycles.

### PICTURE CHART RESTS THE EYES AFTER LONG STRAIN

Setting-up exercises for the eyes are recommended by authorities in many cases, to relieve the organs of the strain of continued use at intense study or other duty. There are various forms of these exercises, but one that has been indorsed is to glance at a chart of pictures of pleasing colors and of different shapes. This gives the eye a chance to relax from the strain of constant focusing, giving refreshment and putting new muscles into play. When the eyes become very tired, simply closing them for a few seconds and relaxing the body at the same time will also bring great relief.



After Long Use, Glancing at This Chart of Colored Objects Rests the Eyes



Showing How Pads Keep Glass and Paper from Slipping: They Require No Adhesive

### SLIPLESS PADS KEEP GLASS TABLE TOPS IN PLACE

Small pads of felt, treated on either side with a composition covering, have been put on the market to eliminate metal corners and other means of keeping glass desk and table tops from slipping. The pads also hold the glass free from the wood, preventing sweating and sticking to the varnish. Four pads, half an inch in diameter, placed under the corners of a glass, make it almost impossible to move it sideways, though it may be lifted upward for cleaning without difficulty. The pads also can be placed under telephones, inkwells, ash trays and other objects, or used under the feet of a typewriter. Placed under a writing machine, the full pressure of both hands is not sufficient to move the typewriter. The gripping power of the pads is so great that, if a sheet of paper is held between two of them, it will be torn rather than pulled free. The material is also produced in inch-wide reels, coated on one side only. The uncoated side can be shellacked to the edges of a desk, to support a glass covering the entire top, and has the advantage of making the space beneath the glass dust-proof.

☐ Synthetic sausage skins are being made of cellulose.





Courtesy U. S. Forest Service

How a Forest Fire Looks from an Airplane; the Observer Can Quickly Estimate Its Extent, Direction and Progress and, So, Aid in Curbing It More Intelligently

By JAMES NEVIN MILLER

**F**LYING low over a blazing forest fire, an air-patrol pilot heard a terrific noise above the whirring of his Liberty motor. His oil pipe had burst! Tragedy loomed, for the intense heat seemed to spell a burning plane at any moment. But the pilot kept his head. With something of luck and more of pluck, he made for an old lake bed some miles away. And after deft maneuvers of the plane a landing was successfully made.

Small numerically is Uncle Sam's air patrol. Something like eight planes, an equal number of pilots and thirteen mechanics took part in its maneuvers last summer. Small, too, were the number of flying hours as compared with those of the previous year. Only 247 flights were made, comprising a total of 547 flying hours, and all in all, only thirty-five fires were sighted via the plane method.

Figures aren't supposed to lie. Yet they do in the case of the air patrol. Despite the fact that today its planes are used mainly for emergency purposes and that the patrol is still, after some ten years of employment, in an experimental stage, the importance of the airplane as an adjunct to the ground method of combating forest fires is firmly established. Never a year goes by without at least two or three new uses of the plane in this connection being discovered.

Aircraft play much the same sort of

role in fighting the red enemy of our forests as they do in ordinary military maneuvers. They are used to gain a rapid bird's-eye view of great conflagrations and to direct the attack accordingly—an extremely important consideration, notably in the case of mountainous districts where reconnaissance of sizable fires is slow and arduous when attempted from the ground.

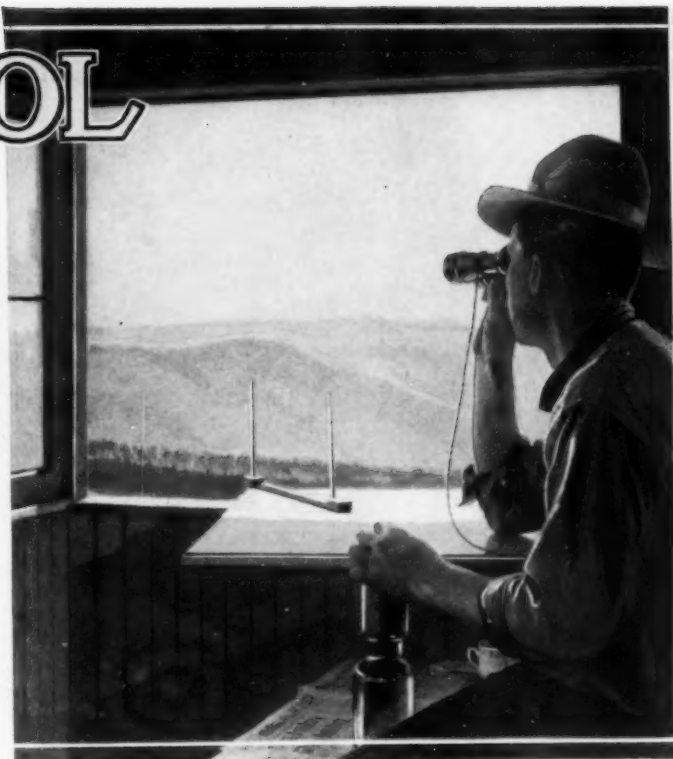
During the past season, fire-control operations in the national forests in California, Oregon, Washington, northern Idaho and western Montana were directed from five bases: at Mather Field and Griffith Park, Calif; at Eugene, Oreg., and at Seattle and Spokane, Wash. Spread about in this valuable timberland are some 1,000 rangers, whose job is to direct all fire-fighting maneuvers. Key men are so placed that, whenever a fire occurs, they may be counted on to be at the scene of conflagration in an amazingly short time. Practically every mountain peak has its lookout, whose iron-clad duty is to remain at his post, day in and day out, forever watching for fires. Sighting one by its telltale path of smoke, he phones the nearest ranger, who thereupon starts directing operations among his highly trained squad, consisting of assistant ranger, fireman, truck driver, and, in the case of a tremendous blaze, a score or so emergency men hired from the nearest towns.

# PATROL

With such a system, small wonder that Uncle Sam can boast that his "iron men of the forests" are able to stop at least fifty per cent of all forest fires before they exceed a quarter of an acre, and halt eighty-nine per cent before they consume ten acres. Never very far away from the scene of ground fire fighting is the airplane patrol, ready at all times for immediate action. Ordinarily the pilot is of tried caliber—a reserve officer of the army air corps. His plane, in the past, has been the old-style but fairly trustworthy de Havilland, borrowed from the army. This year, however, new planes of latest model and greater cruising power will be assigned to the patrol.

Out in the Columbia national forest in southwest Washington, no less than 100 good-sized fires were blazing away on successive days last summer. Immediate and concerted action was necessary. Whereupon the fire-patrol leader in the district, a Mr. Brundage, jumped into a plane at Vancouver, some seventy or eighty miles away, and in three hours was able to make a complete survey of an immense stretch of land, running into hundreds of acres. With no doubt in his mind as to the approximate extent and seriousness of the fires, he had the situation under control in short order.

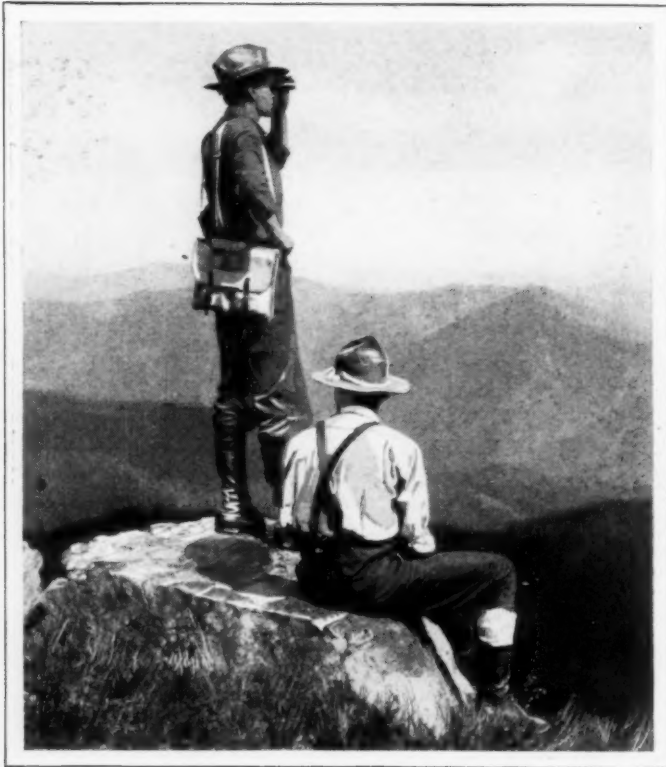
For years a besetting problem of the ranger has been to devise schemes destined to combat the peculiar and devastating electrical storms of the northwest. It has been estimated that they cause something like forty per cent of all forest blazes. Back in 1926, no less than 150 fires are believed to have started on July 6 by a



Fire Lookout at Marties Peak Station, Tahoe National Forest, California; His Main Duty Is to Watch for Smoke

single storm, and six days later, seventy-two fires arose from one tempest. Lightning has a habit of starting fires in inaccessible spots, notably in the remote canyons and potholes of the mountainous regions, which are impossible to view accurately from the ground or even from the high-mountain lookout points. Often-times it is several hours, frequently a day or more, after such a monster storm, before a lookout may gain the line-up of the resulting fires. The airplane, on the other hand, gives an immediate observation weapon whose accuracy rarely fails. Down into the most remote corners, the machine can dive and drop messages to ground workers, offering direct instructions as to fire locations. Usually the messages are placed in canvas bags, weighted with sand. Or, if the observer happens to be in strange territory, he need only look for the triangular ground signs, which show locations of key men.

Speed in surrounding a fire with a control line is as vital as speed in reaching



Rangers on Fire-Patrol Duty in the Cabinet National Forest, Montana, Where Nature Has Provided Her Own Observation Towers

it. A control line is simply a cleared way, of varying width, through the timber, undergrowth and fallen logs, with a narrow trench to mineral soil. The line is widened by setting backfires which spread from the trench toward the main blaze, thus increasing the chance to hold it. In heavily timbered regions it often requires from fifty to 100 men to construct a mile of such a fire barrier in a day; and when weather conditions are adverse, or incorrect tactics have been used, the control line so laboriously constructed may easily be lost. Here again the airplane has proved its efficiency.

An interesting by-product of aerial-patrol operations in the past few years has been its moral effect on incendiaries, careless campers and reckless forest users. Back in 1918—the first year flights were made—it was noticed that a severe outbreak of incendiarism stopped short upon the starting of the air patrol. Later it was learned that plane observers were able to see the offenders long before those

on the ground could locate the plane's position.

A new use for planes in fire control, which has developed during the past two years, is the transporting of fire-fighting tools and supplies and dropping them, where needed, upon the actual fire lines. From time to time inventors and commercial interests have advocated the placement of chemicals from the air as an effective means of combating forest fires. Not long ago the idea was tested out carefully at Mather Field, Calif. Pilots Potter and L. W. Hess carried on a series of experiments involving attempts to extinguish small fires by dropping chemicals upon them from airplanes. Flying low, Hess threw down several gallons of liquids. Two bottles hit within eight feet of their goal,

the liquids spattering over it liberally. But the fire burned merrily on. Fairly conclusively the tests showed the feasibility of approaching pretty close to small fires via the plane method, and, what is perhaps more important still, that present-day extinguishers are hardly powerful enough to smother fires in the open.

A well-known corporation now claims to have developed a new type of fire-fighting equipment which shoots out carbonic-acid gas in such form as to create extremely low temperatures which condense atmospheric moisture and simultaneously exude so much gas that the flames are thereby smothered. Under a 900-pound pressure, the gas is put into small tanks weighing about forty pounds and suitable for handling by the average man. Larger tanks, holding about four charges, are announced to be used as supply units.

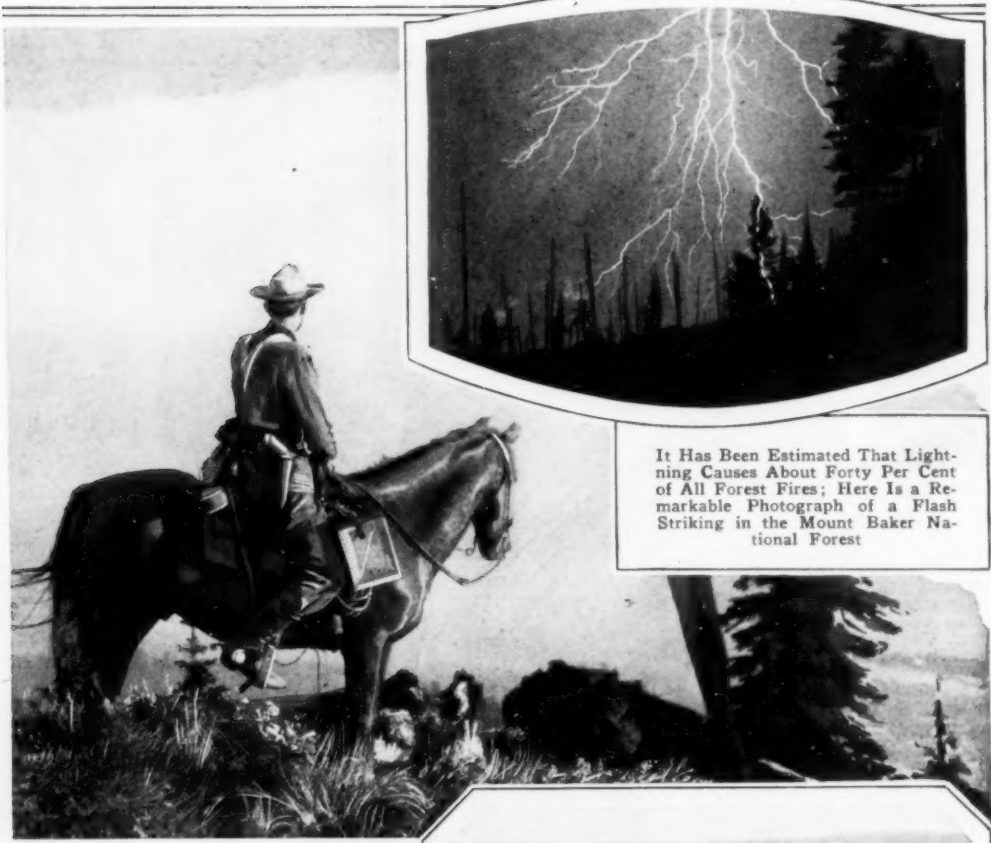
It is claimed for the idea that it enables a man to get unusually close to a blazing pile of slash. Foresters point out, however, that it would not extinguish fires as



A Bit of the Cleveland National Forest in California with Airplane Patrol on Duty, and, at Right, a Serious Fire in the Suislaw National Forest, Oregon; the Air Patrolmen, Though Few in Number, Co-Operate Effectively with the Rangers on the Ground; Half of the Fires That Occur Usually Gain Little Headway



Circling Lofty Mt. Jefferson in the Cascade Range, Oregon: Air Patrolmen Are Capable Flyers Trained to Meet Emergencies



It Has Been Estimated That Lightning Causes About Forty Per Cent of All Forest Fires; Here Is a Remarkable Photograph of a Flash Striking in the Mount Baker National Forest

Ranger on Duty in Cabinet National Forest, Montana, a Sturdy Guardian of Our Valuable Timber Resources; the Introduction of the Airplane-Patrol System Has Made His Work Easier and Safer, but with the Increase in the Number of Campers, There Is Still Much for Him to Do



Above, a DeHaviland Plane on a Patrol Trip in Southern California, and, at Left, One of the Peculiar Ground Signals That Help the Pilot Get His Bearings; Flying over Rough and Wooded Areas, Where Landing Spaces Are Few and Far Between, It Is Essential That the Aerial Patrolman Keep Constant Watch of His Location

Lower and two upper photos Courtesy U. S. Forest Service



efficiently as does water, because the gas tends to evaporate and combine with the air to such an extent that its effectiveness would be lost. Moreover, in handling the gas it is necessary for the operator to be exceedingly careful. The material comes out at so low a temperature that there is imminent danger from freezing.

Some time in 1923, a London paper carried an article to the effect that M. Turpin, inventor of melinite, had laid before the French ministers of war and agriculture a comprehensive plan for fighting forest fires from airplanes. He proposed that the center of the conflagration should be attacked with various chemicals or combinations of them.

Soon the U. S. forestry service was besieged with queries on the subject from well-meaning persons. Why could not the United States devise such a plan, they wanted to know. Very much to the point was the forest-service reply:

"Theoretically, it ought to be possible to suppress a forest fire by using one of the liquid combinations which form a heavier-than-air gas that would exclude the oxygen and stop the fire. The trouble with this is that, in addition to the prohibitive weight of the necessary volume of chemical extinguisher, the gas itself will float away if there is the slightest slope in the ground.

"The center of the conflagration is the least of our concern. The critical point of every forest fire is its outer margins. No effort is ever made to extinguish forests already ablaze. Every energy is directed toward preventing its further advance either by direct attack on its margins, where this is practicable, or by clearing all combustible material from a narrow path of the fire and holding it within limits until it dies down for lack of fuel to continue. An attack on the center would appear to be utterly futile unless you have sufficient means and materials to overwhelm the conflagration completely."



A Few of the Jeweled Objects Discovered in the Tomb of the Sumerian Queen, Shub-Ad

### JEWELS FIFTY CENTURIES OLD FOUND IN QUEEN'S TOMB

Rings of gold and silver, inlaid golden rosettes and small animal figures of the precious metal were among articles found in the tomb of the Sumerian queen Shub-Ad, unearthed recently by members of the joint expedition of the museum of Philadelphia and the British museum. The jewelry is over 5,000 years old, and adds to the interest of the discoveries in recent expeditions to Ur of the Chaldees.

### LIGHT FOR KEYS AND COPY SAVES TYPISTS' EYES



Double Light for the Typewriter Keys and the Copy

Both the typewriter keys and the copy are illuminated from a light combined with a convenient holder that may be attached to the desk with little trouble. The rays are directed in such a way as to reduce glare and eyestrain to a minimum.

Close View of the Glass Jewels, and  
a Sign Made of Them



Courtesy General Electric Co.

### SIGNS SET IN FLASHING JEWELS AID ADVERTISING

Use of sparkling glass jewels, like those introduced at the Panama-Pacific exposition and at other displays, has now been made in advertising. Signs, lettered with the glittering gems, and kept in constant motion by an electrical agitator, have made their appearance. One of the first was made of 400 of the jewels set on a gold background and brilliantly illuminated at night by colored flashlights. During the day, the gems reflect the light that strikes them so that they can be seen at a considerable distance.

### FORD'S JUNK PILE IS GRAVE OF MANY SHIPS

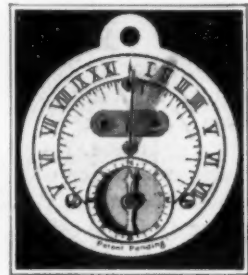
Henry Ford owns one of the world's largest junk piles as the climax of his excursion into ship breaking, following his purchase of 199 war-time ships from the government. The junk pile is a mile and a quarter long, thirty feet high and seventy-five feet wide, and represents the odds and ends left over after the Ford experts had finished salvaging everything usable. Their salvage work was so complete that, when they finished, they de-

clared, paraphrasing the Chicago packer's boast, that nothing had been lost but the noise made by the workmen. The huge junk pile will be fed into the blast furnaces and remelted to be turned out again as chassis members, engine blocks and other parts of cars, trucks and tractors. When Ford bought the ships from the government for \$1,706,000, steel was selling for \$10.50 a ton, and it cost him \$13 a ton for his steel scrap by the time the vessels had been reduced to 200,000 tons of scrap and 16,000 tons of plate. To offset the \$937,000 loss on the steel deal, however, he salvaged in one item alone—the 199 power plants of the

ships—material valued at approximately \$6,000,000. The boilers and engines were put to work in Ford factories all over the world. In addition to the profit of nearly five million made on the engines, thousands of other items were reclaimed, including electrical equipment, refrigerators, windows, doors, lavatories, bathrooms, deckhouses—which are used as watchmen's shanties—radio sets, cables, tanks, bunks, mirrors, pipe and fittings, valves, gauges, scales, hardware, stoves, furniture, pumps and many other things.

### POCKET SUNDIAL AND COMPASS LATEST AID FOR HIKERS

A sundial of practical value is offered hikers and campers in a pocket unit that can be used with little trouble and may be adjusted for any section of the country. The



indicator of the dial folds flat when not in use so that the article may easily be carried. The compass is safely housed under a glass top.

### MINIATURE FLYING FIELD BUILT FOR TOY PLANES

Los Angeles boys, interested in aviation, have been furnished a special landing field for their model planes. It is under the direction of the city playground



Scenes at the Juvenile Airport in Los Angeles, Where Boys May Try Their Model Planes; Insert, One of the Tiny Ships in Flight

commission and is laid out in close imitation of a real field with runways and loading areas. On the grounds is a machine and carpentry shop where miniature ships

may be constructed, and regular classes are held to help the youngster build them. Contests are held to demonstrate the efficiency of the tiny planes.

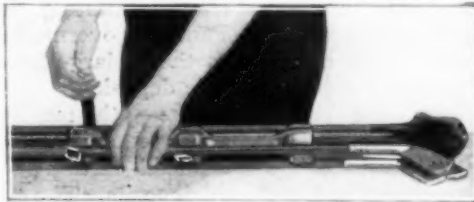
### ELECTRIC LIGHT GROWS WHEAT IN THIRTEEN WEEKS

Wheat that reached maturity in thirteen weeks has been produced at the University of California under electric lights and with jars of water containing the proper food for the development of the grain. Under ordinary field conditions, wheat requires about five months to mature. The quality of the laboratory variety is said to be superior to that produced in the usual way. The lights were turned on for sixteen

hours each day, and lengthening the time of exposure as the plants developed, increased the growth at an astounding rate.

### PRESS FOR GOLF CLUBS KEEPS SHAFTS FROM BENDING

Golf-club shafts are likely to become bent and warped, especially after being stored in damp places. To prevent this trouble, a special press has been devised. It holds six or more clubs, and each shaft fits into a specially designed groove. Straps prevent bending.



Golf-Club Press That Holds Six Sticks and Keeps the Shafts from Warping

# New Magic in Treasure



Seeking Metals with a Divining Rod, from a Centuries-Old Woodcut; the Rod Is Still Believed In by Many

**T**HE United States bureau of mines is about to issue a book on magic. It will tell how to find buried treasure by the latest methods, all of them improvements on the divining rod of immemorial antiquity.

Instead of the forked twig of hazel, willow, peach, or some other tree—the familiar “doodle bug” or “water witch” used by diviners for centuries—the modern treasure hunter utilizes a radio set, a galvanometer, a seismograph, or similar scientific discoveries.

The new magic of buried-treasure hunting is entirely different, and it already is being put to practical use on a considerable scale. It finds new ore bodies, locates underground lakes of petroleum, and is even applied to locating of treasure buried by men.

Some of the treasure finders are by-products of the war, others an outgrowth of the development of radio. One of the simplest is a method of locating deposits of silver sulphide far into the earth. Water, seeping down after a rain, oxidizes such deposits to some extent, the top layers more than the lower ones, and the result is an electrochemical action which

turns the ore body into a giant battery, continually releasing electric currents, flowing from the top to the bottom. A couple of iron rods stuck into the ground a few feet apart and connected to a sensitive galvanometer will detect the currents and locate the ore.

Another way of finding metal deposits is to use the radio—a direction-finding system comparable with that used in locating ships at sea. The ship sends out signals, which are received

on a vertical loop coil on shore, the signals reaching maximum intensity when the loop is pointed directly toward the transmitting vessel.

Ore bodies cannot send out signals, but they can be made to radiate secondary electromagnetic waves after being excited by waves sent out from a radio transmitter. A second coil picks up the waves from the ore and indicates its direction. After the bearing is plotted on a chart of the region, the receiver is moved, and another bearing taken. With two or more bearings, the intersecting lines determine the position.

A radio treasure hunter is being used in Panama with success to locate the buried gold and silver hidden by the Spaniards when Sir Henry Morgan looted the isthmus. An American officer has a treasure-hunting concession from the Panama government, and already has unearthed a large number of rare and valuable deposits.

One of the most unusual treasure hunters in practical use is the seismograph and artificial earthquake, used to locate new oil deposits. The seismograph is the same instrument employed to detect and record

# Hunting



Making an Artificial Earthquake with Explosives, So That the Underground Waves May Be Measured to Indicate the Presence of Ore and Other Shock-Resisting Substances Far Below

earthquakes, and it is used in the same way. The only difference is that a few sticks of dynamite are exploded to furnish the shock. Vibrations travel at one rate through air, at another through water, still another for earth, a fourth speed for rock near the surface, a fifth for deep-lying rock, and at other speeds for various materials which may be found within the earth. The dynamite is exploded by remote electrical control from the seismograph station, and the elapsed time until the shock is received by the instrument is recorded and compared with the known distance it had to travel.

Its success in locating oil hinges on the fact that salt domes and oil are found in many localities together. Where there is a salt dome there is apt to be oil. In free air, the sound waves travel 1,100 feet a second, through rock near the earth's surface 6,000 feet, and still faster farther underground. But in salt domes the speed may reach 16,000 feet a second, so the shock that arrives too soon to have trav-

eled through earth and rock all the way, probably passed through a salt dome on its journey.

The dipping needle, another of the treasure hunters, resembles in its action the hazel-twig divining rod, except that there is no question of its workings, and of the scientific explanation for them. The needle is simply a compass magnet suspended by a thread on a horizontal pivot so that it can move in a vertical plane. In an instrument fitted in this manner, the needle inclines at various angles at different places on the earth's surface, save that, theoretically, it will remain horizontal at the equator, provided there are no other factors to influence it. The presence of a mass of magnetic metal such as iron ore, or even a buried metal pipe, will change the angle, however. Carried across country, any change in its inclination indicates the presence of some attracting body underground.

Even the plumb bob—a lead weight on a string used by builders to check vertical



objects—can be used to locate ore. Theoretically the plumb bob, responding to the force of gravity only, should point directly toward the center of the earth at all times. But a near-by mountain may have enough attraction to deflect it, and a great mass of high density underground will influence it in the same manner.

A variation of the plumb-bob method, which is much more useful as an ore locator, employs an ingenious balance to measure variations in the attraction of gravity. Two small weights of gold or platinum are mounted on a light horizontal beam, which is supported in the middle by a fine wire. One of the weights

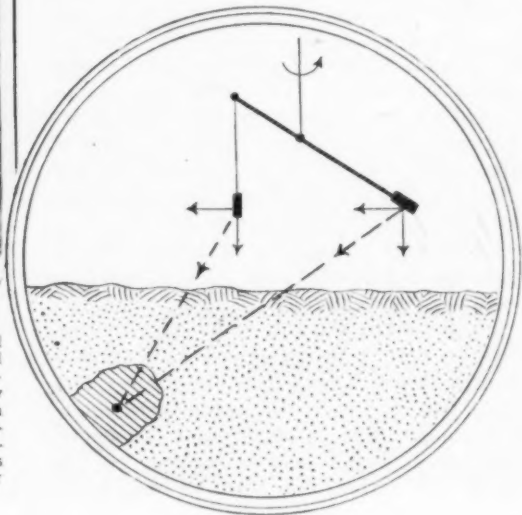
is fastened to the end of the beam, and the other hung a few inches below the opposite end.

When the device is brought in the neighborhood of a large ore deposit, the latter will act on the two weights with different force, causing the beam to twist. The extent of the twist is measured, and observations are made in other positions until the location of the attracting body is fixed and charted.

Buried treasure, whether planted by nature or by man, has always exercised a peculiar fascination upon the mind. The triumph of going out and digging up something no one knew was hidden often is equal to the actual gain. That explains the popularity of the divining rod through the centuries. Commonly supposed to have descended from the casting sticks used by the Romans in taking auguries of forthcoming events, the "doodle bug" made its appearance in its present-day form—a forked twig—as early as the fifteenth century, almost simultaneously with Columbus' discovery of America. Basil Valentine, an alchemist of the late fifteenth century, mentions it being used in the Hartz mountains of Germany by ore prospectors. In Queen Elizabeth's time it was taken to England by Cornish tin miners and employed to locate tin deposits. After the tin mines played out, it still continued in use for finding water, and it has its devotees to the present day, despite the frequent declaration of science that there is no more chance of finding

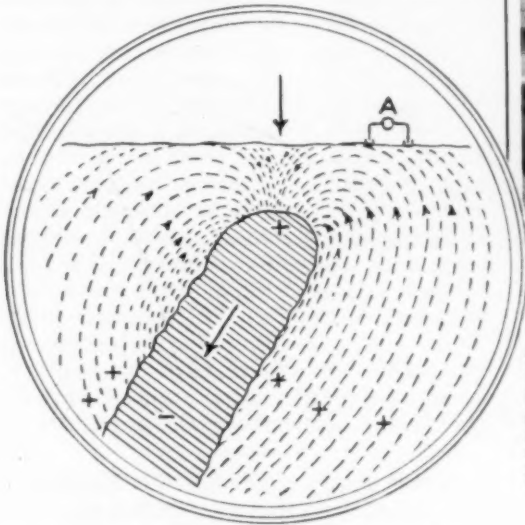


An Up-to-Date Water Hunter in England, Armed with His "Water Witch," Usually a Forked Hazel Twig Which Is Supposed to Dip When It Approaches Water; at Right, Diagram Showing How the Ore-Finding Balance Works When Suspended in the Vicinity of an Underground Ore Body; Seismographs, Radio Detectors and Other Scientific Instruments Are Being Used with Success, but Science Has Failed to Find Any Proof That the Water Finder Really Works



water with a divining rod than there is without it.

One reason why it has survived all scientific attempts to ridicule it, is the unexplainable fact that "water witchers" frequently have a record of far more successes than failures. Prof. W. S. Barrett, F. R. S., who devoted several years to a study of diviners in England admitted that fact, and decided that "motor-automatism" on the part of the holder caused the rod to twist without conscious volition on his part. What produces the involuntary twitching, though, remains a secret. It has been suggested that some people's ears may be peculiarly susceptible to sounds from running water underground; that the diviner's mind becomes a blank so that the faintest impression of the object searched for produces an automatic



motion of the indicator, and similar reasons. Like the homing instinct of birds and dogs, the diviner's ability, scientists have decided, lies beneath the level of any conscious perception.

None of the diviners have a logical explanation for their success, nor can they explain their failures, which usually are fairly frequent. Accurate observations made in England by several scientists, showed, however, that the percentage of successes over failures exceeded what might be fairly attributed to chance.

In the Middle Ages such miraculous powers were credited to expert water di-



A Woodcut of 1700 A. D. Ridiculing the Divining-Rod Devotee, Who Is Shown with a Tray Full of Instruments in One Hand, While, with the Other, He Twists the Nose of All-Seeing Wisdom, Represented with Three Eyes; Retribution Awaits Him Above, Indicated by a Whip and a Plague of Locusts; at Left, Diagram Showing How Rain Turns a Sulphide-Ore Body into a Giant Electric Battery, to Be Detected by the Galvanometer and Pair of Electrodes Shown at A

viners that they turned their hand to everything from searching for buried treasure to hunting witches and heretics for the church. Their abuses in the latter field became so great that in 1701 the Inquisition forbade the employment of the divining rod for purposes of justice.

### ONE-WAY WINDOWS

Designed especially for household use, a window introduced by an English inventor permits a person inside to look out but presents an opaque surface to one attempting to look in.

### KNOCKDOWN MODEL OF YACHT EASILY ASSEMBLED



Various Sections of the Model Yacht, and a Complete Assembly; Parts Are Connected in a Short Time

In a few hours, any boy who can handle simple tools, may assemble the parts of a knockdown model yacht now on the market and enjoy the pleasure of a small boat that sails. Besides saving time in construction, the knockdown outfit can be shipped with less danger of breakage.

### STEEL BUILDING SAFEST SPOT WHEN LIGHTNING STRIKES

The chance of the average person being struck by lightning while in his home is one in several million, declares R. M. Spurck, an engineer of the General Electric company, who has made a number of experiments with man-made flashes of high voltage. Make the chances as many million as you desire to calm your fears, he says, for the probability is so remote that a few million make no difference. Bolts can hardly touch you if you are in a

steel building, and almost every dwelling with plumbing or electric wiring is safe. The house may catch fire but lightning is not likely to hurt the occupants. The top of a hill, with no trees about, is the most perilous position as regards lightning, but the ordinary home surrounded by dwellings of approximately equal height is likely to be struck only about once in 1,000 or 2,000 years. During an electrical storm, keep away from walls in which pipes or wiring are concealed. Do not stand between two metal objects, such as a heating radiator and the plumbing pipes. Under the bed is one safe spot, but there are many other places in the home equally safe. The air-vent pipe that goes through the roof functions as a lightning rod in the usual home-plumbing system. Mr. Spurck explains the apparent mystery of lightning tearing off the sole of a shoe by the fact that when a bolt encounters the moisture, almost always present on the inside, steam is formed and the sole may be blown off. A perspiring laborer has a better chance for his life than a white-collared clerk in case lightning strikes him, for the moisture may carry the bolt off the laborer's body. When lightning strikes a crowd and kills several persons, the common belief is that the bolt was more violent than one which kills but one person. The reverse is true. Weaker bolts, thwarted by the resistance of a body, branch off and may kill other persons, but the more powerful flash shoots on downward into the ground.

### TIGER FACE ON MOTOR FRONT FEATURES HUNTING CAR



Tiger-Front Automobile for Hunting in India; the Figure's Eyes Are Flashing Green Lights

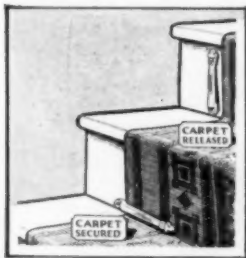
On the radiator front of an automobile, made in Berlin for hunting in India, is the replica of a tiger's head. The eyes are flashing green lights and the teeth are of steel. Besides being an attractive ornament, the head will probably aid in running the car through the jungle growths.

## DIRECT STEAMING OF ENGINE ENDS SMOKE EVIL

By piping steam from a central plant to locomotives in the roundhouses, thus making it unnecessary to keep separate fires under all the boilers, several railroads have reduced the smoke evil in their localities and are effecting savings in time and fuel. When the engine comes in, its fire is dumped, connection is made with the steam supply through a flexible piping from the main conduit, and the steam is introduced into the boiler through a special valve at the bottom, in somewhat the same way that air is pumped into automobile tires. The steam and hot water of incoming engines are utilized for locomotives going out. The engine is not fired again until it has been run out of the roundhouse. Tests of the system have given satisfaction in plants at Gouldsboro and New Orleans, La., Fort Worth, Tex., and at Chicago.

## HOLDER FOR STAIR CARPETS SAVES CLEANING TIME

To keep stair carpets in place, a swing holder has been introduced. It fits tightly against the covering, but, to release the carpet, it is simply pushed back, saving the removal of tacks or nails. Furnished in an ornamental pattern the holder does not detract from the appearance of the stairs and is claimed not to work loose easily.



© Herbert Photos

Mirror Photograph of Brooklyn Bridge, a "Rainy Day" Effect Produced with the Aid of Reflector Attachment on the Camera

## "MIRROR" EFFECT IN PHOTOS OBTAINED ON DRY DAYS

Photographs, emphasizing the mirror effect which is so pronounced on rainy days, can be taken in dry weather with the aid of a special attachment an eastern man has devised. It permits taking the approximate equivalent of a double exposure, but no distortion is noticeable.

## A CURE FOR SEASICKNESS

University of Chicago professors report successful treatment of seasickness by administering three to five grains of sodium nitrate every two hours. The chemical has a reducing effect on the blood pressure, thus diminishing the strain on the vestibule of the ear, which is thought to be the seat of the trouble. Of sixteen persons tested, eight were cured in two hours.

Holder with Hose  
in Two Positions

### GARDEN-HOSE HOLDER SAVES STEPS AND GETTING WET

Service of a special sprinkler can be obtained from the ordinary garden-hose nozzle with an adjustable holder now on the market. It directs the spray at any angle desired, and can be regulated without shutting off the water or approaching too close to the nozzle to get wet when it is running. A sharp spike anchors it firmly in the lawn when one position is desired for some time.

### COPPER ANAEMIA PREVENTIVE RAT TESTS SHOW

Copper is an essential factor in keeping the blood red and the body vigorous. University of Wisconsin chemists have declared. Their tests show that it has an important effect on anæmia in rats, a disease similar to anæmia in children who have been fed exclusively on milk. A shortage of iron has been credited with being responsible for the disorder, and, although iron compounds are still limiting factors, their influence, according to the

Wisconsin investigators, depends upon the presence or absence of copper. The daily feeding of iron in various forms to rats afflicted with anæmia did not check the trouble. But when a supply of iron was obtained by feeding dried liver, or the ash of dried liver, corn or lettuce, an improvement was noticed. The chemists observed a pale, bluish color in the ash of the substances prepared, the typical hue produced when copper compounds are burned. This led them to add copper sulphate as a supplement to an iron compound in the whole-milk diet. Striking cures were the result. The role of copper in plant and animal tissue is not clearly understood, but it is believed to act as an agent that causes the beneficial functions of other chemicals. Experiments with copper in the diets of human anæmia patients are planned at leading hospitals.

### HAND-SIZE AUTO-BRAKE TESTER SIMPLE AS A WRENCH

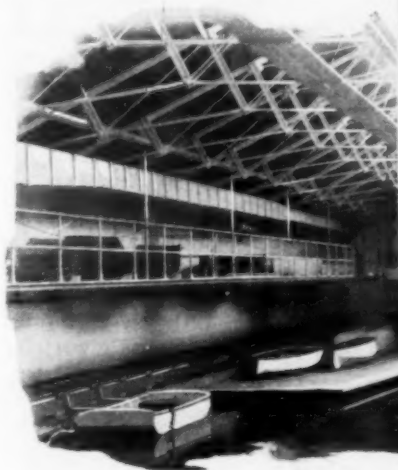
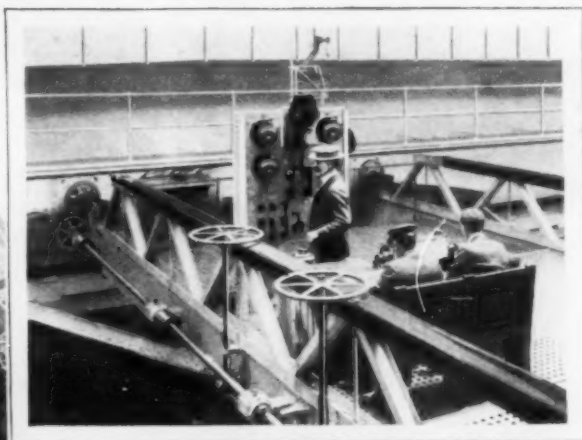
One man can perform an accurate examination of the automobile brakes with the aid of a hand-sized tester that is said to be as efficient as the larger and more complicated units, and yet does not take up valuable garage space. The amount of tension is registered by an arrow at the side when the tester is depressed against the wheels, so that brakes can be equalized exactly and with little trouble. With each unit, a locking-type pedal depressor is furnished.

Brake Tester, and  
View in Use



## WHERE SPEED OF SHIPS IS TESTED WITH MODELS

The speed of American ships, their fitness, their seaworthiness and their beauty of line are studied in a picturesque pool at the nation's capital. Not many people see this basin of water. It



View of the Model-Ship Testing Pool and the Suspended Carriage Where the Measuring Instruments Are Located, and the Observers Stand during the Test

is not on the list for tourists, yet it is one of the most interesting sights in Washington. The experimental model basin is located in the navy yard. It is housed in a long, low building, covering an enormous pool of water, 470 feet in length, some forty-two feet wide and fourteen feet deep, containing more than 1,000,000 gallons of water. The models tested are all twenty feet long and made of California redwood. From a seat on the giant carriage above, the behavior of the craft is watched. Just how fast the liner will go, how much fuel it will consume, how much it will cost to operate, is all discovered and checked by the tests administered to the miniature. The basin gives the solution and the answer to the work of the ship's designers. It proves absolutely if he is right or wrong in speed construction of the hull and as to behavior under storm conditions. For here, by means of giant fans and other devices, storms can be simulated. Chiefly, it is the speed of the model that is watched. It generally takes

two weeks to properly test a ship's model. In that time, its every movement in the water is closely reported, graphed and charted for later study and recording. The forty-ton carriage that spans the basin is used for measuring instruments, for observation and for the towing of the models. It is operated by four electric motors under easy and instant control. The resistance offered to the hull of the little craft is recorded, and the speed indicated.

### FLYING BECOMING SAFER

According to statistics compiled by a life-insurance company, aviation accidents, in proportion to the mileage flown throughout the United States, are diminishing. In 1926, there were 160 fatal accidents in air operations, including those that happened to pilots, mechanics and others. Full reports for 1927 have not yet been compiled, but it is believed that the total will be less, although the mileage was far greater.



Target Practice at Dummy Figure of Man behind Barrier Which Represents the Bars of a Bank Cashier's Cage

### TARGET DRILL FOR BANK CLERKS HELPS CURB ROBBERS

Los Angeles police have been instructing various bank clerks of the city in target practice so that they may be better able to cope with robbers in case of necessity. A target, shaped like a man, is used, and to duplicate, as nearly as possible, actual conditions in a bank, the shooting is done behind a shelter which is composed of a partition with a window and a set of bars to represent those around the tellers' cages.

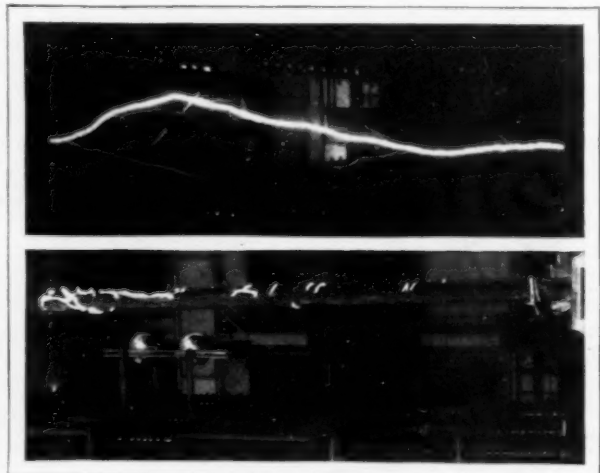
### MAN-MADE LIGHTNING SETS NEW RECORD WITH FLASH

Artificial-lightning flashes of 3,600,000 volts each, the highest ever obtained with laboratory apparatus, were made in an experimental plant of the General Electric company recently, in connection with work being

done to further protect life and property from lightning. These huge sparks, each with voltage about seventeen times greater than that carried by the highest-voltage transmission line in this country, lasted only about one-tenth-millionth of a second, and electricity for them was stored in artificial clouds just as it is accumulated in real thunder clouds in the sky. Waves of lightning, the tests showed, travel along a metal wire just as water waves travel on the ocean. As waves splash up to a double height when they strike a wall, so the lightning waves "splashed" up to double voltage when they struck the end of a line.

From direct voltages of 3,000,000, voltages of

more than 5,000,000 were observed by reflection from the open end of a line during the experiments. Lightning is one of the greatest foes of electrical apparatus, and much already has been done in the company's laboratory to produce outfits that will be proof against accidental flashes,



Courtesy General Electric Co.

One of the Giant Man-Made Lightning Flashes and Part of the Apparatus; Electricity Was Stored in Artificial Clouds

# With UNCLE SAM'S DEVIL DOGS



Soldiers of the Sea on Guard at the Mouth of the Ozama River in Santo Domingo; a Scow and a Tent Become Headquarters for the Marine Guards of the Patrol Boats

**D**OWN the streets of Paris island, S. C., swings a regiment, led by a brass band. The bandmaster twirls his gold-plated baton, tosses it into the air, and the band blares into life with one of the most stirring marching songs ever written:

"From the halls of Montezuma  
To the shores of Tripoli . . ."

Another regiment of "leathernecks" has completed its twelve weeks of intensive training and is off somewhere back of beyond to tell some restless people that firearms are dangerous things to play with, and they must be good. For, wherever in the world local governments fail and the lives and property of foreigners are threatened, sooner or later a squad, or a company or a regiment of United States marines will happen along to restore peace.

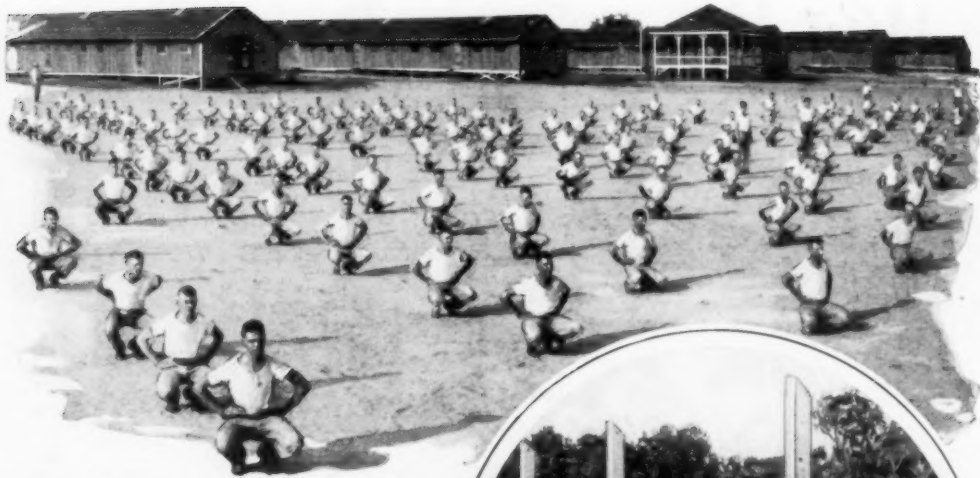
There are a thousand officers and 18,000 men serving in the "Soldiers of the Sea"—and seventy-five per cent of them are on foreign duty. Marines are guarding international trains, patrolling rivers and protecting legations and foreign settlements in China. A leatherneck army is

chasing bandits through the hills of Nicaragua. In Haiti they are the guardians of the peace. There are detachments in the Philippines, Guam, on the Panama canal, at Guantanamo, Cuba, and in the Hawaiian and Virgin islands.

When mail bandits got active at home, the government called for the marines and installed armed guards on the trains. In fact, it has become so customary to shout for the marines whenever trouble threatens that senators have even suggested using them to deal with local disorders, and a marine general, Smedley Butler, got a leave of absence to reorganize the Philadelphia police.

Starting primarily as a seagoing police force—and therein lies the age-old enmity of sailor for sea soldier—the marines also were used as sharpshooters to repel boarders in the hand-to-hand fights of sailing-ship days, and as landing forces to take and hold enemy towns.

They still retain their naval connections as a separate corps under the navy department, but most of their fighting now is



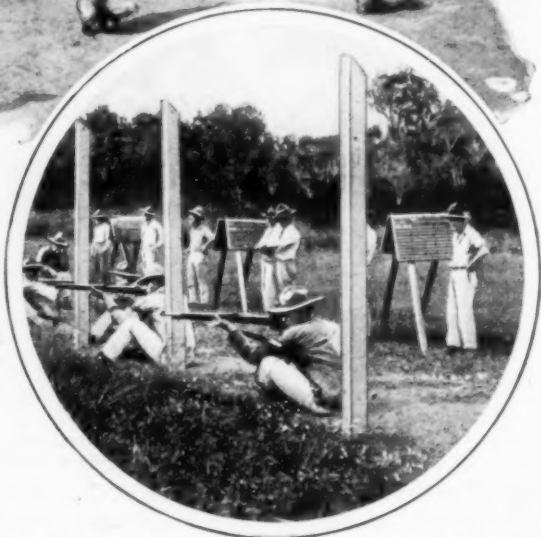
done on land, for the days of hand-to-hand sea fights have passed.

Within the corps, though they form an army and a navy of their own, capable of handling river and harbor patrols afloat, or of fighting on land or in the air, they are infantry, artillery, machine gunners, tank corps, sappers, scouts, cavalry and air force, all rolled into one.

In time of war, if the navy doesn't need them, the president is empowered to transfer the leathernecks to the army, and it was under army leadership that they invaded the halls of Montezuma at the taking of Chapultepec during the Mexican war; fought at Vera Cruz with Gen. Funston, and served in the second division when they stopped the German advance in the wheat-fields along the Marne and earned the name of "Devil Dogs" in grudging admiration from the same Germans who had named England's killed Scotsmen the "Ladies from Hell."

Only one out of every eight or nine who applies to join the marines gets past the initial examination and is sent either to Paris island, on the Atlantic, or San Diego, on the Pacific. Out of these two schools, at the end of twelve weeks' training, come leathernecks, and before the hard-boiled drill sergeants have finished the three months' drill, the recruit has fairly earned the title.

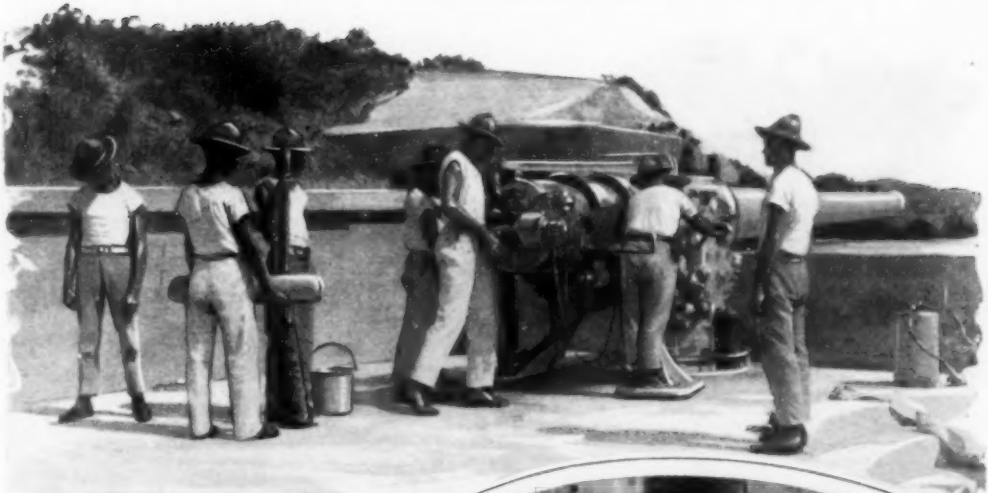
The Pacific fleet gets its marine replacements from the depot at San Diego, and the Atlantic fleet draws either from



Recruits Doing Their Daily Dozen at Paris Island, S. C., and Marines on the Rifle Range at Guantanamo Bay, Cuba

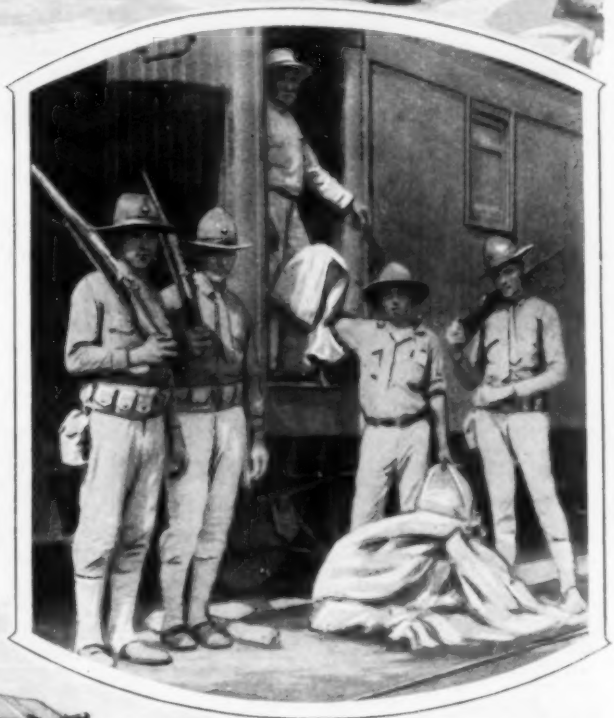
the school in South Carolina or the big marine base at Quantico, Va., which is the real headquarters of the corps. In times of emergency, entire regiments are shifted around the world. Drafts from the east and west coasts were rushed to China a year or so ago, and far-flung marine stations contributed to the division mobilized in Nicaragua.

The fight with Sandino's bandit army in the Nicaraguan mountains has been the most extensive small war in recent years, not because of the size of the enemy force, but because of the difficult country over which the troops have to move. Mountainous and sparsely settled, without roads or navigable streams, with impenetrable jungle lining the few poor trails, it has been ideally adapted to the guerilla tactics of the bandits, and is the worst place in the world for operations with organized forces.



Marines as Artillerymen Man the Coast-Defense Guns at Guantanamo, and as Soldiers, Right, Guard the Nicaragua Mail

The marine air force, however, introduced a new note in Central American warfare. Swooping over the bandit lairs, the marine flyers sprayed the surprised rebels with machine-gun fire and scattered them with deadly little bombs. The only way to tell the difference between presumably peaceful natives and the armed bandits was to wait until the latter opened fire, but once they attempted to attack the planes, the retribution



Marine Patrol Sets Out for a Tour through the Unpacified Districts in the Island of Haiti





Marine Pack Train, in Haiti, and, Left, with the Camera, Lieut. Schilt, Hero of the Evacuation by Air of Wounded Comrades in Nicaragua

followed so swiftly and effectively that the Sandino forces soon discovered their only safety lay in not firing on flyers at all. Lieut. Christian Schilt, a marine flyer, has been recommended for the congressional Medal of Honor for flying through bandit fire again and again, landing his ship



The Knights of King Arthur's Court Never Saw a Joust to Rival This Burro-Back Tournament Staged at the San Francisco Barracks



Marines Standing Inspection on the Dock before Boarding Their Transport for Service Overseas; the Corps Is Proud of Its Long Service Record in Every Part of the World

in a narrow rutted street of a tiny hill village and ferrying out five loads of wounded marines after one battle.

In their journeys over the globe, the devil dogs have been forced to adapt themselves to every sort of primitive condition, and Nicaragua was no exception. The only suitable draft animals to transport supplies to the regiments chasing the bandits were oxen, hitched to unwieldy wooden-wheeled carts. Marine ox trains were organized, mules were brought in to transport light mountain guns, and with the very latest thing in fighting planes humming overhead to guard the trails, the leathernecks have moved steadily up country.

Pacifying a country is one task, but before it is safe to leave, there must be some assurance of future order; so, simultaneously with the move on the rebel strongholds, the marines set to work to organize and train a Nicaraguan national guard to take their place when they left. Marines were detached and loaned to the Nicaraguan government, which commissioned them in the guard. Corporals became sergeants, sergeants were commis-



Marines Marching Past as the Stars and Stripes Is Hoisted over Vera Cruz, Mexico, Following Its Occupation; the Expedition in 1914 Was the Marines' Second Venture in Mexico

sioned as lieutenants and captains, lieutenants as majors, captains as colonels, and so on. As fast as the native troops were trained, they were sandwiched in among the marine companies for active service. Training the natives was a difficult problem, because they have never had any conception of a military force without political affiliations. Native armies always belonged to the ruling politician or took the side of the politician who was trying to oust the temporary ruler. Several of the native recruits had to be discharged because they talked politics in public, but eventually the bulk of the new troops began to get the idea of a national army unconnected with any faction.

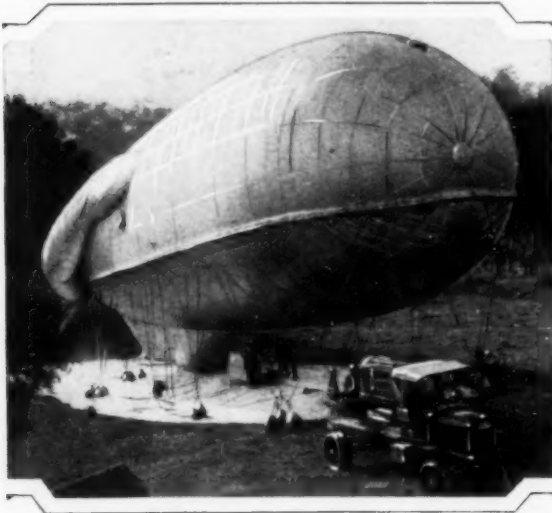
For the marines themselves training never stops. They are encouraged to pursue correspondence courses, which are fur-

nished by the government. The schooling—subjects being optional with the students—covers stenography, automobile mechanics, carpentry, plumbing, farming, poultry raising, radio and similar courses which will fit the men for profitable work when they retire from the service.

The corps has six bands, including the famous marine-corps band stationed at Washington, and operates musical schools at Paris island, San Diego and Quantico, from which 150 trained musicians are graduated each year. Schools for cooks and bakers, operated by the corps, turn out 500 experienced bakers each year for service in the corps. Athletics gets its share of attention, with rowing, swimming, baseball and football as major interests, and boxing, wrestling, polo and other games for those who prefer them.

The formation of the seagoing infantry goes back to Colonial times. One battalion of leather-necks fought with Washington at Princeton and Trenton. John Paul Jones, Barry and Biddle all had marine detachments to aid in their sea victories. Marines fought the pirates of Tripoli and the Barbary states, and they have met West Indian freebooters, South sea cannibals, West African slave raiders, American Indians, and have even served in Abyssinia, as guard for a legation sent to negotiate a treaty with old King Menelik.

Although they are connected with the navy department, their officers



Marine-Corps Sausage Balloon Used in Maneuvers on the Historic Battlefield at Gettysburg, and Gunners in the Field with a Pair of Long-Range Anti-Aircraft Guns

have army titles, the commanding officer being a major general, a post now filled by Maj. Gen. John A. Lejeune. Officers for the corps come partly from the ranks, and partly from the naval academy at Annapolis. Students there who elect to enter the corps are given special training in their final year, and are then commissioned as second lieutenants, U. S. M. C., instead of as ensigns, U. S. N.

### SHIP'S SPEED AND DISTANCE SHOWN ON LOG

The speed of a ship and the distance it travels are automatically registered on a special meter which has recently been introduced. An important part of the apparatus is a rod which extends through the bottom of the vessel and into water not affected by the ship's motion. Pressure created by the velocity of the vessel is transmitted through tubes connected to the rod and is translated into terms of speed on a special instrument calibrated to record the number of knots. An electrical apparatus, operated in conjunction with the speed meter, shows the distance traveled. The readings on both the speed and distance indicators are duplicated on dials set at convenient points in the ship.

### BOTTLE OPENER ON KEY TOP ALWAYS AT HAND



Keys with tops notched to form a convenient bottle opener have been placed on the market. Blanks of this pattern are available so that smiths may fashion a key of any desired form from them.

### ODORS TO CURB COLDS

An eastern physician employs four small bottles of pungent substances to aid in treating colds in the head. The sufferer is asked to sniff each in turn until he can distinguish one of the odors. The practice is said to stimulate the affected membranes and afford relief in some cases.



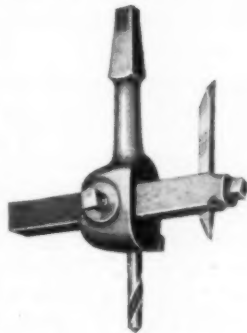
Brush Head Turned, to Show Ease of Up-and-Down Movement for Thorough Tooth Cleaning

### TOOTHBRUSH HEAD ON PIVOT GIVES BETTER CLEANING

With an adjustable toothbrush, now on the market, the teeth may be scrubbed with an up-and-down movement as well as across, thereby reducing the likelihood of decay and making the cleaning task somewhat easier. With a simple twist, the head of the brush may be set at any angle desired.

### HOLE CUTTER FOR ELECTRICIAN SAVES TIME AND WORK

For cutting conduit holes in cabinets, gutters, switches and the like, a simple tool is now available. It fits handily in the kit and operates on sheet metal, fiber, bakelite and other materials. The cutter itself is made of high-speed tool steel and the shank fits a standard brace.





Ironing Board Attached to the Springs of the Disappearing Bed; One Space-Saving Position

### IRONING BOARD ON BED SPRINGS SAVES SPACE AND FURNITURE

Designed especially for hotels and apartment buildings in which disappearing beds are installed, a folding ironing board may be fastened to the bed spring or to any convenient door or wall. It is held up out of place by a spring catch which is released by pressure of the finger when the board is wanted. The arrangement keeps the guest from spoiling other furniture in the hotel room, saves space and involves but little work of installation, as the board is fastened with screws.

### HUNT SUGAR CANE BY AIRPLANE TO INCREASE U. S. YIELD

Over the lands of the head-hunters in New Guinea, an airplane expedition will soar this summer in search of varieties of sugar cane that may be grown to advantage in the United States. In a few hours, they will be able to cover a territory that would require months to explore on foot. The venture is partly inspired by the success of other kinds of sugar cane, imported

here, which have yielded far more than the domestic varieties, and also brings to light a romantic incident of the disastrous floods in Louisiana, in 1927. Until two years ago, the sugar-cane industry there had been suffering severely from inroads of plant diseases. A tested variety, imported from Java, had thriven in spite of insect and other pests, however, for, though it contracted the disease, it was not harmed by it. The floods threatened to destroy a large plantation of this cane. Would the planters below consent to the cutting of the levees so that it might be saved? They did, but the sacrifice was rewarded for the imported variety is producing far greater yields than the old, disease-ridden kinds. The airplane expedition will search for other canes that may be cultivated here with even better results.

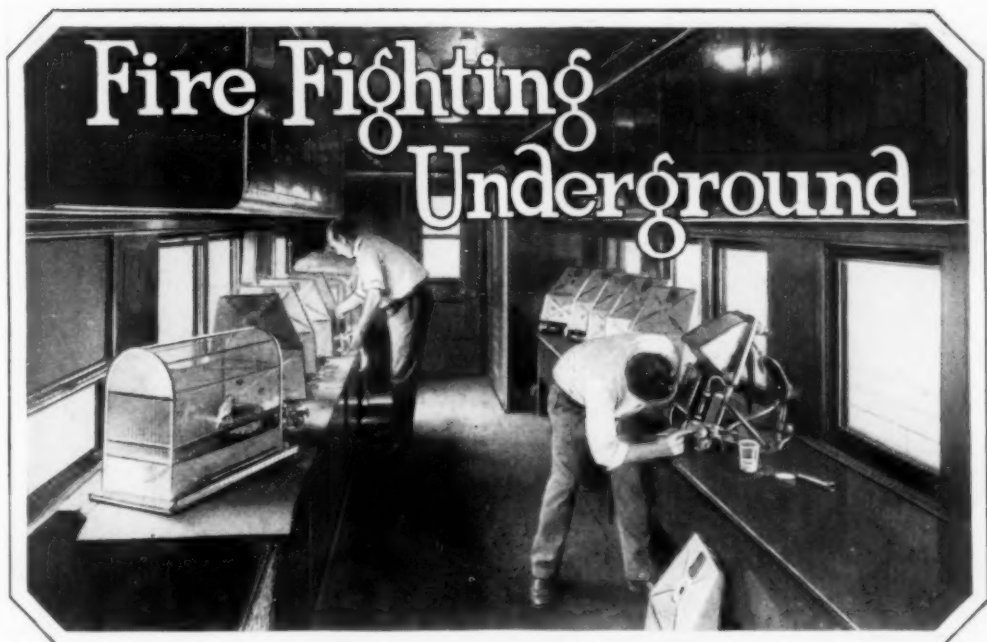
### BANK VAULT OPENS FROM INSIDE TO FOIL ROBBERS

Easily installed in the bank vault, a special handle arrangement releases the locks from the inside, so that anyone trapped within may quickly escape. This would frustrate a robber's plan to shut a bank attache in the vault until the time locks operated, as the prisoner could open the doors before or after that time. In operating the handle, knowledge of the vault's combination is not necessary.



Interior View of Vault, Showing Handle That Unlocks Door from Inside





Canaries to Test Mine Air, Left Foreground, and Two Mine-Rescue Workers, in the New Bureau of Mines Car, Inspecting the Oxygen-Breathing Apparatus Used Underground

**S**PEEDING a thousand miles through the night, clipping eleven hours from the best railroad time for the journey on a trip unique in the annals of international humanitarian work, a mine-rescue car from the United States recently crossed into Canada to put out a fire in the biggest gold-producing mine in North America and recover the bodies of thirty-nine victims of the disaster.

The dispatch of equipment and men outside of the country was without parallel, but the job was all in the day's work for the crew. Car No. 3, the latest and finest of the ten at the disposal of the bureau of mines, was at Jenners, Pa., a mining village seventy-five miles south of Pittsburgh, when the appeal for help was received. It was in charge of Russell G. Thornburg, foreman miner, who had just been transferred after a long period of rescue work in the Alaskan mines, and to reach Canada the car would have to pass through Pittsburgh, where the experimental station of the bureau of mines is located, and where additional expert fire fighters and equipment could be obtained.

It was nearly midnight when the order reached the car, reposing on a rusty siding of a meandering branch-line railroad.

An engine was obtained and hastily fired up, the car jolted down the mountain spur to another branch-line junction a dozen miles away, and down that line in time to be hooked onto a main-line passenger train at 4:00 a. m. Reaching Pittsburgh at dawn, the car picked up four more fire fighters and began loading extra apparatus.

Fifteen sets of oxygen helmets and tanks, the absence of which had kept the Canadians out of the burning mine, were taken, as well as twelve gas masks built to bar any form of poison gas. The Canadians have gas masks, but they are useless when thick smoke and poisonous fumes have driven out all air, for then there is no oxygen to breathe. Two dozen carbon-monoxide self-rescuers, a little device to be worn at the belt and used to filter out poisons temporarily in an emergency, an assortment of electric and flame safety lamps, ten cylinders of oxygen, poison-gas detectors, and four canaries were among the equipment. The canaries were all veterans of many mine fires in which, by drooping or falling over unconscious, they had warned the crew of poison gas before it had become dangerous to the men. There were also several sets of gas-analysis apparatus which enable the bearer,



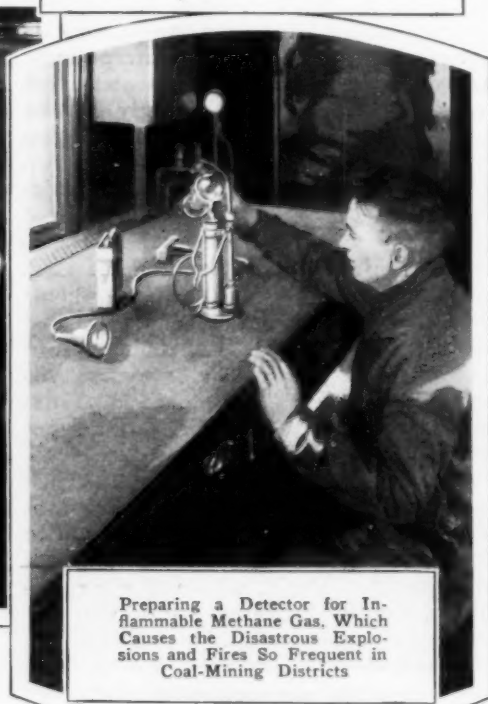
Filling Flasks with Oxygen on Mine-Rescue Car; Each Steel Bottle Lasts Two Hours, Then Another Must Be Connected to the Mask



With the Apparatus Above, It Is Possible, by Analyzing a Sample of Air, to Tell Whether Fire Is Raging Underground, or Poison Gas Is Present in Dangerous Amounts



A Rescue Crew Adjusting Oxygen Masks and Tanks before Entering a Burning Mine; the Masks Render Them Immune to Every Form of Gas and Smoke for Two Hours



Preparing a Detector for Inflammable Methane Gas, Which Causes the Disastrous Explosions and Fires So Frequent in Coal-Mining Districts

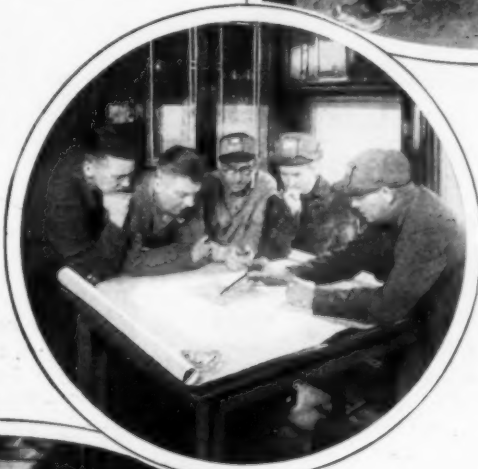
through examination of an air sample from any part of a mine, to determine whether there is fire or dangerous gas in the immediate vicinity.

With that load, and fire experts gathered from Washington, Pittsburgh, and from a mine on which they were working at Wilkes-Barre, the car started northward. Between Pittsburgh and Buffalo, pulled by a special engine, it clipped two hours off the passenger-train record. The Canadian national lines took over the car at the border, rushed it to Toronto and, after a brief stop, on for the last 485-mile dash into upper Ontario, over a winding frontier road, with snakelike curves through the endless forests, where snow lay four feet deep. The engineer on the last division was nearly frozen when the train reached Timmins shortly after daylight.

As the car came to a halt on the mine siding, the difference between fighting an above-ground and an underground fire became apparent. There was no speeding of apparatus to



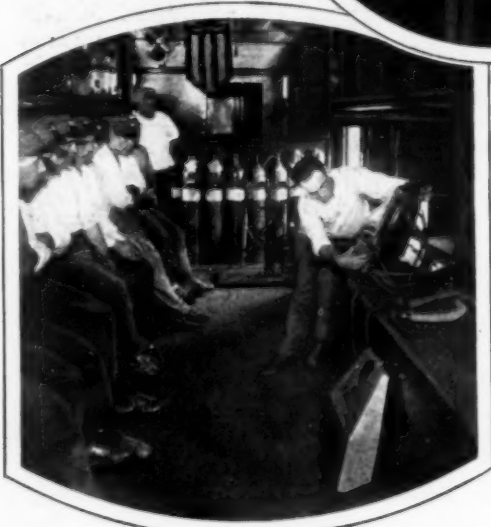
Using a Safety Lamp to Detect Dangerous Gases Clinging to Roof of a Coal Mine, and the Crew, at Left, Studying the Map before Going Underground



the scene, nor did the rescue crew hurriedly don their oxygen masks and dash to the mine cage. Instead, they called for maps of the 100 miles of tunnels in the great Hollinger mine and a report on conditions and what had

been done since the fire started. When they reached the reeking smoke-filled levels, only one course was possible; the mine must first be cleared of smoke so they could see ahead. The objective was the area of smoldering fire, where tunnel timbering was ablaze, but a bare 300 feet from the known fire center was a powder-filled magazine, which the flames might attack before the men could prevent it.

At 11:30, the firemen reached the magazine and found both its attendants dead. Screens were erected to isolate the magazine and force pure air ahead to drive the fire back. Hours were spent covering the last 300 feet, but at 5:20 in the afternoon the fire center was reached, and an order went back to bring up the hose. At 6:45, the rescue crew turned on the water,



Forty Thousand Miners Were Trained Last Year, as These Are Being Taught, How to Safeguard Their Lives When a Mine Fire Occurs

## LIGHTED AIRPLANE TARGETS AID NIGHT SHOOTING



One of the Sleeve-Shaped Targets with the Light in Front, and Drawing Illustrating How Night Gunnery Practice with the Flying Marks Might Appear

Sleeve-shaped targets, towed by airplanes and having small flashlights mounted on the frame, are being used by the navy for gun practice at night. They are towed a safe distance behind the plane and, at an altitude of several hundred feet, closely resemble a real plane as it would appear if flying "dark" at a much greater height. The lights are placed on the front of the target so that the gunners can fire directly at them as they would have to do under actual fighting conditions and, in an attack of a plane on a ship, the flying craft always comes straight at or over the vessel. The reason for night practice is

that the use of strong searchlights in locating hostile planes is not always possible in warfare. On the other hand, if the lights are used, they sometimes suddenly blind the enemy pilots so that gunners on the vessels will have a chance to hit their craft before the bombs are dropped.

#### SOUND WAVES SET OFF ALARM TO FRIGHTEN BURGLARS

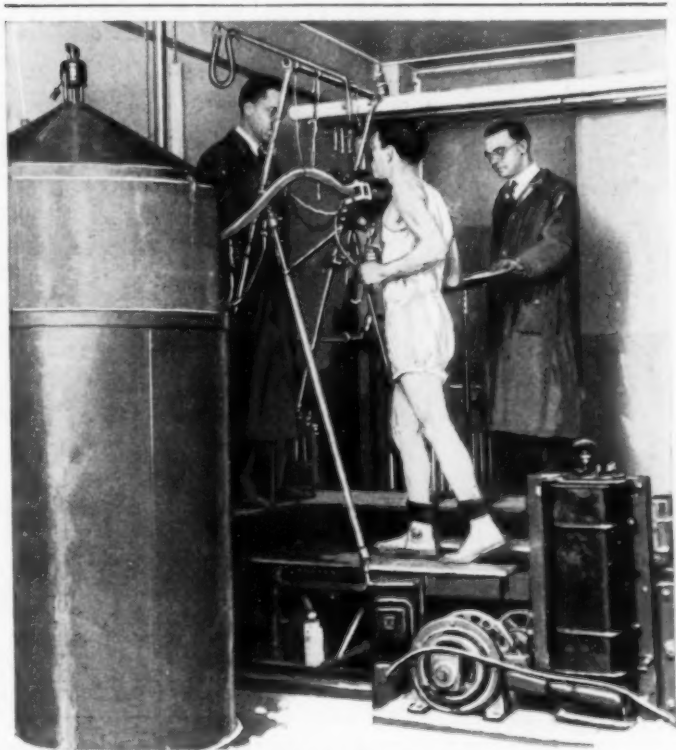
Efficient protection of banks and vaults against burglars is provided by an alarm so sensitive that it is set off by waves caused by talking, striking or tampering

with the protected area in any manner that produces a noise. The operating mechanism is electrical and is concealed in a cabinet together with the clock that governs the setting and release of the system, while the other important part of the installation—a small case on which the sound vibrations strike and relay their action to a loud gong on the exterior—may be placed on a ceiling, wall or other convenient location. It is inconspicuous and, of course, cannot be disconnected from the alarm circuit, while the system is operative, without sounding the signal. A special feature of the apparatus is that it is automatically reset. Should one alarm be given, it adjusts itself for another after the bell has rung for a certain time. Tests with the alarm showed that it was set off by the sound of voices in the vault, by cutting through the walls, and by the noise of explosives or the backfire of an oxyacetylene torch.

#### DISPENSER FOR SHAVING CREAM PROMOTES SANITATION



Shaving cream is applied directly to the brush from a special dispenser now on the market, eliminating the unsanitary mug, and effecting a saving of the cream. The unit is stationary, so there is no difficulty in finding the tube. One container holds enough cream for more than 500 shaves, and it is easily refilled.



Treadmill Practice for a Runner While Experts Make Measurements and Tests to Show the Degree of Fatigue after Performance

#### TREADMILL TEST FOR ATHLETES AIDS STUDY OF FATIGUE

Interesting findings concerning the relation of physical exertion and fatigue have been made at Harvard University by examining athletes while they are performing various tasks. One of the experiments consists in placing a subject on a treadmill and having him wear a special mask while he exercises on the mill. Carbon dioxide, given off in breathing, is collected and measured, to estimate the accumulation of poisons as a result of the exercise. The treadmill can be adjusted to demand different degrees of exertion. By correlating the effort expended with the length of time the test lasts and the amount of oxygen consumed, an analysis of the subject's performance may be more accurately made than would be possible in an actual race.

☞ Gold is said to be the most widely distributed metal, next to iron.

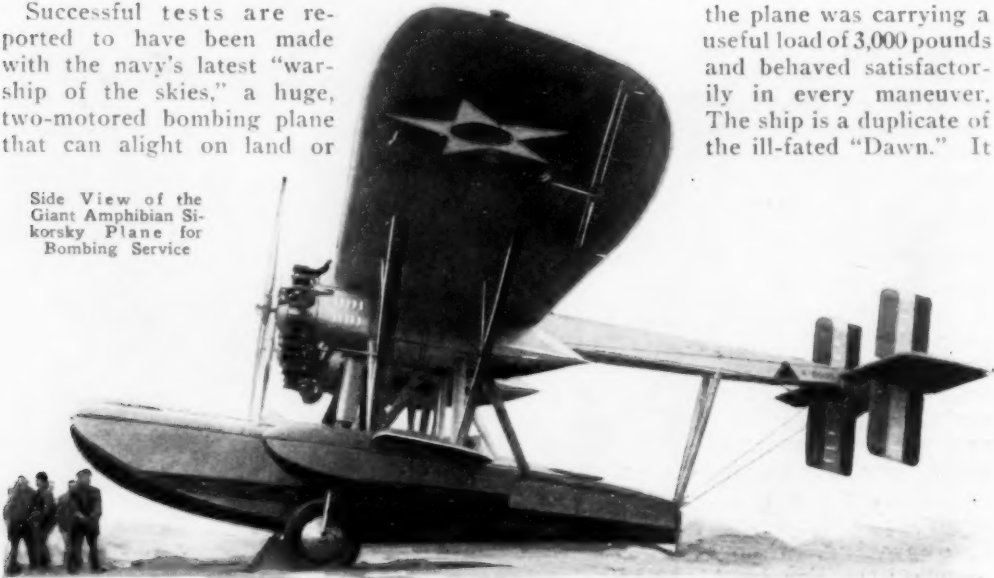


## LATEST NAVY AMPHIBIAN CARRIES GUNS AND BOMBS

Successful tests are reported to have been made with the navy's latest "warship of the skies," a huge, two-motored bombing plane that can alight on land or

the plane was carrying a useful load of 3,000 pounds and behaved satisfactorily in every maneuver. The ship is a duplicate of the ill-fated "Dawn." It

Side View of the Giant Amphibian Sikorsky Plane for Bombing Service



water. Besides bombs, it carries three machine guns. On one of the test flights,

has four cockpits, one for two passengers and the others for machine guns and crew.

## GUIDE TEACHES GOLF PUTTING TO IMPROVE GAME

To aid in acquiring skill in putting, a special holder for the club has been devised by a well-known golf player. It is attached to the stick handle by a clamp and has projecting arms that fit against the legs. The club is allowed to swing as a pendulum and in the correct manner to accomplish a successful putt. By using this guide for a few trial strokes and then putting without it, the beginner makes rapid progress in learning the correct form. The attachment fits in the golf bag, is put on or taken off in a few seconds, and is said to be especially helpful in curing the young

player of faults that he may have acquired in previous putting practice.

## ROOTS AS MINERS

Roots of vegetables and other plants are among nature's most efficient miners, investigation by Prof. John E. Weaver and Dr. William E. Bruner, of the University of Nebraska, has disclosed. By excavating a deep trench alongside the various plants studied, and carefully following the development of the roots, they traced the operations of radishes, beans, melons and other products. A four-year-old rhubarb plant was found to occupy a cylindrical space of soil equivalent to eight feet



Putting Guide in Use, and Close View, Showing Connection with Grip

in diameter and eight feet deep, while some of the longer roots reached eleven feet, and a ten-year-old horseradish plant had roots fourteen feet deep.

### SEEK TO IMPROVE PARACHUTES WITH SILK SUBSTITUTES

Search for a satisfactory substitute for silk in making parachutes is under way at Washington. The United States needs 5,000 of these articles in peace time, and would require 30,000 to 40,000 in the event of war. Most of the raw material for them is imported. Silk is light, strong and durable and has the valuable quality of "bounce," that is, it springs out of the wrappings and, so, quickly assumes a position where it will open. Other materials tested have many of the desirable features of silk but lack this springiness. Cotton yarn has been treated and woven with a degree of success, and experiments have been made with the cellulose substitute for silk, but this substance has too great a tendency to absorb moisture. So far, the best results have been attained with long-staple cotton of a special grade. Recently, American research workers discovered a way to weave the silk so that the parachutes would have even greater bounce than was possible with the imported fabric.

### TRUCK WITH REVOLVING SIGNS LATEST ADVERTISING AID

Revolving drums on the sides of an automobile truck that appeared in Tampa,



Moving Billboards on Auto Truck; the Posters Revolve as Vehicle Proceeds and Are Lighted at Night

Fla., recently, carried forty different signs, advertising various products. The posters turn as the auto is run and, at night, the legends are brilliantly lighted with electricity from the truck's circuit.



Removing Old Wall Paper with the Portable Steaming Outfit, Which Also Cleans the Wall

### STEAM WALL-PAPER REMOVER ALSO CLEANS SURFACE

Old wall paper is easily and quickly removed with a portable steaming outfit now on the market. The vapor is applied through a hose and a wide concentrating plate which is held against the wall. The steam is generated in a lightweight boiler which one man can easily carry and is cheap and simple to operate. Steaming the paper for a few seconds softens it so that a scraper can be run underneath it and the paper loosened from the wall without damage to the plaster or other material below.

### LIGHTS DIMMED TO TELL TIME IN SOUTH AFRICAN TOWN

Residents of Bloemfontein, South Africa, never have to guess when it is eight o'clock in the evening, for at that time the street lights are dimmed for a few seconds. This is done from the power-control station on reception of a telephone signal from an observatory. The plan has proved of great service, as the dimming occurs when most persons are at home so they can regulate their clocks.

# IT WAS *the* GARDEN



By J. EARLE MILLER

ARE the Americas—the New World of the map makers—really the Old World in which man originated, and from which civilization spread?

Four widely scattered discoveries of prehistoric remains in recent months have strengthened the belief that, if man did not actually originate in the western hemisphere and spread from here over the world, he at least arrived in the Americas in a very primitive state back in glacial times, thousands of years earlier than any previous evidence had indicated.

At Vero, Fla., human bones and weapons and utensils have been found in the same stratum of soil with the bones of the extinct mammoth. At Colorado, Mitchell county, Tex., and near Folsom, N. Mex., arrow heads, better made than those in use by the Indians when the first white men arrived, have been dug up both within and under the bones of a type of bison that has long been extinct. Another find, near Frederick, Okla., produced arrow heads and five "metates" used for grinding flour, from beneath the remains of mammoths and a camel. Dr. Harold J. Cook, honorary curator of paleontology of the Colorado Museum of Natural History, who examined the Fred-



Carved Stone Heads of the Serpent God Ku-Kul-Can at Chichen-Itza, Yucatan, and Cern Goddess of the Aztecs

erick discoveries before they were removed from the ground, declared there was no question that the samples of human handiwork were contemporaneous with the extinct animal species among which they were found.

The four discoveries, taken together,

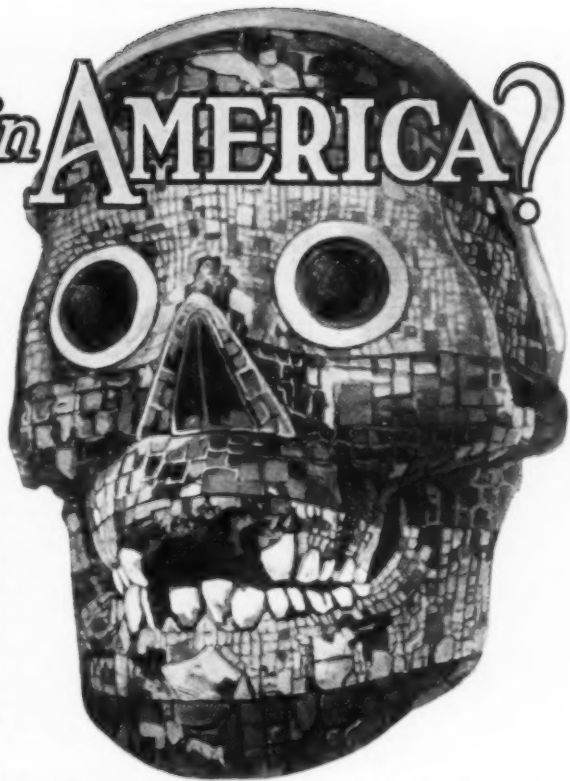
# of EDEN *in* AMERICA?

have revived interest in the search for further facts about the early history and civilization of the Mayas of Central America and the Incas of South America. Dr. Gregory Mason, leader of the Mason-Blodgett expedition now working in Central America, is a firm believer, as are the others who have excavated among the Mayan ruins, that the ancient civilization of the New World is as old or older than that of Egypt, and in many ways superior.

The ancient Egyptians' knowledge of mathematics and astronomy has long been one of the wonders of the world, but the work of the last few years in Central America has proved that the ancient Mayas were better astronomers and better mathematicians. In fact, they invented zero, which made possible our modern system of decimal counting.

Even within the time of recorded history, as preserved in the few books that survived the Spanish conquest and dated only from 176 A D., the Maya astronomers were far ahead of their contemporary Romans. All calendar systems are based on the exact calculation of the length of the year, and, since the year consists of 365.2422 days or 29.53 lunar periods, neither the revolutions of the earth in relation to the sun, nor the revolutions of the moon in relation to the earth can be divided exactly. The old Julian calendar, which was in use in southern Europe until 1582, and in Russia until within the last few years, made the year twelve minutes too long, and at the time Russia changed to the modern Gregorian calendar the accumulated error amounted to two weeks.

But 2,000 years before that the Mayas had calculated the length of the year to

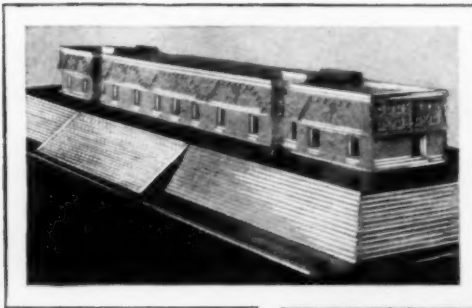


Mask Made of a Human Skull Inlaid with Turquoises, a Fine Example of Mayan Work in Precious Stones

within an error of one day in 2,148 years. Our present calendar is not much better, for it has an error of a day in 3,323 years. The Mayas, with similar accuracy, had calculated the lunar period to within one day in 300 years.

The Maya astronomers didn't stop there, however, for they determined with great accuracy the periods of the revolution of Venus, probably of Mars, and possibly of Jupiter, Saturn and Mercury. The Venus calendar was frequently employed, and they were aware that eight solar years almost exactly equal five Venus years, and sixty-five Venus years 104 solar years. The solar, lunar and Venus calendars were often combined so that incredibly long periods of time could be accurately calculated. Calculations up to 34,156 years have been found on some of the carved calendar rocks which they erected long before their historical records in book form began.

It was here that their invention of zero played a big part. The symbol is so com-



Model Showing the Reconstructed House of the Governors at Chichen-Itza, Above, and, at Right, an Altar Piece from a Temple at Palenque, Yucatan

mon to us that most people fail to realize its unusual character—a symbol for nothing. Yet, without such a symbol, rapid mathematical calculations would be impossible, for it is the zero which makes place-value numeration possible and distinguishes, for example, 170 from 1,700 or 17,000. While the Mayas had been using the symbol for ages, it was not until between the sixth and seventh centuries that zero was invented in India, from where it spread to Europe several centuries later. The Mayas had anticipated the Hindu inventor by a thousand years.

Without the familiar zero, instead of nine numbers to learn, the mathematician would have to have a separate name for each number as high as his calculations were to go.

The Mayas and the Aztecs had a similar and very involved calendar by which, by means of systematic changes of names and numbers, they could distinguish any day within a calendar round of fifty-two years—the unit in which they kept their records. The Aztecs could not go any farther than this, and couldn't distinguish between two days of the same name in

different calendar cycles. But the Maya mathematicians created what they called the "long count," in which they reckoned, as we do today, the elapsed time from an initial point, the system by which we measure from the presumed date of the birth of Christ. In the long count they measured by kins, or days, uinals of twenty days, tuns, or years of 360 days, katuns of twenty years, and baktuns, or

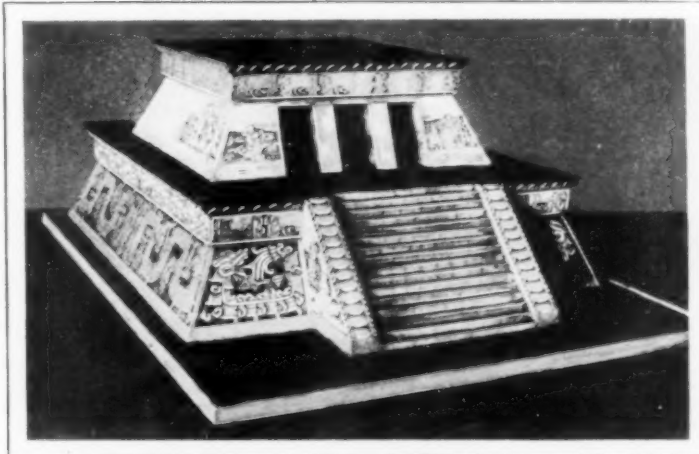
cycles of 400 years. They also used a great cycle, but there is some doubt whether it was 5,200 or 8,000 years.

Aside from their intellectual achievements, they produced pyramids as big and bigger than those in Egypt, even though not so well built; their carving of stone is equal to the best of the Old World, and as workers in gold and precious metals and in painting, they were the



Ruins of the Temple of the Tigers, So Named Because of the Many Carved Beasts in Its Decorations, as They Appeared Before Repairs Were Made

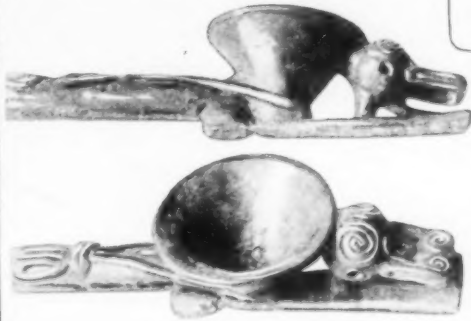




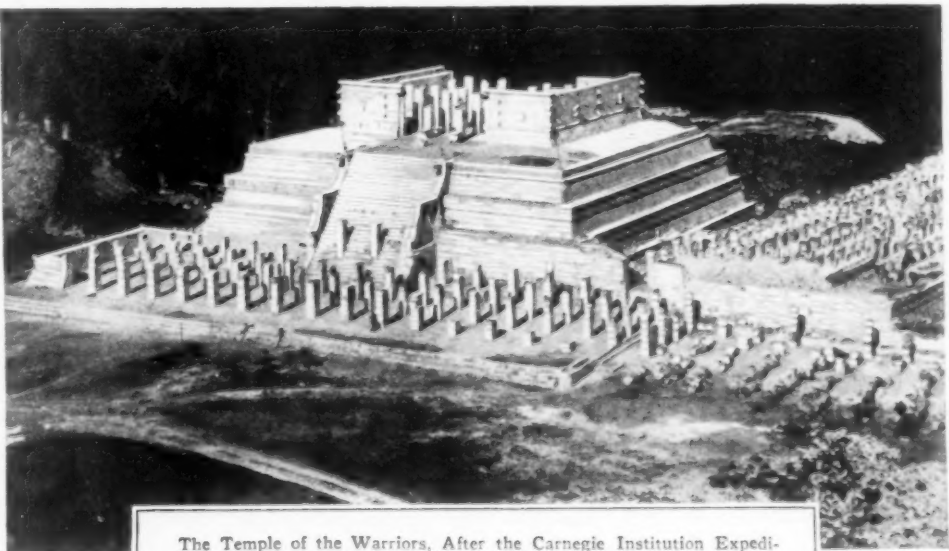
Above Is a Model from the National Museum Showing the Reconstruction of One of the Temples of Chichen-Itza; the Mayas Built Massive Flat-Topped Pyramids and on Them Erected Squat, One or Two-Storyed Temples of Perfectly Fitted Stone Blocks; Because They Never Learned to Build an Arch, They Were Limited in Height



Aztec Goddess of the Harvests, Above; Aztec Civilization Reached a High Level, but Had Already Begun to Decline Before the Spaniards Came



Carved Pipe Found in the Temple of the Warriors, Which Has Been Excavated and Repaired by the Carnegie Institution Expedition, at Chichen-Itza, Yucatan; the Bird's Head Supporting the Bowl Is a Symbolic Emblem Connected with the Religious Rites of the Mayas; Chichen-Itza Became Famous When Its Sacrificial Pool Yielded Hundreds of Skeletons of Victims



The Temple of the Warriors, After the Carnegie Institution Expedition Uncovered It from the Encroaching Jungle and Fitted as Much as Possible Together; in Front and at Right Are Portions of a Court

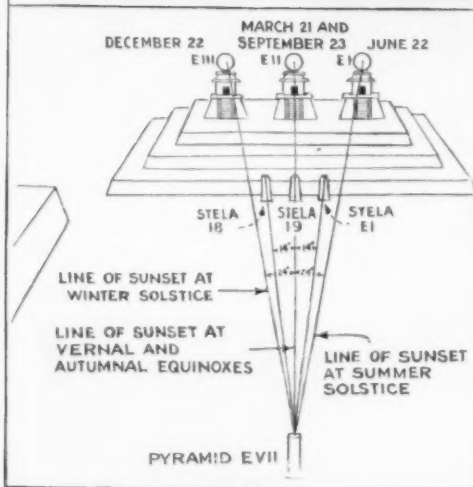
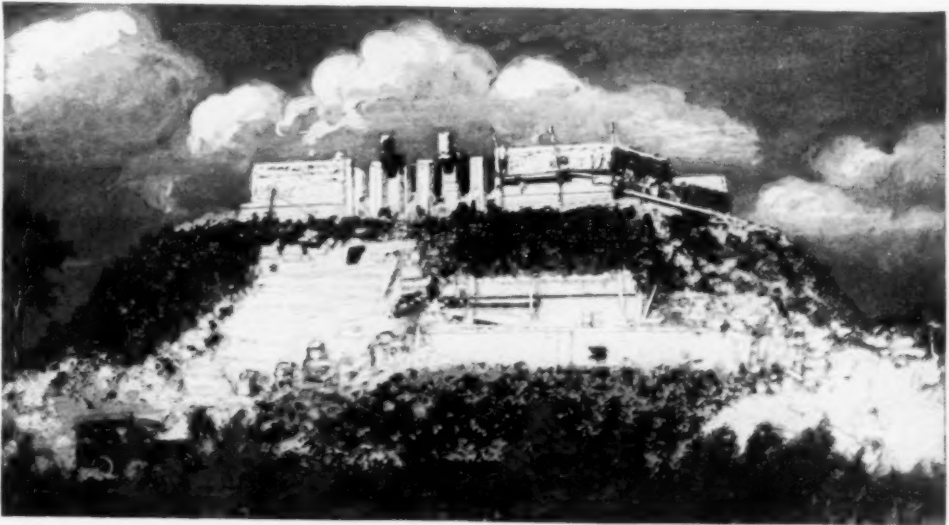


Diagram Showing How the Mayan Astronomers Determined the Dates of Solstices and Equinoxes, and, Above, Ruins of a Mayan Temple

equals, and in some cases may be classed as the superiors, of the Egyptians.

While their buildings, in the main, were erected of small stones, the skill with which they faced and fitted these together without mortar equaled that of the best craftsmen of Egypt, Greece and Rome. Most of the temples and palaces were located on flat-topped pyramids, the latter being built of stone facing filled in with rubble and dirt. Their failure to build solid-stone pyramids from huge blocks, after the Egyptian manner, was not due to inability to handle the big blocks, for they

did use them when the occasion warranted. Instead, they were much more modern than the Egyptians, for they saved the vast expense and labor of solid-stone construction with good results, even if the structures were not so lasting.

Their one big drawback architecturally, was their failure of discovering the principles of the arch. Without an arch, they were limited in the height to which they could build, and structures of more than one or two stories are quite rare. A four-story tower at Palenque, in southern Mexico, is a notable exception.

The old empire of the Mayas, centering in Guatemala, and abandoned, for some unknown reason, about 600 A. D., was notable more for its sculpture and other decorations than for its architecture. When the new empire arose in Yucatan to flourish from 980 to 1450—a half century before the Spanish arrived—the conditions were reversed, and architecture triumphed over sculpture, though the latter remained good.

The history of the new empire is rather well known from several Mayan books, called the Books of Chilam-Balam, which were secretly circulated after the Spanish ecclesiastics had destroyed most of the records of the Mayan priests. To the student of the early history of man in America, however, they are not so interesting as the carved record rocks of the



Stone Head from a Mural Decoration on a Yucatan Temple; Many of the Mayan and Aztec Carvings Are Striking Works of Art, Despite the Ravages of Time



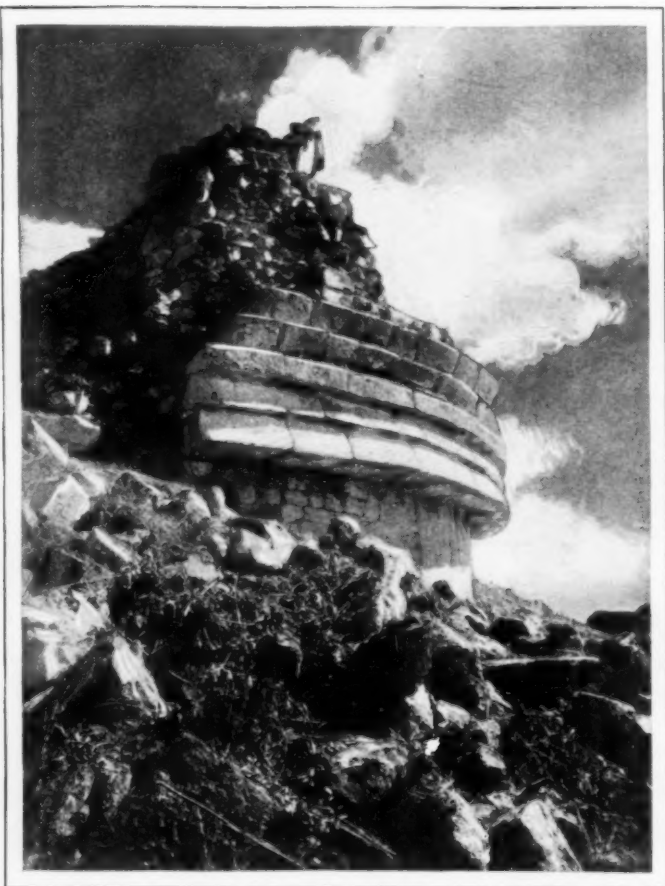
A Maya of the Present Day Standing beside the Carving of a High Chieftain of His Ancestors; the Enormous Headdress of the Ancient King Is Typical of His Rank, as Shown in Many Temple Decorations



An Ancient Aztec Painting Showing the Sun God Quelling the Darkness of Night, While Two Worshipers Stand with Bowed Heads; It Was the Aztecs Who Introduced the Feathered-Serpent Cult



An Elaborately Sculptured Mayan Jar, Found in Guatemala by One of the Expeditions of the Museum of the American Indian, of New York; Symbolical Figures in Deep Relief and Constant Repetition of the Feathered-Serpent Motif Indicate the Vessel Probably Was Used in Some of the Temple Rites Introduced to the Mayas by the Conquering Aztecs



Ruins of the Mayan Astronomical Observatory at Chichen-Itza Before the Carnegie Expedition Began the Work of Rebuilding

older empire. In the jungle ruins in Guatemala these record books of the Mayan astronomers still stand, for they were carved from stone. Every five years, a date stone was erected as a sort of permanent calendar. At least seventeen cities were flourishing in Guatemala and the surrounding region when the old empire reached the height of its development, about the year 520. At that time the civilization in Central America was the equal of any in the world, and far above that of our Teutonic ancestors in Europe.

Why the Mayas should suddenly desert their cities, which were splendid towns that had flourished, in some cases, for several hundred years, remains an unsolved mystery, but the answer probably lies in climatic changes, which made it impossible to raise enough food.

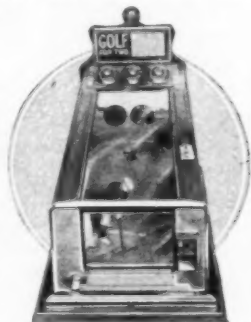
What happened in the next three centuries is another mystery, but, for some reason, the Mayas appear to have built no permanent homes, nor attempted to carry on their culture, until it was finally revived in Yucatan in the latter part of the tenth century.

Colonel Lindbergh's recent flights over Central America started a tourist rush that way, and it is probable that within a few years as many Americans will be going to Yucatan and Guatemala to see the enormous ruined cities, as have flocked to the Valley of the Kings in Egypt in the past.

#### COIN-IN-SLOT GOLF TESTS SKILL OF PLAYERS

Some of the thrills of a real game of golf are afforded by a coin-in-the-slot unit which features a small course with opportunities for drives and putts. The coin releases the mechanism, and the

player manipulates two levers, one controlling the tee and the other the dummy golfer, a small figure of a man with a club that swings in realistic fashion when one of the levers is operated. If the ball goes into one of the openings of the "drive" targets, a "putting hole" opens into which the ball is to be driven with the fewest possible strokes. Score is kept with a special device used as part of the game. Considerable skill is required in manipulating the two levers and in "keeping the eye on the ball."





Crayon-Dye Design as It Appears after Transfer from Paper to the Fabric, and Applying the Pattern with Aid of Hot Iron; Blotting Paper Is Placed on Both Sides of the Cloth to Prevent Damage



### CRAYONS OF INDELIBLE DYES SIMPLIFY DECORATING

Dyeing fabrics and other materials without the use of liquids is now possible through the introduction of a special kind of crayon dye. The design or picture is traced with the crayons in the colors desired upon paper and then transferred to the cloth with a hot iron. Blotting paper is placed on both sides of the fabric. If wanted, designs already drawn upon transfer paper, may be obtained. The crayon dyes are furnished in a wide variety of shades, will not damage the cloth and are easier to use. Since the pattern is first applied to the paper, there is less danger of spoiling the fabric.

### ANTS TUNNEL SIXTY-FIVE FEET TO REACH WATER SUPPLY

A riddle that has puzzled scientists for years was solved by a farmer in South Africa recently, while he was digging a well. The mystery was how ants kept their nests moist through three years of drouth. Examination showed that the hills were always liberally supplied with heated vapor and it was supposed that the

insects had some way of producing the moisture themselves. This theory was abandoned, however, when the well diggers found a miniature shaft, little more than two inches in diameter, running from an ants' nest to a water reservoir sixty-five feet below the surface. An endless chain of white ants was observed day and night, descending the shaft, taking on a supply of water and going back.

### RETARDER ON OUTBOARD MOTOR SLOWS SPEED FOR TROLLING

Easily attached near the propeller, a plate has been introduced for a popular make of outboard motor so that the speed of the boat can be reduced to permit trolling. It is operated on a spring hinge so that it rises as the speed of the motor is increased, and makes it possible for the fisherman



to obtain a satisfying rate of speed going to and from the fishing grounds.





Cards for Golf Game; on Front Faces Are Instructions for the Next Deck to Be Played From

### NEW GOLF GAME USES CARDS INSTEAD OF BALLS

Indoor golf played with cards instead of clubs, balls and nets, is the latest for the devotee. The game is played with a special deck of ninety cards, divided into four suits, designed for nine holes of either match or medal play. The four parts of the deck, printed in different colors, form a driving deck, approach deck, hazard deck and putting deck. As each card is played, it is turned face down, and on the back are found instructions for the next play. Two of the decks contain twenty-four cards, one twenty-eight and one fourteen, the numbers, in connection with the instructions on the back, being calculated so that, regardless of how the plays work out, there will always be enough cards to finish nine holes of play. The four decks are shuffled separately and laid down in a row. The first player takes a card from the driving deck, turning it over to find his next play on the back. The second

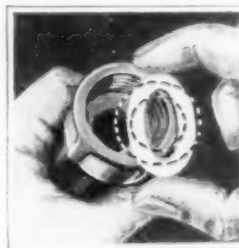
does the same, and the one who is the greatest distance from the hole has the next play, as in ordinary golf. The lowest possible score for eighteen holes is forty-eight, but par for the game is fixed at seventy.

### WHALES OF ANTARCTIC BRING THOUSANDS APIECE

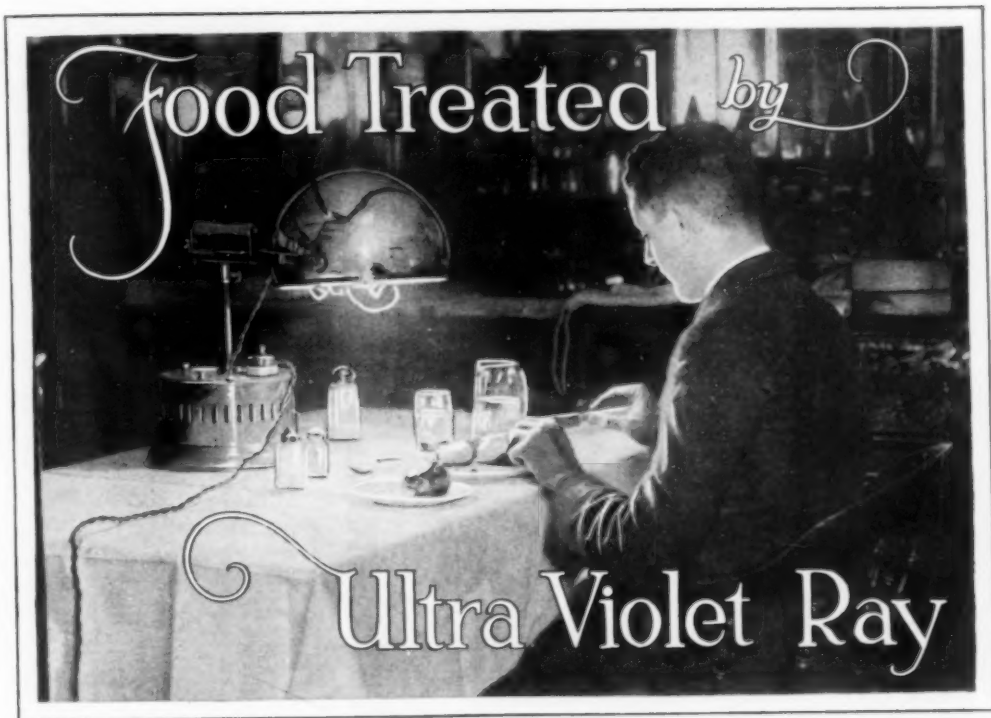
Under modern methods of extracting the valuable products, whales caught in the antarctic will bring as high as \$10,000 apiece. The humpbacks, found off the coast of California, sometimes realize \$2,500 each, while the white whale of the northern Atlantic is prized for its hide, which is shipped to Scotland for the manufacture of shoestrings. Floating factories that convert the whales into material for the soap companies, bone charcoal for the sugar-refining industry, dried meat and chicken feed, simplify the task of turning the catch into profit. Members of the United States biological survey have

asked for information about the logs of old whaling vessels, as these records are considered valuable data concerning the migrations of the big sea mammals. Parasites found on the whales may also give a clue to the animals' wanderings. For instance, one species of known southern origin has been discovered on whales in northern waters.

### HOSE WASHER IS OVAL-SHAPED TO PREVENT LOSS



By cutting them in an oval shape instead of round, rubber washers for the garden hose are not likely to fall off. They fit more tightly than the usual kind and hence reduce the time and bother involved in frequent displacements.



By CRAG DALE

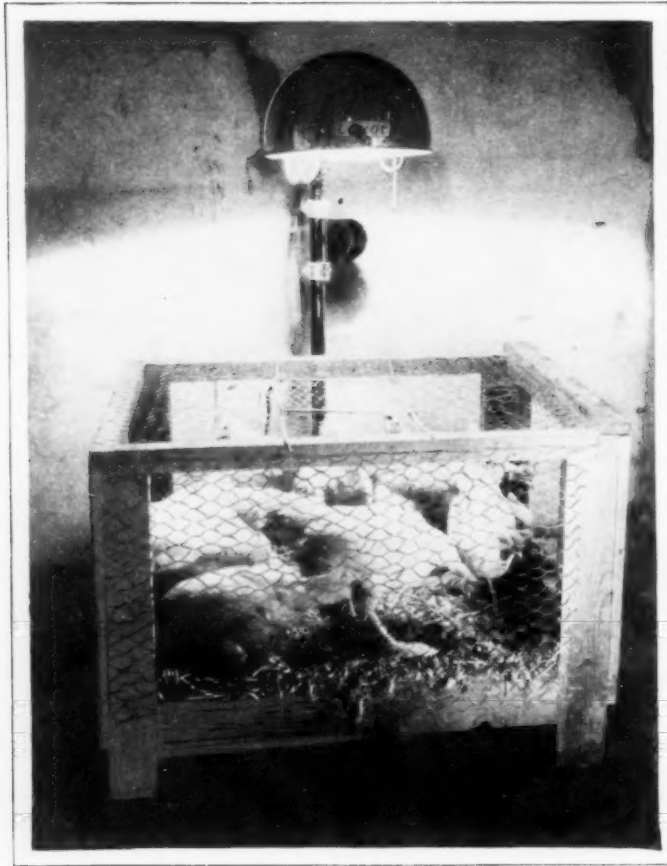
AT the University of Wisconsin there is a young man, named Harry Steenbock, who has calmly turned down upward of a million dollars for his patent of an apparatus that will transfer life-sustaining ultraviolet rays into virtually all food. He refused the fortune and then gave his patent to the university because he didn't want money to interfere with his ambition, which is to keep on plugging away at the mystery of light—what it, or lack of it, does to people and animals.

But the trustees of the university, quick to see the commercial value of the discovery, already have started the golden flow of dollars into a chemical research fund through licensing the use of the basic patent to several large food manufacturers. One company alone pays \$50,000 annually for its license, and now is carrying on elaborate experiments to determine how these health-giving, bone-building rays can best be transferred to the great troughs of oats that pass slowly under the lamps. Other manufacturers are experimenting with the making of an apparatus that can be used in the home, on

the table, like a toaster, or on the farm to give greater vitality to pigs and chickens.

Prof. Steenbock's accomplishment is, in more or less technical words, the capture of a chemical food element known as vitamin D, and its induction by use of ultraviolet-ray lamps into almost all ordinary foods: wheat, oats, corn, flour, cabbages, spinach, butter, milk, eggs, oleomargarine, hominy, lettuce, potatoes, rice—any food except sugar and salt. Vitamin D is, as chemists recently have discovered, that property in food which enables the human or animal system to absorb and hold the proper amount of calcium from foods which will eliminate all possibility of rickets in growing children, and, at the same time, stimulate growth to the maximum that the heredity of a child, or animal, will permit. Next to sunlight, it is found most abundantly in cod-liver oil.

"It is in the sun that the great life forces are contained," explained Prof. Steenbock, in telling about his discovery. "Chemistry, I believe, has its base, or origin, in the sun's rays. Until very recently, scientists have thought that it was the



Group of Hens Whose Egg Production in Winter Was Doubled as a Result of Ten Minutes' Exposure Daily

heat rather than the light of the sun that accomplished growth. Exhaustive study of the codfish was one of the things that disproved the theory of heat. We found that ultraviolet rays penetrate water with comparative ease. The chemistry of the codfish is such as will absorb and store away a relatively large amount of vitamin D which the fish gets from sunlight."

But even when it was determined that light rays were the curative factor in rickets, it still was thought that the only possible way in which they could be used beneficially was through direct application of the rays to the subject. After a year of experiments, Prof. Steenbock became convinced that there must be some indirect method of irradiation with ultraviolet rays. And then he hit upon the test that made him famous.

With a quartz mercury lamp the young

professor treated a half dozen rats, daily for several weeks. Then he killed them. He had another pen of rats which he had been feeding in such a way that they all were sorely afflicted with rickets. From the dead rats, Steenbock took the livers and fed them to the rats that were dying from rickets—and within ten days every one of these rats had been completely cured.

Now, Steenbock had the proof that it was not only the ultraviolet ray itself that had a chemical effect upon the tissues of the body, but that it could be transferred through food even when the ray was not from the sun itself. That knowledge led to other and varied experiments—arduous, involved in a mass of detail and taking more than a year to accomplish. But from them all Prof. Steenbock evolved the positive method of irradiating all cereals and

all natural fats with the ultraviolet rays.

"How ultraviolet rays can act in connection with the ability of the body to assimilate calcium, we do not know as yet," explained Prof. Steenbock. "We do know that, under certain conditions, humans cannot assimilate calcium, much less store any of it in body tissue in the absence of these radiations.

"The substance in the body upon which ultraviolet rays act in order to irradiate the body is called cholesterol, and it is found very extensively in nerve tissue and in the skin. Light—either sunlight or artificial ultraviolet rays—activates that substance with antirachitic vitamin D.

"As a matter of fact, there is relatively little of the ultraviolet ray of the proper wavelength that reaches the surface of the earth. It may be that other rays, as yet unknown, counteract the ultraviolet spec-



Harry Steenbock Giving a Demonstration to Poultry Raisers and School-Teachers of How to Virtually Eliminate the Usual Losses in Raising Young Chicks

trum to a great extent. Ordinary window glass completely baffles ultraviolet rays."

Prof. Steenbock took occasion to shatter a hitherto unchallenged belief:

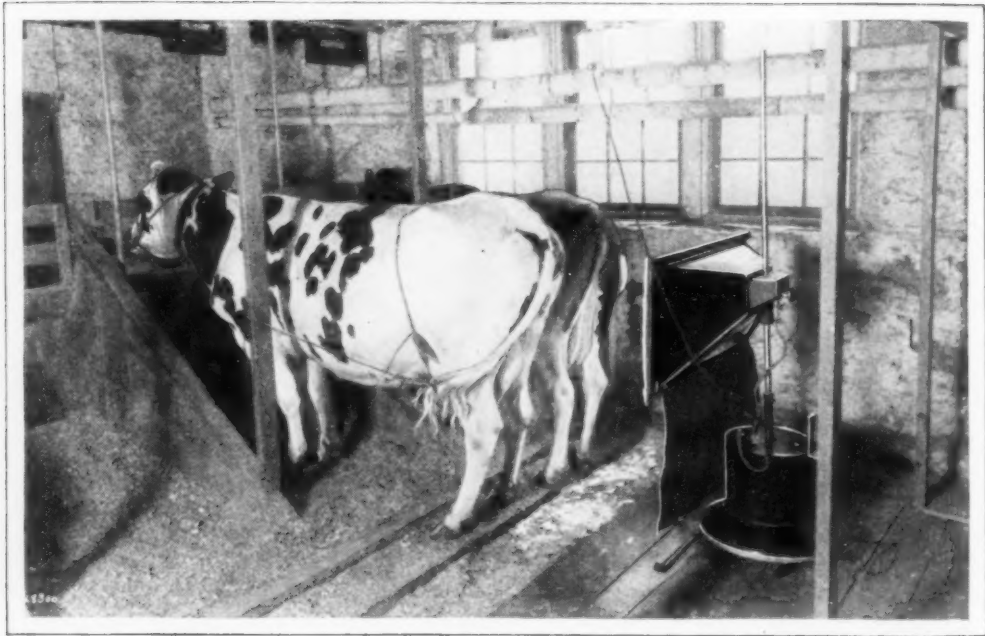
"Milk has no active vitamine D, neither has butter fat," he declared. "That is not due to the lack of compounds that can be irradiated, but rather to lack of radiation itself. We have carried on extensive experiments with cows in an effort to determine what effect irradiation has upon them, and we have found that they do not respond in any degree either to direct radiation or to cod-liver oil. That is rather remarkable and, as yet, we do not know why."

Prof. Steenbock sums up his work in food irradiation, saying: "The future use of irradiated foods in the treatment of rickets, and in the diet of growing children, is unquestionable, and rickets is only one of the number of forms of disturbed calcium relations. It has even been shown definitely that excessive lack of calcium reserve in mothers' milk can be prevented by radiant energy. Certain forms of tuberculosis yield readily to irradiation, and

we are getting favorable results in the treatment of some cases of anemia."

During the progress of Steenbock's experiments, he and some of his associates at the university discovered that baby chickens are extremely sensitive to rickets. They also knew that only about thirty per cent of all winter eggs hatch under incubation. Combining these two facts, it occurred to the scientists that one reason why the hatching rate of these eggs was so low, was that the baby chick in the egg had rickets so acutely that it could not peck its way out of the shell.

Feeling sure that irradiation would solve that difficulty and result in more hens laying more hatchable eggs—which, in turn, would result in lower winter prices for eggs—Steenbock began irradiating a group of hens, keeping an equal number, from the same flock and of the same breed, away from artificial irradiation. The first result was that, during February, the irradiated hens laid 173 eggs. The non-irradiated hens laid sixty-eight eggs during the same period, and there were twelve hens in each group.



Science Struck a Snag When It Attempted to Increase the Vitamine D in Cows and Improve the Nutritive Value of Milk through Irradiation, for the Cows Were Not Affected by the Light

The eggs from the irradiated hens were incubated and 168 of them hatched out healthy chicks. Only twenty-two eggs from the non-irradiated group of hens were

hatched. In March, the same experiment was continued with the same hens, showing an even higher percentage of eggs and chicks for the irradiated group.

### SIMPLE SOIL-TESTING OUTFIT TO IMPROVE LAWNS

In a few seconds' time, and with but little trouble, you can make a chemical test of the soil of your lawn or garden to determine if it contains the necessary materials to aid the growth of grass and plants. A pinch of the soil is placed upon a small paper, which is folded in the shape of a trough. Then it is moistened with a chemical squeezed from a tube. The liquid thoroughly mixes with the soil and changes color, according to the nature of the sample. By letting the surplus chemical drain off and drop upon a test chart, showing different colors and giving an anal-

ysis according to that color, proof is obtained whether the ground is acid, neutral or contains too much alkali. The chart also tells how much limestone to add for general crops.

### FUSED-QUARTZ THERMOMETER REGISTERS HIGH HEAT

Temperatures of more than 1,800 degrees Fahrenheit are registered on a thermometer of fused quartz, employing gallium instead of mercury. The reason for these substitutes is that glass melts at a far lower temperature than those which the meter records and mercury would boil and explode the instrument.



Dropping Testing Liquid on Sample of Soil; It Is Then Drained Off and Compared to Color Chart



### MYSTERY MINERAL CURBS FIRE AND PREVENTS RUST

A whole mountain of a mysterious mineral substance near Libby, Mont., is being utilized for a number of practical purposes. At first believed to be worthless, it has been treated to make efficient insulation against fire, water and sound and is also adaptable to the manufacture of cement products, paint, plaster, roofing and many other materials. When heat is applied to it, the mineral expands to many times its original thickness and assumes a beautiful golden color. In this form, it is insoluble, vermin-proof and is lighter than cork. Analysis has shown that it is composed of silica, aluminum oxide, magnesium and small amounts of calcium oxide, sodium and potassium oxide. It is being successfully used as lining for ovens and for safes to keep out moisture.

### SIPHON PIERCES BOTTLE CAP TO KEEP CONTENTS FRESH



age, the bottle is turned upside down and the plunger of the siphon pressed.

Edison has been granted more than 1,150 patents.



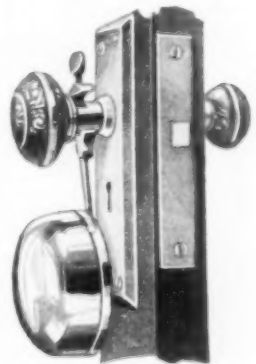
Mask-Equipped Bicycle Brigade of a Russian Army Unit during Practice Maneuvers and Gas Drill

### SOLDIERS ON WHEELS TO FIGHT IN GAS MASKS

Bicycles play practically no part in the operations of the American army, but a cycle corps of gas fighters is an interesting branch of the Russian military organization. In recent maneuvers the cycle brigade took an active part. The chemical phase of warfare has been studied extensively in Russia.

### BELL ALARM ON DOORKNOB WARNS OF BURGLARS

Easily attached to doors or windows, an alarm bell furnishes a signal to warn of the presence of intruders. It is connected so as to ring as soon as the knob is turned or the window raised. It has no keys or batteries and will last indefinitely. The noise helps frighten marauders away, as well as warning persons inside.





At Work on Model of the Moon in Plaster of Paris; a Dentists' Drill Was One of the Tools Used

### CARVE MODEL MOON IN PLASTER WITH DENTAL DRILL

Among the instruments an amateur astronomer in Los Angeles has used in making a relief model of the moon is a dentists' drill. It is helpful in carving out the small craters and other irregularities on the surface of the model which is fashioned of plaster of paris. Photographs supplied by Mount Wilson observatory and data obtained through two high-powered telescopes of his own have been used by the astronomer in preparing the model.

### CASING OF SHOCK ABSORBER IS MOISTURE-PROOF

A shock absorber which eliminates the freezing troubles of the hydraulic type and the possibility of spring and reel breaks in the usual friction type, is being marketed by a Michigan factory. The strap in the new absorber does not enter the friction casing, but is attached to it on the outside. Within the casing, two segments of a split ring are expanded when a



downward force is exerted on the strap, and their friction against the casing controls the movement and eases the rebound. The casing is water-tight.

### BUSLIKE STREET CAR MAKES LESS NOISE

Marked reduction in noise, greater speed and comfort, and other important improvements are said to have been realized in a street car modeled after a motor bus. Upholstered seats, a wider aisle and more attractive appearance inside and out, are features of note, while the car is

lower, with a single step for entrance and exit. Bearings are of the roller type and the gears run in an oil-tight case in a bath of oil. There is an expanding inside brake for each wheel. Thorough tests are said to have been satisfactory.

### AUTOMATIC HAND FIRE FIGHTER WILL NOT DAMAGE GOODS

Effective protection against fire is afforded in a hand extinguisher which is similar to the larger chemical units carried by fire departments, does not damage clothing or furnishings and is always ready for instant service. It is set into operation simply by striking a plunger on the bottom against the floor or other surface. This penetrates a capsule inside, releasing an acid that combines with a chemical to force a powerful stream of liquid from the nozzle. The materials are said not to deteriorate with age, the extinguisher is quickly refilled after use and, being light and compact, is easily handled in an emergency.



## AUTOS STOPPED AT CROSSING BY TOUCH OF BUTTON



Pedestrians' Light Shining to Guide Street Car and a Close View of the Signal with Button at Side

Of special service on outlying street-car routes is a combination floodlight and a red signal for the pedestrian. When he wants to stop a car, he presses a button on the side of the lamp-post. This causes a red light to flash and, at the same time, a brilliant floodlight illuminates the street to the track so that he can cross to the car in safety. The red light also warns automobiles to come to a halt.

#### TIME RAZES ANCIENT TOWER IN FEW MINUTES

After standing for nearly 1,130 years, the wonderful tower of Charlemagne, in Tours, France, crumpled and fell into ruins within a few minutes recently. This is said to be the most abrupt disintegration of such a structure on record. Twenty-four hours before the fall, cracks showed on its face. The mayor ordered persons dwelling near by to vacate their premises, but no great fear was at first entertained that the tower would collapse. However, when the cracks became wider, the watchers realized that the end of the stone pile, which had been visited by thousands of tourists, was near. Almost the entire population of 70,000 gathered to see the strange passing of the historic landmark. The fire department played



searchlights upon it. A few moments after eight o'clock in the evening, the massive pile trembled, swayed and then sank into a pile of broken stone that littered the street for a distance of 200 feet. No one was injured in the crash. The tower was the last standing part of the famed Abbey of Saint Martin which was completed in the year 800. Two hundred monks at that time lived in its dormitories.



F. C. Lincoln, in Charge of Government Bird Banding, Attaching a Tag to a Mallard Duck

**T**HOUSANDS of lapwings, small European birds of the plover family, appeared out of the sky on the coast of Newfoundland recently, and dropped to the ground, many so exhausted that they died.

Hitherto almost unknown on this side of the Atlantic, the entire flock had spanned the Atlantic, from east to west, something man at that time had failed to do. Occasionally lapwings, caught by rare easterly gales, have been blown to Ireland, but this flock was forced across the Atlantic, unable to fight its way back to European shores. The normal flying speed of this bird is about forty miles an hour, and with a tail wind behind, the flock may have averaged seventy miles an hour for the crossing.

The migration of birds over the world is a fascinating study, investigation of which is not only adding to the knowledge

## The MYSTERY

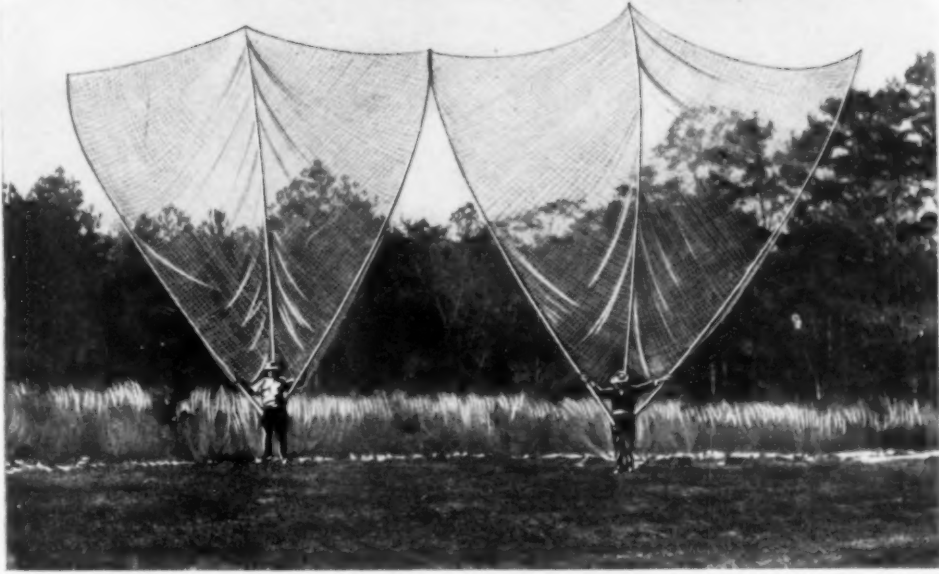
of bird habits, but is solving economic problems as well. The United States biological survey has found the basis for game-bird regulation by studying the habits of the migrating flocks through the seasons. It is trying to solve the problem of ending the depredations of the red-winged blackbird in southern rice fields by finding the best season and the best place to fight the marauders, for they have proved immune to attack with poison bait during the rice season, when they are in the south, and so must be fought at some other place and season.

The National Geographic Society and the Carnegie Museum have dispatched a joint expedition to Venezuela to study the winter life of birds which nest in the United States in the summer. Many birds travel thousands of miles with the change of the seasons in search of suitable weather. The ducks and geese which flock to the Gulf of Mexico shores in winter do their nesting in summer from the northern United States to the Arctic ocean. A year or so ago an unusually bad winter in the far north drove the white snowy owls southward in thousands, and every taxidermist in New England was kept busy for weeks preparing the rare specimens bagged by hunters, for these owls are rarely seen in that district.

Two hundred years ago a great gray heron was captured in Germany, which wore upon one of its legs several metal bracelets. An inscription on one of the rings, after being translated, revealed that the heron had been captured in Turkey several years before, and that it had been marked and released. This is the first recorded experiment in bird banding, an activity which is now teaching us many secrets of bird life. Today, ornithologists, government workers, and amateurs are trapping birds in all parts of the United States, and in other countries, too, and placing tiny aluminum bands upon their legs. Then they are released and records kept of their goings and comings.

The capture of the Turkish heron did not stir much curiosity or interest, and

# of BIRD MIGRATION



Pair of Clap Nets Developed to Catch Quail; the Two Outside Poles Are Swept Forward and Together like Wings, to Catch the Birds in Mid-Air as They Are Scared from Their Nests

it was not until a hundred years later that bird banding was attempted again. Bruggmann, a Dutch naturalist, began to puzzle about the long-legged, long-billed storks that made Holland their summer home, and which are supposed to have something to do with the birth rate. These storks had a habit of going away for the winter, and returning again in the spring.

"Do the same storks return to the same village or windmill each year?" he wondered. So he captured several of the lanky birds and fastened metal rings upon their legs. He then set them free and began a long period of waiting, to see if any of the marked birds would return after the winter was over. He never saw one of the birds again, and concluded that they choose a different home each summer. His conclusion was not strictly well-founded, because the bands may have been torn off by the birds during their southern journey.

Nearly another century passed before Christian Mortensen, a Dane, banded several species of birds in an effort to learn something of their habits. He was more

successful than his Dutch neighbor, because several of his birds were captured later, still wearing their bands. This success inspired other bird students, and bird banding as a method of studying the inhabitants of the air spread to other European countries. The World War put a temporary end to the work.

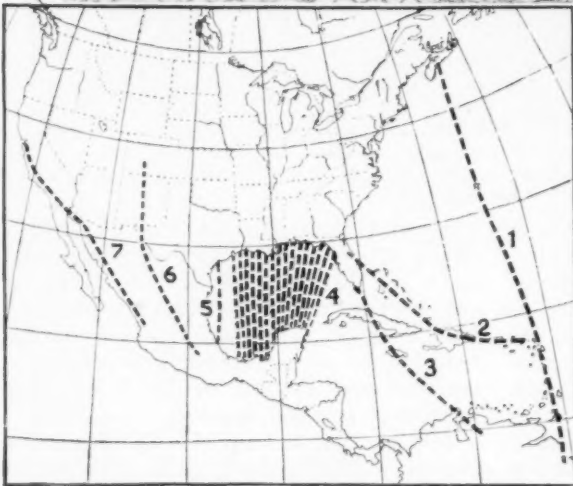
Bird banding in the United States really started in 1909, when Dr. Leon J. Cole, of New York, founded the American Bird-Banding association. Early methods of marking birds were crude and unsatisfactory. One of the principal drawbacks, and a rather unpleasant one, was the necessity of killing the birds in order to recapture them after they had been marked.

It remained for S. Prentiss Baldwin, of Cleveland, a business man turned ornithologist, to do away with putting birds to death in order to learn their secrets. He devised a series of traps in which the birds could be caught repeatedly, without injury. These traps take several forms, from the ordinary sparrow traps, consisting of a shallow wooden frame covered with wire or cord mesh and operated by





Bird Trap, Protected by Wire Fence, to Keep Dogs and Cats from Annoying the Feathered Captives



Bird-Migration Routes; Most of Them Use Route Four, Though It Necessitates a Flight of 500 to 700 Miles across the Gulf

a jerk of a string, to large house traps, big enough to hold several men. The system of trapping, as perfected by Baldwin, was adopted by other bird banders, and is largely responsible for the entering of the United States government into the field. The activity is now under the control of the biological survey, and permits to operate bird traps and banding stations must be obtained from this bureau.

About fifteen years ago, Baldwin purchased a farm near Cleveland. Time and again, the beauty of the scene was marred by the cry of some wild bird in trouble. Perhaps a cat had caught one of the little

robins just learning to fly; or a red squirrel was robbing a song sparrow's nest; or English sparrows were trying to break up the home of a family of wrens.

Baldwin set out to rid his farm of these enemies. He set out sparrow traps, and the English sparrow population in the vicinity rapidly dropped to a low figure. The work proved interesting, and he soon became an enthusiastic student of bird life. Banding attracted his attention and he now spends much of his time at it.

Fifteen years ago there were perhaps a few hundred birds on Baldwin's farm. Today, on the five acres where he maintains his banding station, the bird population is denser than at any other place in the United States. There are thousands of them—wrens, robins, bluebirds, song sparrows, chipping sparrows and many others. This proves at least one thing: Bird banding is not cruel, and does not frighten the birds in any way, as many people have been led to believe.

In fact, a banding station becomes a sort of seasonal home for the birds. There birds of a feather, and birds of



Chipping Sparrows in a Trap Cage, Above; They Are Often Confused with the Obnoxious English Sparrow, Largely Because, like Their Relation, They Prefer to Live Close to People



It Looks a Bit Rough, but This Is the Best Method of Handling Live Wild Birds, as They Are Not Injured, and Seldom Struggle; the Bird, Which Has Been Caught in a Trap, Is the Familiar Mourning Dove Whose Cry Is Popularly Supposed to Herald an Approaching Rainstorm; in Fact, It Is Sometimes Called the Rain Dove



With the Little Finger Held Snugly over the Neck, the Bird Will Not Struggle While the Band Is Being Attached to Its Leg



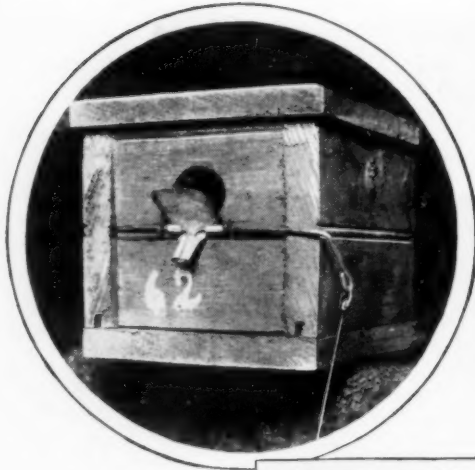
When First Banded a Bird Is Held in This Manner, While Its Color and Species Are Being Determined; Note Its Grasp on the Little Finger



The Proper Method of Holding a Red-Bellied Woodpecker; the Little Finger Serves as a Perch; Its Beak Is Very Strong and It Is Well to Be on Your Guard When Handling This Bird



After Examination, the Brown Thrasher Is Permitted to Lie in the Palm; Frequently It Rests like This for Several Minutes before Flying Away after Its Release



widely separated natures meet on a common ground where they find food, water, shelter and protection from their natural enemies. Some of the little fellows become so fond of the place that they spend a large portion of their time in the traps, obtaining food.

"But the birds must be terribly frightened by being caught in traps and then held in the hands for examination," many of the visitors to Baldwin's farm exclaim.

Bird banders have found that the birds are not in the least scared, and that many of them seem to like the experience. Of course, there are some kinds, such as the cardinal, which create quite a disturbance when caught, but their objections are only temporary. They always return.

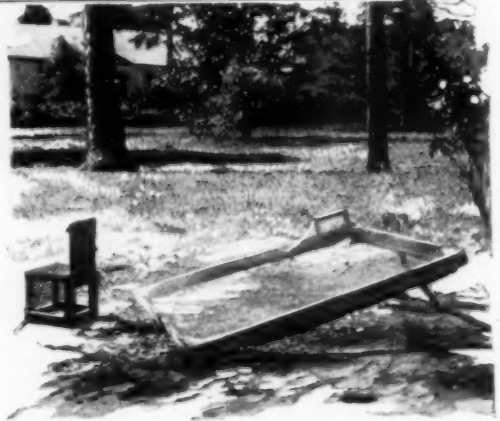
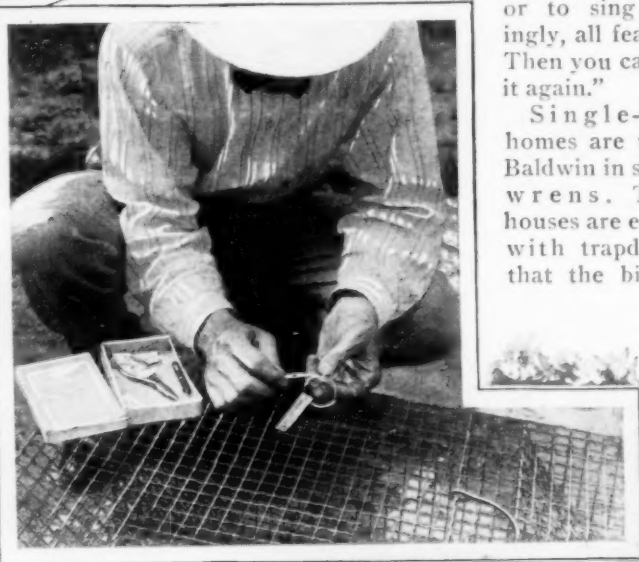
"It is the experience of every bird bander that most of the birds taken from traps continuously operated are 'repeats,' or birds which have been in before," Baldwin explains. "My records show many cases of birds that form the trap habit, and are caught four or five times a day.

"Probably few of us experience a real

fright—the fear of immediate death or terrible injury—more than two or three times in a lifetime; and we never forget it. But every wild bird lives in a daily danger and fright for its life. A hawk sails overhead; a cat passes near by; a dog comes quickly around the corner, or a snake or rat lurks under a bush, and the bird must move quickly to a place of safety. If a bird took seriously every escape from danger its nerves would not last a month.

"So, if you catch a bird in a trap or in your hand, and it struggles desperately to escape, release it at once. It probably will fly to a near-by bush and proceed to smooth its feathers or to sing mockingly, all fear gone. Then you can catch it again."

Single-family homes are used by Baldwin in studying wrens. These houses are equipped with trapdoors so that the birds can

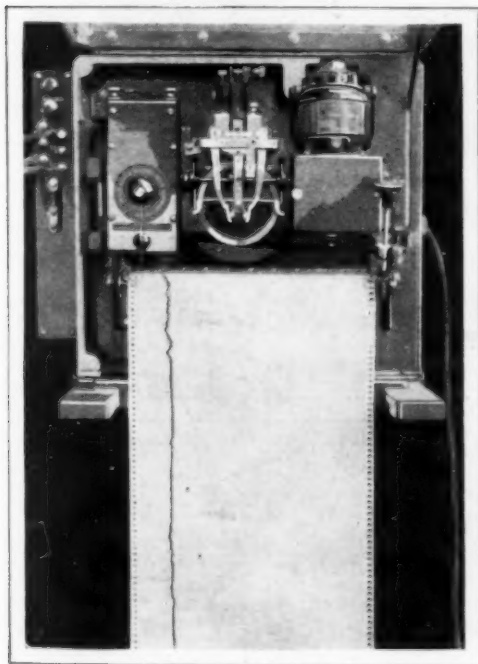


Nest with Perch Trap, a Bird Bander and His Tools, and a Drop Trap, with Gathering Box at the Left

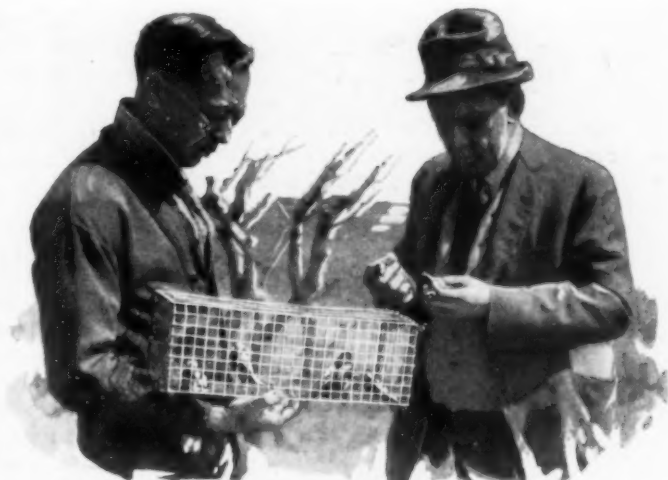
be captured for study. A jerk on a string operates the trap. In writing the family history of a generation of wrens, Baldwin begins with the time the parent birds arrive from their winter home in Central America. After the nest is completed, the mother bird lays her eggs, Baldwin numbers each egg and assigns it a place in a record book. The eggs are weighed each day during the incubation period to determine the change caused by evaporation of moisture in them. When the

sprawling, ugly baby wren picks its way into the world there is a number waiting for it—the same as that on the egg from which the bird came. The mark is placed on the wren's beak until it is old enough to wear an aluminum bracelet. The baby birds, like the eggs, are examined daily for weight and other variations.

Before the little wren becomes old



An Electric Recorder for the Mother Bird; Placed in the Nest It Registers Every Absence



T. E. Musselman and S. Prentiss Baldwin, Examining Chipping Sparrows with Diseased Feet, Result of a Mysterious Malady

enough to fly or to fear the men who visit it daily, it is banded, the band being fastened to its leg by means of small pliers. The band bears a serial number, and a notice to the finder to report it to the biological survey.

The young wren, now nearly full-grown, launches itself into the world after a few trial spins. Perhaps it will be found next in some other state, or even in its Central American winter home. Often a bird will return year after year to its birthplace, while some of its brothers and sisters never return.

"Wrens become so accustomed to being handled, measured and photographed from day to day that they learn to expect it," Baldwin said.

"We have attempted to extend the intimate studies of wrens to other species, but have not had much success. Robins were tried, but they are such suspicious, nervous birds that they are scared away if their nest is bothered in the least."

Electricity has been called to the aid of the bird student. Baldwin has devised an apparatus for recording the time when mamma Wren leaves the nest, how long she stays away, when she returns, and when she changes position on the eggs.

The why, where, how far, and when of bird migration is one of nature's greatest mysteries. It is not yet known where the tiny warbler, the size of a man's thumb, gets its energy to fly without stop the 2,400 miles from Nova Scotia, over the

Atlantic, to the Lesser Antilles or South America, a non-stop record that man may not equal for many years, at least as far as efficiency is concerned. Or why does the arctic tern fly 11,000 miles from its home near the south pole to a nesting place in the arctic regions, and back again each year? What determines the routes taken by the robins, cardinals, bluebirds and other of our better-known birds in their annual pilgrimage to the southlands?

Birds are among our most valuable natural assets. Their menu includes all kinds of bugs, worms, mosquitoes and other insects which destroy our food and other materials. If birds were to disappear suddenly from the earth, it would be only a matter of a short time until insects would be well on their way to becoming the only inhabitants of the globe.

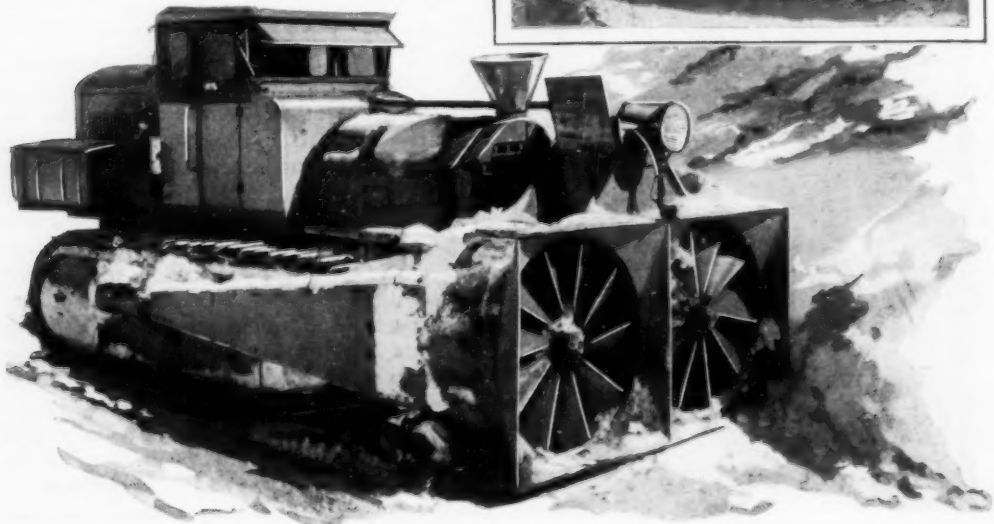
Bird banding, then, is to be classed as a valuable service in the community and nation. The biological survey is trying to interest more persons in the work, so that more complete results may be obtained. Anyone over eighteen years old can trap and band birds, providing he obtains a permit and instructions from the survey. In some states it is necessary to have a permit from the state government also.

So, the next time you capture a bird, dead or alive, which is wearing a numbered band, notify the biological survey of the fact, giving the number on the

band, the kind of bird, the place captured, and other details. You will be helping a worthy cause in doing this.

### DOUBLE-MOTORED SNOWPLOW CLEARS SWISS ROADS

Equipped with two fifty-horsepower motors, an efficient snowplow has been introduced in Switzerland to clear the roads. One of the engines drives the rig itself while the other operates the snow-throwing blades that hurl the drifts far to either side. Last winter, more than nine miles of the road from St. Moritz to Maloja were cleared of snow thirteen feet deep in about four hours.



Huge Road-Clearing Rig to Combat Snowdrifts in the Alps; It Has Two Fifty-Horsepower Motors and Can Be Operated in Difficult Places with Endless-Tread Drive

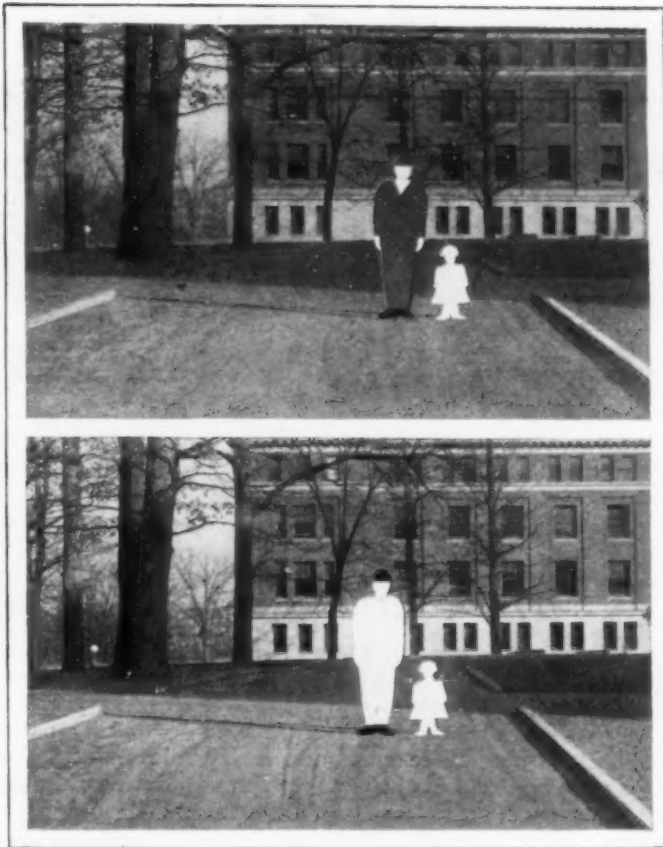
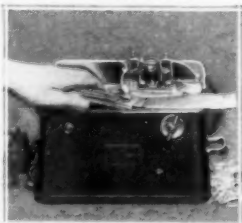


## TELEPHONES' LIFE IS TESTED WITH PHONOGRAPH

"Joe took father's shoe bench out. She was waiting at my lawn." These sentences are repeated over and over again from phonograph records into telephone transmitters, while engineers measure the effect of the sounds in one of the testing laboratories of the Bell Telephone company. The words have been chosen because they represent simple combinations of speech that contribute most appreciably to loudness. The sentences are like the well-known statement, "the quick young fox jumps over the lazy brown dog," a test sentence for typists, containing all the letters of the alphabet. Engineers declare that 5,400 calls of two minutes each constitute an average year of service for an ordinary desk-telephone transmitter, a performance which is completed in about fifteen days in the laboratory test. According to the way the instrument stands the trial, estimates are made as to its approximate rate of aging under actual service conditions.

## AN IRON BOOKKEEPER

For banking establishments, a device has been introduced that opens the mail, counts and sorts coins and coupons and enters the results in a book, performing many of the functions of a human clerk. One person can operate it, and it is said to strike a balance in four hours where four days have been required with ordinary methods.

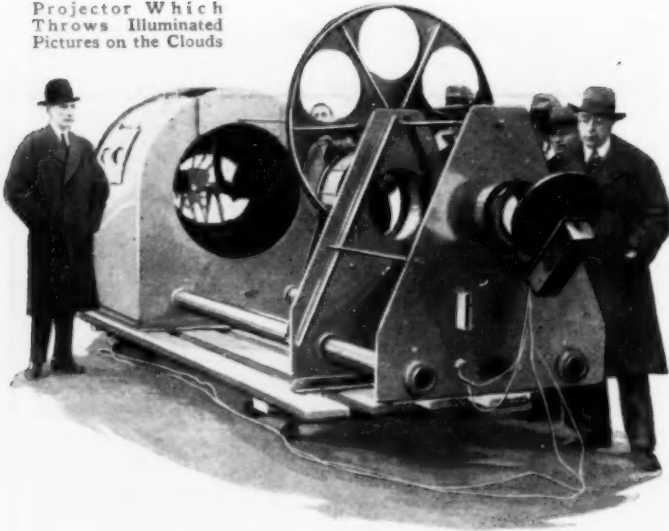


Dummies Used in Headlight Tests at Bureau of Standards; Note How Light Clothing Shows Up Adult Figure

## LIGHT-COLORED CLOTHES HELP PROMOTE AUTO SAFETY

By the use of dummies of adults and children, scientists at the bureau of standards have performed a number of tests that show some of the hazards of night automobile driving and the difficulties of providing adequate lighting. One of the striking results of the experiments proved the importance of light-colored clothing at night as an additional protection to the pedestrian. When the dummy of the man was dressed in white it was seen twice as easily as when clothed in dark garb and appeared to be considerably larger. This was due to a familiar optical illusion. Light-colored automobiles were likewise much more clearly visible at night than those painted in dark hues. The tests showed that light clothing at night is a protection from automobiles.

Projector Which  
Throws Illuminated  
Pictures on the Clouds



### PICTURES THROWN ONTO CLOUDS FOR ADVERTISING

Six different pictures are projected upon the clouds in less than five minutes with an improved machine recently introduced for night-time advertising. At a distance of about 500 yards, each picture is 170 yards wide and remains in view for forty-five seconds. Then a circular holder turns automatically and a new one is exposed. The process is repeated as long as the projector is left in operation.

### CHARIOTS FIFTY CENTURIES OLD FOUND IN MESOPOTAMIA

One almost complete four-wheeled chariot and another in a more fragmentary state have been dug up on the site of the ancient city of Kish by members of the Field Museum-Oxford University joint expedition to Mesopotamia. They are about 5,000 years old, scholars estimate, and are believed to be the oldest wheeled vehicles ever excavated. An apparent tragedy

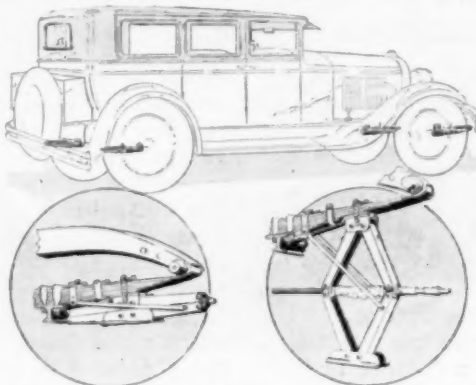
was revealed in one of the chariots. Around it were found the skeletons of a man and four animals, supposed to have been the driver and his team. The animal skeletons have been identified as an early species of horse. Evidence that the master and the animals were victims of a sacrifice to ancient gods was found, or the man may have been a prisoner of war or killed by his own comrades in arms. Between two of the horse skeletons was discovered a shaft, terminating in a metal boss and supporting

the rings through which the reins had passed. This gives new light on the manner in which the chariots were rigged by the Sumerians. As the pieces were taken out, they were sprayed with oak varnish to aid in preservation, and the parts were carefully packed in plaster of paris and layers of paper, to insure safety for them during shipment.

### PERMANENT JACKS FOR AUTO SIMPLIFY REPAIRS

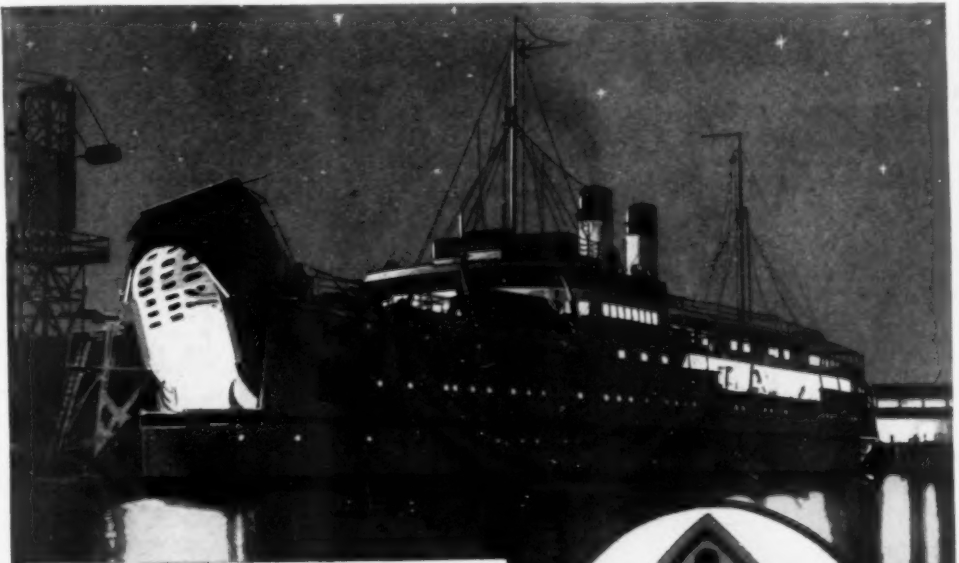
Permanently attached to the car springs, jacks for each wheel of the automobile are quickly let down for service and raise the car by means of a long wrench which is folded into small space for carrying. The jacks are constructed to stabilize the auto-

mobile, are said to work as well in driving on a hill or sloping road as on the level, and contribute to the comfort of riding. The principal feature is that they eliminate the unpleasant task of setting the jack in place and are convenient for lifting the auto off the floor when stored.

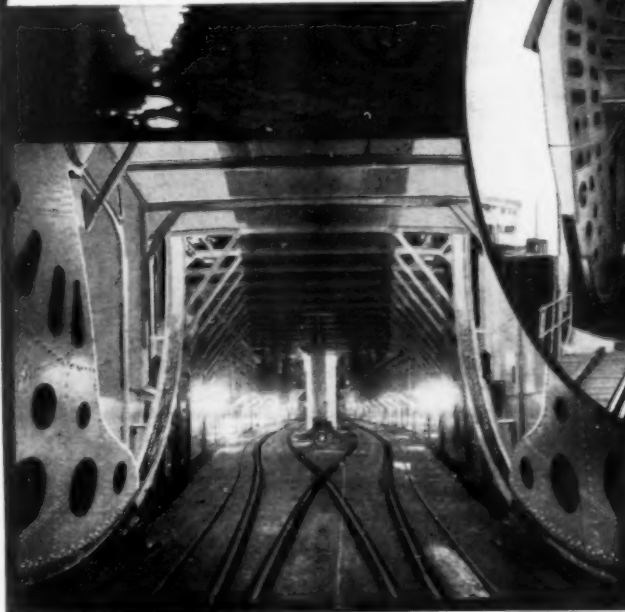
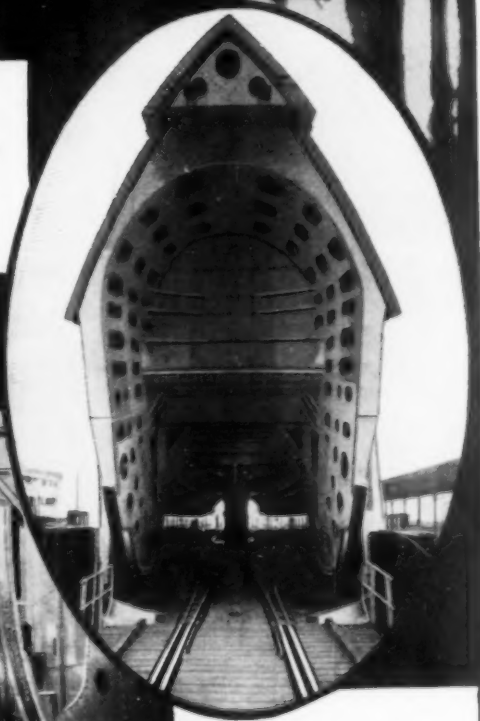


View of the Car with Jacks Attached, and Drawings Showing the Unit Folded and Extended

## SHIP THAT SWALLOWS TRAINS IS USED AS FERRY

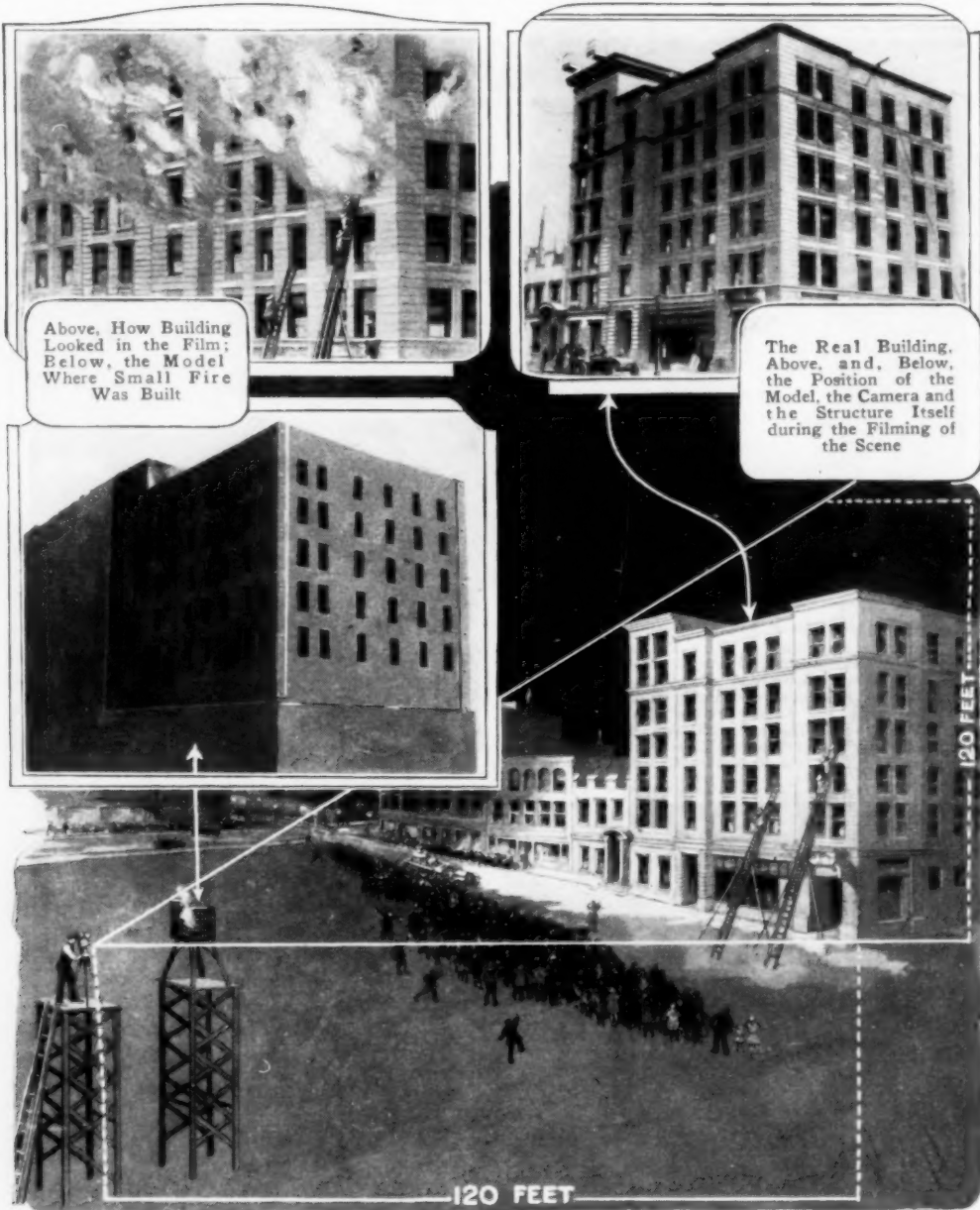


Like Some Fire-Breathing Dragon Out of an Ancient Fairytale, the New German Car Ferry "Schwerin," Above, Opens Its Mighty Jaws by Lifting Its Bow and Swallows a Train of Twenty Passenger and Forty Freight Cars for the Through Service across the Baltic Sea, Which Links Berlin and Copenhagen Via the Port of Warnemuende; Closed, the Jaws Can Turn the Waves or Crush Ice



Tall as a House, the Open Bow, Above, and, at Left, a View of the Tracks Inside; the Ship's Funnels Rise in the Center

“SHOOTING” THRILLING FIRE RESCUES IN MOVIES



Firemen made daring rescues from upper stories, streams of water played against the walls, and billows of smoke apparently rolled among the licking flames. So it looked in the motion picture, at least, while spectators enjoyed the thrills of a night's battle with the fire demon. But

dawn came and the building that had figured in the conflagration was absolutely untouched. Not so much as a soot mark marred its gleaming walls. There had been no fire though the movie showed real smoke and real flames. The effect was produced by a simple stunt in double-

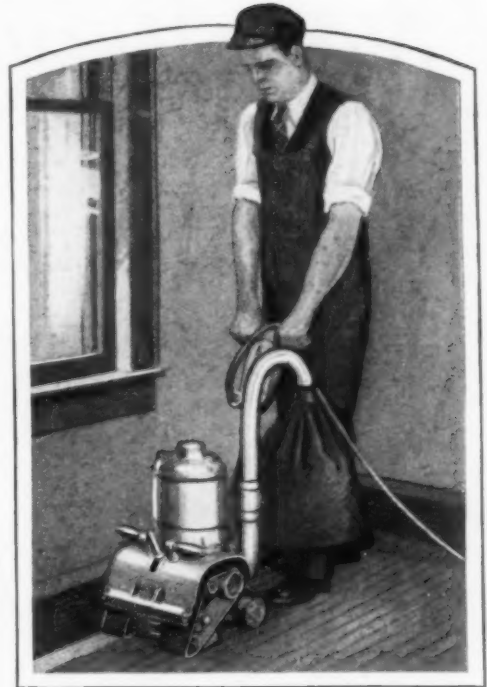
exposure photography. The scene had been taken at night, and at the correct distance in front of the camera, a carefully modeled miniature of the real building had been placed in such a way that the film was "shot" directly through it. Oil-soaked rags were set ablaze behind the model, which was painted a dull black so that it would not be seen in the picture, and the real building was brilliantly illuminated on the exterior. The fire and smoke seemed to come from the real structure where the firemen were performing their rescues in absolute safety, save for the slight hazard of a few drops from the hose lines.

### FOLDING MAPS FOR AUTOISTS EASY TO HANDLE

Road maps, folded by a patented process so that they are never opened to a size larger than the pocket cover which contains them, have been perfected by a Minneapolis map publisher. The Minnesota map is already on the market and the others are to follow as fast as the plates can be prepared. The folding method enables the user to turn pages right, left, up or down and follow from section to section without ever opening the map; in fact, it is so pasted in the folder that it cannot get out of fold. A complete map of the state is printed in a fold of the cover, laid off and numbered in corresponding sections, so that the driver who uses it can see the state as a whole. An index on the map locates all towns and villages. An automatic machine has been developed to take the flat sheets and covers and cut, fold and paste them. The folding process is applicable to all kinds of maps, charts, prints and other material where folding is necessary for carrying or filing.



Map Folded and Pasted So All Parts Are Accessible; It Never Opens Larger Than Its Cover



Sanding the Floor Close to the Baseboard Is Easy with This Motor-Driven Unit

### FLOOR SURFACER SANDS EDGES SAVING HAND LABOR

Edges, corners, narrow closets and other places are easily reached with a motor-driven floor surfer which eliminates hand scraping. The work is done by abrasive belts that run over flexible shoes. They are so adjusted that the machine can be operated flush with the walls and in places inaccessible to the ordinary sander. Dust is collected by a vacuum fan. The apparatus has rubber-tired wheels, weighs less than 100 pounds and, since the butt ends of a floor can always be surfaced with the grain, it insures a better-looking job.



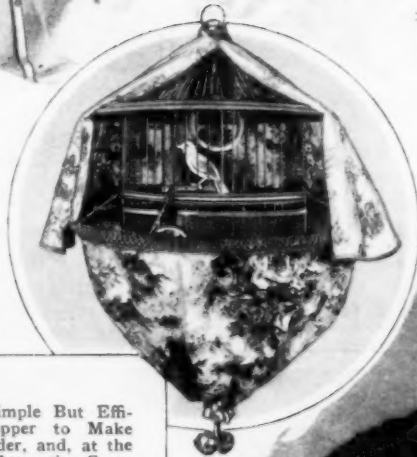
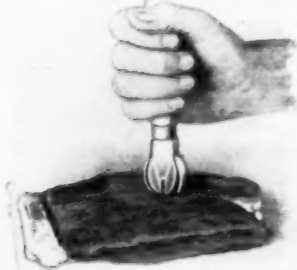
# New Ways to Avoid



For Serving Meals in Bed, This Tray with Folding Legs Is Convenient; It May Also Be Used as a Reading Rack



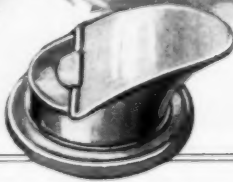
It Clamps to the Floor-Lamp Standard; a Handy Ash Receiver



Left, a Simple But Efficient Chopper to Make Meat Tender, and, at the Right, an Attractive Cover for the Birdcage to Catch Seeds and Feathers



Silver Balls as Substitutes for Ice; They Contain Frozen Liquid to Chill Drinks and Foods



It Transforms Milk Bottle into a Pitcher; a Special Pouring Cap

# Home Drudgery



Rubber and Bristle Scrubber for Cleaning Pans



Added Convenience in Built-In Furniture: This Folding Dining Set Includes an Ironing Board as Is Seen Underneath at Right



Holes in the Milk Can Are Sealed, after Pouring, by This Easily Attached Spring Stopper



Liquid Floor Wax Is Evenly Distributed from Cylinder on Top of the Felt Pad

Not Readily Broken and Easy to Use; a Pitcher, the Handle of Which Is "Built-In"



without the mask and gas supply. He reported that he felt no harmful effects after the test, and that the oxygen, passing through the inner tube, had been pleasantly cooled by the water.

**FILM NIGHTMARES GET ZEST FROM DISTORTAGRAPH**

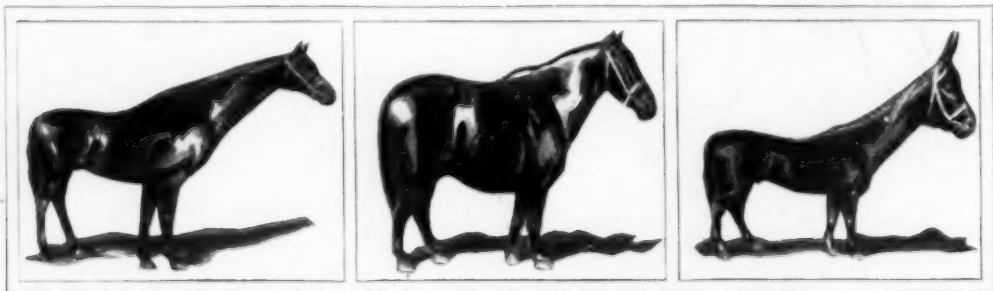
An invention that turns a simple movie into a nightmare of distortion has been perfected by an Englishman, H. G. Ponting, who was Capt. Scott's photographer on his ill-fated trip to the south pole. People, animals or inanimate objects are changed into grotesque caricatures by successively

distorting various portions. The process makes it possible to rephotograph an ordinary still picture and make it live on the film as it flows from one grotesquerie into another. An ordinary postcard photo of a race horse was shown by the inventor to an audience in London. As retaken for a movie, it became successively a short-legged dachshund-like animal, a long-legged giraffe type, a combination horse and mule, and other shapes. A picture of a cow became equally fearsome. The machine, called a "distortagraph," uses a combination of lenses to produce entirely new optical effects. Pictures of Lloyd George, Charley Chaplin and Mayor William Hale Thompson were

**OXYGEN TUBE IN FIRE HOSE TO HELP SAVE LIVES**

By means of a special coupler attachment, a supply of oxygen or air can be sent to the fireman's mask from the hose line, in an arrangement a Canadian expert has devised. The small tube, carrying the refreshing gas, is inside the water conduit and is protected from damage in this way. The simple turn of a valve admits the flow to the mask, and connections are made at the source with a special container on the fire wagon. In a recent test, a fireman remained in a smoke-filled building for half an hour under conditions that would have rendered him unconscious

Tube Connections at Nozzle End, and at Hydrant and Hose Cart



Three Pictures of a Famous Race Horse After They Have Been Run through the "Distortagraph," the Newest Agency for Making Funny Movies Still Funnier

turned into weird monstrosities, which, like a cartoonist's caricature, still preserved enough of the original's features to be recognizable. The invention is expected to revolutionize the making of fairy-story films, animal pictures, and comedies in which film faking plays a part.

### ELEPHANTS SERVE AS TRACTORS ON AFRICAN FARMS

Plowing fields with elephants has proved only about one-fourteenth as costly as with tractors in the Belgian Congo. An elephant can be kept for about twenty-five cents a day; a well-trained animal will plow more than an acre a day and is also useful for pulling stumps, piling timber and for many other heavy tasks. Elephants were imported from India to work in the Congo when the depredations of the tsetse fly proved so injurious to horses and cattle. The Indian animals did not long survive the African climate, but their trainers taught the Congo natives some of the secrets of capturing and teaching young wild elephants.

### KINDLING CUBES FOR CAMPERS SIMPLIFY STARTING FIRES

Making a fire is often a difficult task when camping, and to simplify the process, a small cube of easily ignited material has been introduced for use with the match. It has a hole in it, the match is stuck through, lighted, and the cube catches fire, forming a small blaze that will more readily ignite sticks or other materials.



Face Steamer in Use; Switch Controls Temperature, and Breathing Tube Insures Comfort



### PORTABLE VAPOR FACE BATH LATEST BEAUTY AID

Eliminating the use of hot towels, lights and other apparatus, a portable steamer to give the face a vapor bath has been introduced for home or beauty-parlor use. It gives the skin and scalp a thorough steaming, the temperature being controlled by a regulating switch; is simple to operate and saves time. The subject is exposed to no discomfort, as a supply of fresh air is obtained through a tube.

### SUGAR OBTAINED FROM CORN USED IN MANY FOODS

Besides its cane and beets, the United States has an important source of sugar in its corn fields, although this product has not yet been produced in any great quantities, due to the intricate processes involved in its manufacture. It has proved useful in medicine, especially for feeding infants and invalids, and serves an important purpose in the food industry.



Where an Auto Road Stands on "Stilts"; Section of Highway in Golden Gate Canyon, Yellowstone Park

### AUTO ROAD ON CANYON WALL MARVEL OF ENGINEERING

One of the most picturesque improvements in the Yellowstone park is the automobile road recently completed along Golden Gate canyon. Part of the way, it cuts into the steep mountain sides and is carried by arch supports. The highway is of concrete.

### TALL BUILDINGS GUARD OTHERS FROM LIGHTNING

Tall buildings and rods mounted on high towers, protect neighboring structures from lightning if the latter are not so high as to extend out of the cone of protection, according to the findings of F. W. Peek, Jr., of the General Electric company. This protected area extends around the base of the high building for a distance of between two and four times its height, the experiments show. The tests were made with artificial lightning at pressures of 3,500,000 volts on small model buildings, but confirmation of the laboratory findings has been obtained from a study of real

electric storms. Last summer, for instance, during a shower in New York city, the New York World building was struck by lightning. It is within the 1,100-foot circle about the base of the Woolworth tower, but its dome extends about 100 feet outside of the cone of protection. Had the World building been 200 feet closer to the Woolworth building, it would not have been struck, Mr. Peek believes. Practical application of the results of some of the lightning experiments has been made in safeguarding oil-storage tanks. Tall rods, placed outside the big reservoirs, provide overlapping cones of protection and so reduce the danger of fires.

### WINDOWS WASHED FROM INSIDE WITH SPRING SWAB

Cleaning the outside of the window is simplified with a collapsing unit operated from the inside so that the use of ladders is unnecessary. The outfit is worked somewhat like a pantograph, the motion of an extension handle inside being reproduced with the cleaning pad, attached to a similar bracket, outside. There is a handle grip to keep the washer steady and the window needs to be raised but a few inches. The scrubbing member is pointed so that it will reach up under the portion covered by the upper window.

Pantograph Window  
Cleaner in Operation  
from Inside





# Easy Tricks



It Is Easy to Blow Out a Candle Sheltered behind a Tumbler, and It Would Be Just as Easy If the Tumbler Was Several Times Larger, For the Air Simply Sneaks around It

**B**EING with tumblers, which are of glass, these little tricks should be very easy to see through.

The performer takes a tumbler. He gets dramatic. "Ladies and gentlemen," he drawls, with the smile of the wizard on his face, "I have just discovered that I have a wonderful magical power which enables me to blow through solid objects. Look!"

He arranges a lighted candle and a glass as shown above and then blows directly against the glass. "Allez!" And the candle flame on the opposite side of the glass is whiffed away! But, really, there is nothing wonderful about it, for the single air current made by blowing on the glass merely splits and sneaks around the tumbler and joins forces again on the other side to put out the candle.

Imagine anyone asking you to support a heavy tumbler on a single sheet of paper

which rests on the edges of two other tumblers! "But, Amos, he did it! He folded the paper up in them there little accordion pleats, as shown, and, well—that was all there was to it!"

For the next effect the performer exhibits a tumbler, a strip of paper and a coin. He delicately balances the coin on the edge of the tumbler, with the slip of paper underneath it. The problem is to take the paper completely away without dislodging the coin.

Without previous knowledge of the law of inertia governing this effect, the average spectator will either take the paper by the extreme end and jerk it away, or he will attempt to move it cautiously on the basis of "gently does it." Neither way works. But if you hold the extreme end of the paper in one hand and strike the center portion smartly with the other, as shown, you will be surprised to find how



easily the paper comes away and how motionless the coin remains balanced on the edge of the glass.

The levitation of a lady has nothing on this one! The problem is to raise a tumbler by merely pressing the hand, face down, on the mouth of it. Mr. Match does the trick. Light him. Drop him into the tumbler. Place your hand, face down, over the mouth of the tumbler. And there you are! The match heats the air inside the glass, causing it to expand. When you place your hand over the glass the match goes out, the air cools and contracts, creating a partial vacuum, and the outer air pressure holds the glass tight against your hand.

Try this one on your dining table! The performer takes a glass half full of water



A Sheet of Ordinary Paper Will Support a Water Glass, Provided It Is Properly Folded in Accordion Pleats

and puts a plate over its mouth. The glass is then inverted and the plate placed on the table. And now, here's the catch: Can you drink the glass of water, using one hand only?

Well, just like everything else, it's easy if you know how. It's a good "daily dozen." Bend over, resting the top of your head on the upturned bottom of the glass. Now, if you will press the tumbler

tightly against your head by lifting up on the plate, you can raise the glass and balance it on your forehead. From there it is a simple matter to remove the plate and then drink the water. All with one hand! It's a pretty wet trick if you miss!

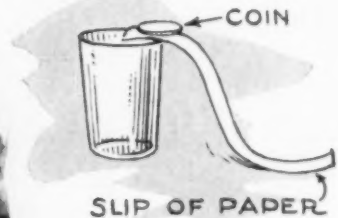
The next swindle, up to a certain point, is identical with a little ceremony you've done several times before. You place an expensive cut-glass tumbler on the edge of the table. You eye it deliberately. You knock it off the table.



There Is a Trick in Withdrawing the Paper Strip from Beneath the Balanced Coin, without Disturbing the Latter

But—it doesn't break! That's the trick. To perform this effect you must set the tumbler at the extreme edge of the table, mouth up. Then push it off gently by pressing with your right forefinger lightly against the lower part of the glass. If you have done this carefully, the tumbler will make a half revolution in its downward flight, and alight squarely on its rim. A smash from a fall like this is virtually impossible, even with the most delicate glass-work. It's not a certainty, however. Better try it with a pillow on the floor for the first few times.

The average tumbler will quite placidly submit to being made to stand on its base,



but when the magician makes an ordinary tumbler stand on one edge of its base—well, that's why we call him a magician. Let's see how he does this clever bit of jugglery. You'll

need a match. This match is previously slipped under the table cover. With a little manipulation, you can rest the tumbler at an angle against this concealed match, and make it stand on edge in a manner strangely mystifying.

The trick of making the tumbler stick to the palm by creating a partial vacuum inside has an interesting relation, done, however, with a milk bottle instead of a glass. The stunt is to put a hard-boiled egg into a milk bottle without breaking the egg. First boil your egg and remove the shell. Now try fitting it into the mouth of a milk bottle, and see how far it comes from passing the bottle neck. But, if you



All It Takes to Make a Tumbler Stick to Your Hand in Any Position Is a Bit of Hot Air, Provided by a Lighted Match Before You Start the Trick; the Hot Air Cools, and a Partial Vacuum Does the Rest



Here Is the First Position in the One-Hand Drinking Stunt, Starting with an Inverted Glass of Water



In the Second Position, Shown Above, the Tumbler Has Been Raised and Is Balanced on the Forehead, Pressure on the Plate Holding It in Place and Keeping the Water Inside during the Maneuver; the Next Step, at the Right, Is to Keep the Glass Balanced While You Remove and Discard the Plate; Then You Are Ready to Drink the Water



drop a lighted match into the bottle first, to heat and expand the air, and then place the egg in the bottle neck, you will see it slowly contract and draw itself out longer until it slides with a pop into the bottle, resuming its natural shape and showing not a single break.

Want to get the egg out again? That's easy. Lift the bottle to the lips, blow as hard as you can, building up a nice bit of compressed air, then, still keeping the mouth of the bottle sealed tight with the lips, tilt the head back until the egg slips down and seals the neck.



Can You Knock an Expensive Cut-Glass Tumbler off the Table and onto the Floor without Breaking It? It Is Best to Practice with a Cheaper Glass Until You Acquire the Knack

Then you can set the bottle down on the table and watch the egg come out.

The lighted match exposes how the trick is done, but it is possible to perform it without any visible aid, and then you have something really mystifying. All you need is a hot place where the bottle can be set for a few moments to warm the inside air. You can have your bottle waiting on a radiator in winter, or you may have a small electric hot plate con-

cealed somewhere under the table. Get the bottle good and warm, then put it on the table, drop the peeled egg into the mouth, casually announce that shortly you will have the egg descend into the milk bottle, without damage to either, and proceed with another trick, keeping an eye on the egg. It may take the bottle several minutes to return to room temperature, but as it cools and the air inside contracts, the egg will start down. At the moment you see it begin to move, you can proceed to do the egg trick.

Tumblers are very useful things for the magician, mostly because they are transparent, and the audience therefore think they can see everything. Ever watch a magician lay a pack of cards on top a tumbler, completely covering the mouth, then borrow a half dollar, make it vanish, and have it appear in the glass? Know how to do it? One of the simplest ways is to palm a half dollar, exhibit your deck of cards, fanning them out, then, holding the coin against the back of the deck and showing the face, place the



deck, face up, on the glass, the coin being caught between glass rim and deck. Drape a handkerchief over the cards to conceal where the coin comes from.

Now borrow the half dollar; hold it in the right hand, then, apparently, transfer it to the left, and use the presumably empty right hand to pick up a wand or pencil. Wave the left hand, which apparently holds the coin, over the glass, and at the same time tap the end of the deck, opposite to the one covering the coin, with the wand. That tilts the deck up and the half falls into the glass with a loud clink. Under cover of removing the handkerchief and deck and extracting the half, the borrowed coin can be pocketed and your own returned to the lender.

Did you ever see a deck of cards placed in a tumbler, and then have a chosen card rise right up out of the deck at the magician's command?

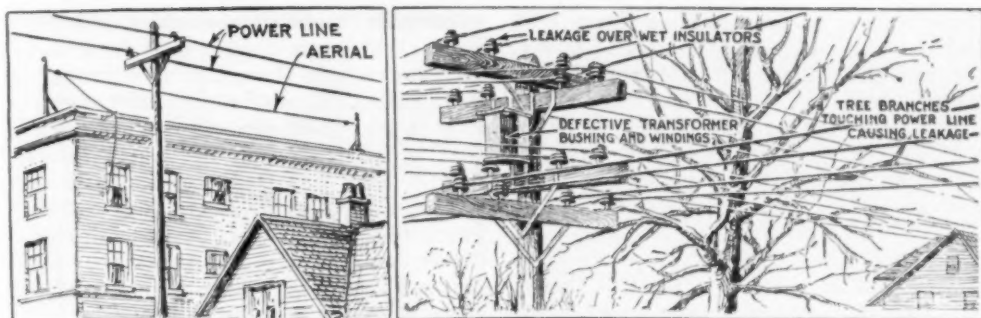
Here's how it is done. The deck presented the audience, is one of the prepared "forcing" decks sold by magic stores, and arranged so the user can force certain cards on the customers. After these cards are chosen and returned to the deck, the magician lays it down on his table while arranging the tumbler, and then picks up another deck, already prepared for the trick. A black silk thread has been knotted

through a hole in one card of this deck, and this card is placed three or four cards down from the front of the pack. The thread leads up over the top of the cards, and is then drawn back across the top of the deck. Holding it in that position, the chosen cards, which correspond to those later to be forced on the audience, are inserted at intervals, each one, as it is pushed down into the deck, pushing ahead of it the thread, so that each of the cards rests in a loop of the string.

After all the cards are in place, the thread is cut to leave an end a couple of feet long, and a bent pin is attached to the end. When the deck is placed in the tumbler, the pin is hooked into the performer's clothing. To make a card appear from the deck all he has to do is move his body slightly away from the pack, when the card nearest him will rise. After it reaches the top and falls out, the next comes up, and so on until all have appeared.



Balancing a Tumbler on One Edge Looks Difficult, but a Bit of Forethought in Planting a Match beneath the Table Cover Before the Guests Arrive Makes It an Easy Trick to Do



## Drums, Hums and Crackles

By E. R. HAAN

**D**RUMS, hums and crackles are quite familiar to radio listeners, in fact, many set owners have never heard a good clear radio program because of such interference. These conditions are often accepted as a necessary evil, but it is quite possible, in many cases, to remedy these troubles.

If drumming noises, hums and crackles, intermittent or continuous, persist, and you are sure the fault does not lie in the set, batteries or eliminators, you will probably find its source in a near-by power line or some electrically operated device. One of the simplest tests by which you can assure yourself that the trouble is not in the radio installation is to remove the aerial lead from the binding post on the set. If the noise stops, it is reasonably safe to release the set from suspicion. On the other hand, if the interference is continuous or sustained over long periods of time, this indicates at once that the trouble is not caused by atmospheric conditions, since interference of this class comes in crackles and crashes of varying intensity.

In this article we are dealing with sustained, monotonous hums, drumming noises and crackling sounds of similar nature, known as "man-made static." The

National Electric Light association has classified such interferences under the following heads: power circuits, industrial applications and household appliances. Under the first head are grouped lines, insulators, lightning arresters, transformers, generators and motors. The second group lists arc-light circuits, telephone and telegraph lines, pole changers and converters, street cars and sign flashers. Under household appliances, we find electric pads, violet-ray machines, flatirons, doorbells, light switches and small motors.

Heading this article are two sketches showing the most common form of interference, that at the left representing an aerial parallel to a power line. This might, in many cases, be the most convenient way to install the aerial, but it is also an ideal method of picking up interference. To correct troubles of this type, merely run the aerial at right angles to the power line. The sketch at the right shows three

forms of interference, rather exaggerated as concentrated in such a limited area, but nevertheless entirely possible. Defective insulators, or insulators coated with ice or sleet, provide a path for an arcking discharge; transformers may have a distinct core hum, and most of us have seen the



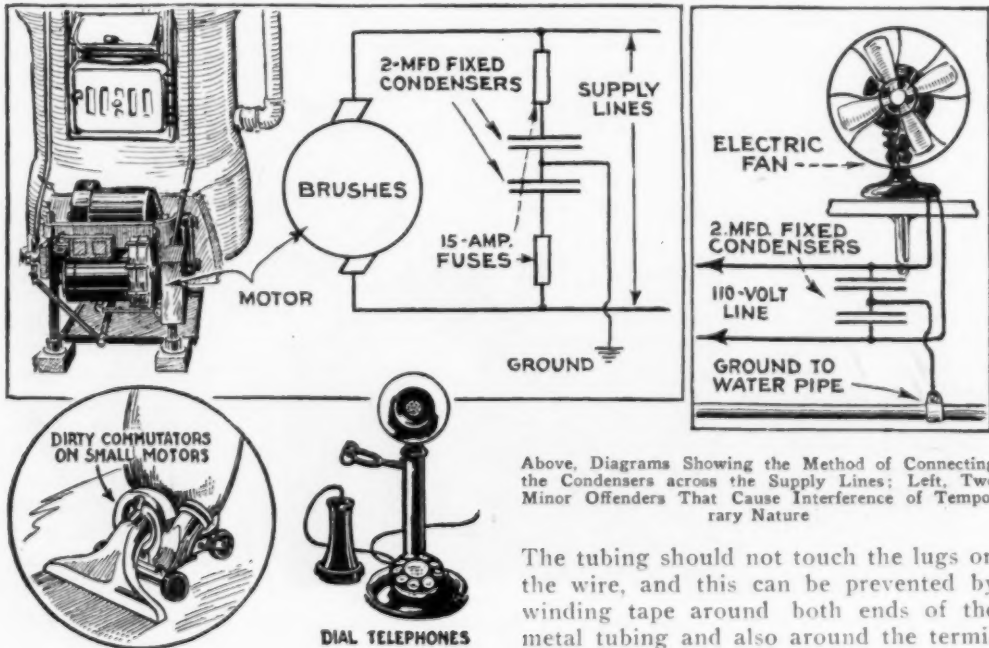
Tightening Switch-Box Connections; Condensers Are Shown Connected above the Box

display of fireworks resulting from tree branches rubbing against high-tension lines in wet weather. The only remedy for such troubles is to call the power company.

Obviously, loop receivers are not subject to these troubles as much as those of the outdoor-aerial type; yet, if the loop receiver is placed close to electric-lighting wires or to extension cords on lamps, some trouble may be experienced. Shielding the whole receiver or the coils only will often eliminate much of the line pick-up in the home. Two heavy-duty fixed condensers of either 2 or 4-mfd. capacity may be placed in series across the supply line and a lead to the ground taken from the center connection, between the condensers. This will do away with much of the extraneous noise carried by the line. The remedy just described may be applied at the switch box, or, if stationary or semi-stationary motors are in use in the building for any purpose, such as operating blowers for oil burners, lathes, washing machines, etc., the condensers may be connected in series and shunted across the 110-volt terminals of the motor. Bad contacts in fuse or switch boxes may cause a sputtering or crackling sound often difficult to locate. The remedy is to tighten all contact screws, and see that the blades

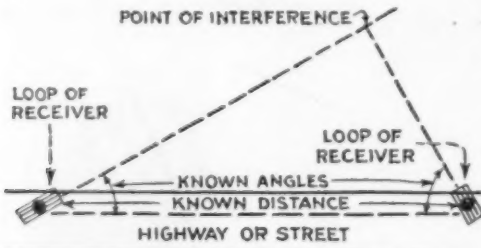
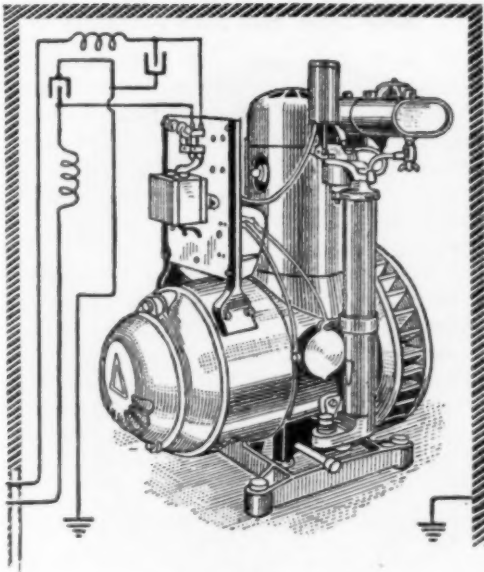
of switches make good contact with their clips. The same applies to light sockets. Bad contacts in thermostatic controls, or in the mechanism of electrically operated household appliances, often cause trouble that can be remedied by simple repairs. The heating pad is a common offender, and in this case the best thing to do is buy a new one. This is the case also with defective electric irons. When they have reached the stage where their complaint is heard in the loud speaker it is an indication that they have outlived their usefulness. If automatic telephones are in use, a clicking sound is often heard in the speaker of the receiver when the calling dial on the telephone is rotated, and similar noises are heard when doorbells are operated or lights turned on or off. These noises, of course, are temporary, and do not cause much annoyance.

Interference from farm-lighting plants is a common complaint in rural localities. These plants are equipped with a magneto that sounds very much like an amateur experimenting with a spark-coil transmitter, as far as the radio receiver is concerned. The remedy consists in shielding the high-tension lead from the magneto to the spark plug by slipping a length of flexible metal tubing over it.



Above, Diagrams Showing the Method of Connecting the Condensers across the Supply Lines; Left, Two Minor Offenders That Cause Interference of Temporary Nature

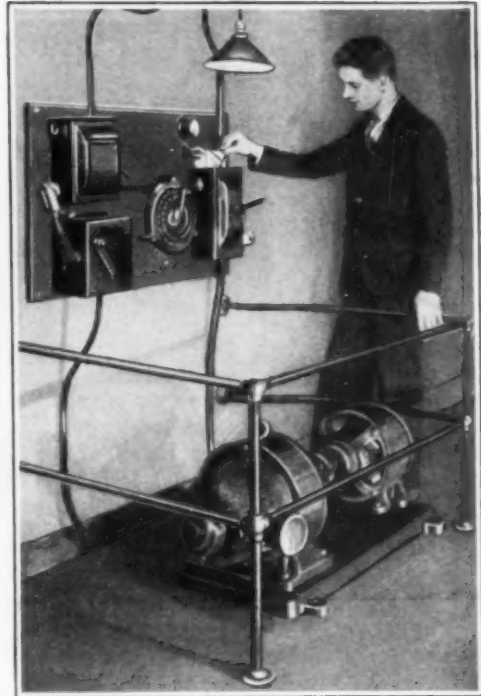
The tubing should not touch the lugs on the wire, and this can be prevented by winding tape around both ends of the metal tubing and also around the termi-



Left, Above, Completely Shielded Farm-Lighting Plant, Showing Method of Using Condensers and Coils; Below, Diagram for Locating Trouble by Means of a Portable Loop Set; Right, Tracing Interference to Noisy Motor Generator

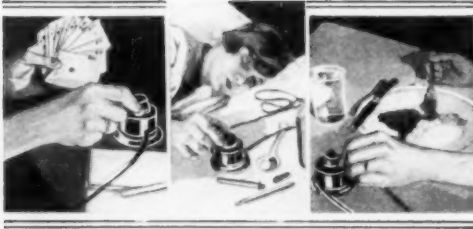
nals. An insulated wire is then soldered to the metal tubing and connected to a water pipe or to a metal rod driven into the ground.

As an alternative, the entire plant may be shielded (see page 122). The method of using heavy-duty fixed condensers previously described to prevent interference caused by sparking commutator brushes may also be applied as shown in the same illustration. Condensers from discarded Ford coils can be used for this purpose, and it is a good idea to insert fuses between the output lines of the generator and the condensers, to prevent a short circuit in case one or both of the condensers break down. A further precaution is to provide inductance coils in the line. These coils are wound on a tube, 2 in. in diameter and 3 in. long, and con-



sist of about 150 turns of the same kind and size of wire as that used for the output lines of the generator.

To locate interference caused by electrical devices about the home, operate the set and tune in the interference at a loud volume, then turn off the various appliances one by one until the offender is located. Neighborhood troubles may be located by means of a portable loop receiver. It is carried to points in the vicinity of the suspected source, and the loop rotated, at each stop, until it points in the direction at which the noise is heard at its loudest. By making a complete circle and plotting the lines determined by the loop, it is usually an easy matter to locate the source of the trouble. If the point of interference is quite a distance away, the location of the point of trouble may be quickly approximated by the method shown in the diagram at the lower left on this page. The intersection of the dotted lines represents the place from which the interference is radiated; it is then an easy matter to determine the distances from the observation points to the source of trouble by comparing them with the line of which the length is known.



Control for Remote Operation Reduces Volume of Receiver to Suit the Occasion

### Handy Tone and Volume Control

The table-type volume control shown in the photos provides a variable resistance in the form of an accessory rather than a part. The unit consists of a micrometric variable resistance with a range of from 0 to 500,000 ohms, mounted in a metal stand and provided with standard cord-tips and a connection block. Several useful applications are illustrated in the photos, and on any occasion when it is desirable to reduce the volume of the set the outfit will save many steps. It may be employed as a volume control also for electric phonographs, or used in connection with a.c. tube harness. The current-handling capacity is sufficient to assure long operating life.

### Radio Speaker in Colonial-Type Tilting Table



A modern cone speaker built to resemble a colonial tilt-top table has recently made its appearance on the market. The table top is an efficient baffle board said to greatly enhance the tonal effect. The unit is designed to exclude moisture, keeping the speaker efficient in any climate.

### New Tube Has Five Elements

A new tube recently introduced in France has five elements, a filament, three grids and one plate, six connections being necessary for operation. Four of these are on the base in the usual position, the other two being on the side of the insulated base itself. A tube of this type is, of course, usable in many varied and complicated circuits. A favorite circuit is one where the triple-grid tube acts simultaneously as first detector, oscillator and r.f. amplifier with regeneration. A three-tap loop and condenser are used to control regeneration, as in many circuits now common in this country, except that the single tube does the work of several.

### Low-Loss Midget Condenser

The low-loss midget condenser shown in the illustration is now available for use where a minimum of power loss is demanded. In the new instrument bakelite replaces metal wherever possible. It is specially designed for neutralizing and balancing, to compensate for coil and condenser variation. There are two sizes: one 7-plate type with a capacity range from 3.5 to 25 mmf., and one 13-plate, ranging from 4.8 to 50 mmf.



### Hum Caused by Glow Tube

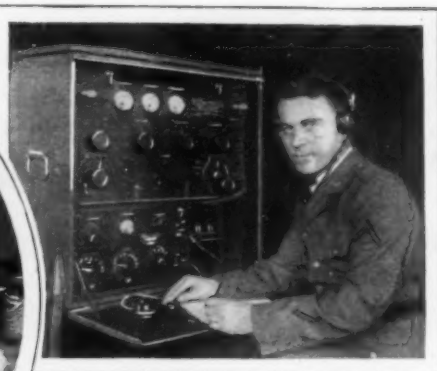
In properly designed B-eliminators the glow tube is a useful device and has a definite place, but if applied to some of the existing eliminators, it often causes a hum. The increased current drain saturates the limited choke coils and this is what causes a troublesome hum in an otherwise quiet eliminator. Hence, the glow tube should be used only in eliminators known to have ample chokes for the extra current drain, which often reaches 15 to 30 milliamperes.



## Facts and Fads for Radio Fans



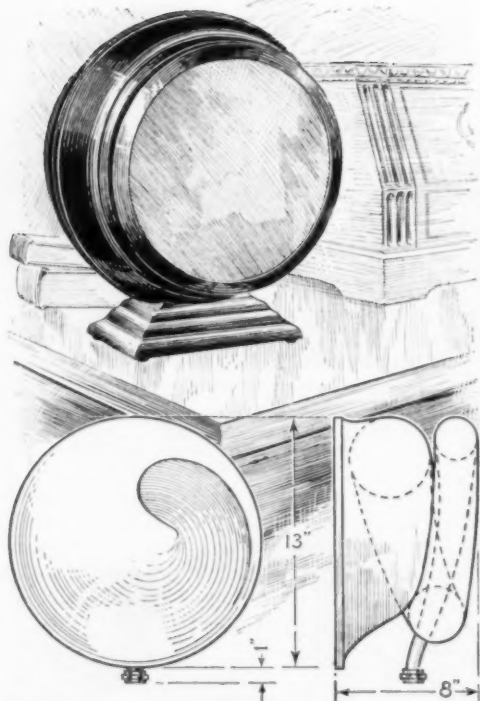
Above, Edward C. Hartman, Whose Duties Are Similar to a Train Dispatcher's, Is Radio Dispatcher for the New Chicago Studio of the National Broadcasting Company, Operating over the Blue Network; the Telegraph Equipment Shown Is a Temporary Installation



Portable Transmitter, Designed for Signal-Corps Communication with Aircraft, Is Suitable for Either Telegraph or Voice



Above, One of the Largest Loud Speakers in the World Is Built into the Ceiling of a Residence at Oak Park, Ill., the Artistic Electric-Lighting Fixture Adding to the Decorative Effect; Left, Dr. F. B. Jewett and Gen. John F. Carty, of the American Institute of Electrical Engineers, at the New York Meeting, Addressing, via Radiophone, a Joint Session of English Engineers-Held in London; Although Separated by the Atlantic, Both Bodies Heard the Speakers Clearly as well as the Applause of the Audiences



New Drum Speaker of Compact Design; Below, Diagrams Showing the Construction of Tone Chamber

### Compact Exponential-Type Speaker

The drum-type exponential speaker shown in the illustration is very compact for a unit with a long tone chamber. Built to meet the need for a quality reproducer, it does not incorporate a cone or conventional horn, but has a tone chamber which is coiled in small-shell fashion and is said to assure a high quality of reproduction. The drum is attractively finished in bronze.

### Correct Grid Bias Saves Batteries

A grid bias properly used in the r.f. stages of a radio receiver will result in a saving of B-battery current as well as increase the sensitivity and selectivity of the set. When the CX-301A or similar tubes are used in the r.f. stages and a B-battery voltage of 90 volts is applied to the plates, a C-biasing battery of  $4\frac{1}{2}$  volts should be used. If the set builder wishes to avoid the use of a C-battery for this purpose, a convenient method, and one which does not introduce coupling between the stages, is to obtain the grid bias from the 1-volt

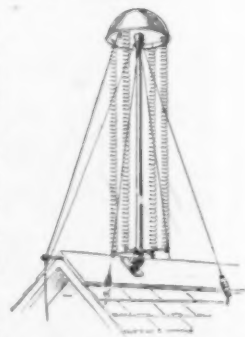
drop in the filament circuit. A fixed resistance of 4 ohms may be added in the negative filament lead to each r.f. amplifier tube, and the grid-return lead from the tube may then be connected with the negative lead from the A-battery. When the rated current of .25 amp. is flowing through the tube, a negative grid voltage of 1 volt will be obtained by the use of this resistor.

### Homemade Filament-Control Units from Old Rheostats

Fixed filament resistors for radio tubes may be made from old rheostats by removing the resistance wire and using various lengths for different types of tubes. For a.f. tubes, where filament current is not critical, these homemade units work as well as the more expensive types. Unwind the resistance wire from an old 6-ohm rheostat and rewind it on a strip of the insulating material, cut to the size required. For the standard 201-A or 301-A tubes a resistance of about 4 ohms is required, and about two-thirds of the original winding will be needed. Holes are then drilled in the ends of the insulating strip and Fahnestock clips used for terminals, or the end of the strip may be placed under the filament terminal of the socket and the nut screwed down on the wire; a soldering lug may then be used for the other terminal.

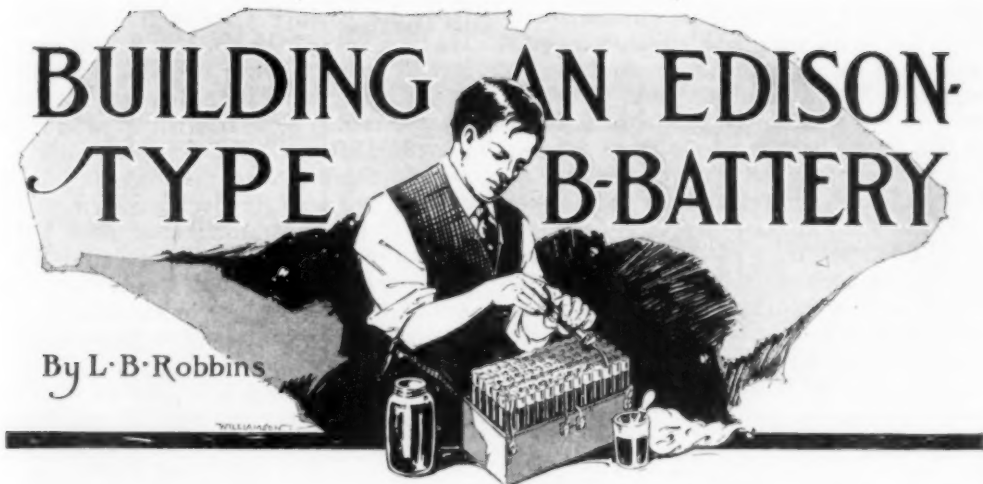
### New Aerial Easily Installed

The coiled-wire aerial shown in the sketch can be erected easily and quickly on either a gable or flat roof. It takes little room and is ideal for congested districts where roof space is at a premium. The cap, terminals, coils, guy wires, roof bracket and all necessary parts are supplied by the manufacturer. Compact aerials of this type are less sensitive to static and other interferences, and work well with all circuits.



# BUILDING AN EDISON- TYPE B-BATTERY

By L. B. Robbins



FOR an inexpensive storage B-battery the Edison type has several advantages: First, a 100 or 140-volt unit is smaller and lighter than the ordinary storage battery; second, there is no destructive acid to spill, and third, the nickel-steel elements are non-sulphating and last indefinitely. Batteries of this type hold a charge, when idle, for long periods, making recharging unnecessary if the battery is not being used. The elements are sold by many concerns, and the test tubes can be bought in quantities from chemists' supply houses at a very small price. The total cost of material for building a 100-volt unit is about \$5, and for a 140-volt block about \$7. For the former you need 78 flint-glass test tubes, 6 in. long and  $\frac{3}{4}$  in. in diameter; 78 rubber separators, preferably with perforations to allow quick circulation of the electrolyte, and 78 pairs of elements. The positive element (the round one) is  $4\frac{1}{2}$

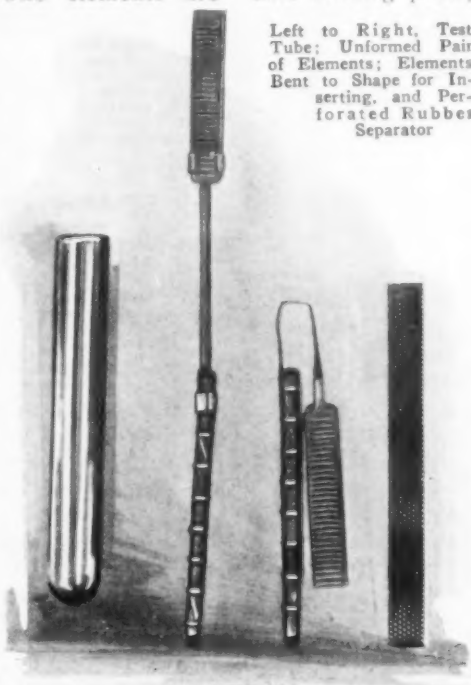
in. long, and the negative (flat) element 3 in. The connector is of soft steel, about 4 in. long. Two pounds potassium hydroxide, 1 oz. good mineral oil, such as liquid paraffin, and 5 lb. distilled water are also required.

For the case and fittings, cut  $\frac{1}{2}$ -in. white pine to the sizes indicated in the diagrams on pages 128 and 129. To complete the material, obtain four Fahnestock clips, or suitable binding posts, some rubber-covered

hookup wire, a small piece of thin copper sheet, solder suitable for steel, 8 small copper tacks or rivets, 12 ft. of No. 12 brass wire, and enough sheet rubber or felt to cover the bottom of the case.

The inside measurements of the latter should be  $11\frac{1}{8}$  by  $5\frac{1}{8}$  in. by 3 in. deep; countersink the nail heads and apply a coat of shellac or waterproof paint for a finish. Measure down  $\frac{1}{2}$  in. around the sides and ends and, with a No. 12 drill, bore 12 holes in each side and five

Left to Right, Test Tube; Unformed Pair of Elements; Elements Bent to Shape for Inserting, and Perforated Rubber Separator



in each end, spacing them  $\frac{13}{16}$  in. apart. Cut the brass wire into suitable lengths and pass through the holes to form 78 square cells for the test tubes. Previous to fitting the wires, the rubber or felt pad is laid in the bottom of the case. Fasten the four clips to the front of the case as shown in the photos and insert the test tubes in their cells.

Distilled water is now poured into an earthenware or glass bowl, and the 2 lb. of potassium hydroxide stirred in until dissolved. The solution will become quite warm at this stage and should be allowed to cool thoroughly before proceeding fur-

from the positive plate to the top about  $\frac{1}{4}$  in. Two of the connectors are sawed in half so as to leave two single positive and two single negative elements. A perforated rubber separator is placed in each test tube, after which the elements are inserted. Starting from the lower left-hand corner, put a single negative element in front of the separator. (See page 129.) Place the positive plate of a double element on the other side of the rubber separator, with the connector straddled over to the next cell, into which the negative element is inserted. Continue this operation in the direction indicated by the arrows until 39 cells have been filled; a single, positive element is placed in the last section of the 39th cell. Start the 40th cell with a single negative element and continue in the same manner until the 78th cell is filled with the last single positive element.

The ends of the steel connectors on each single element may be

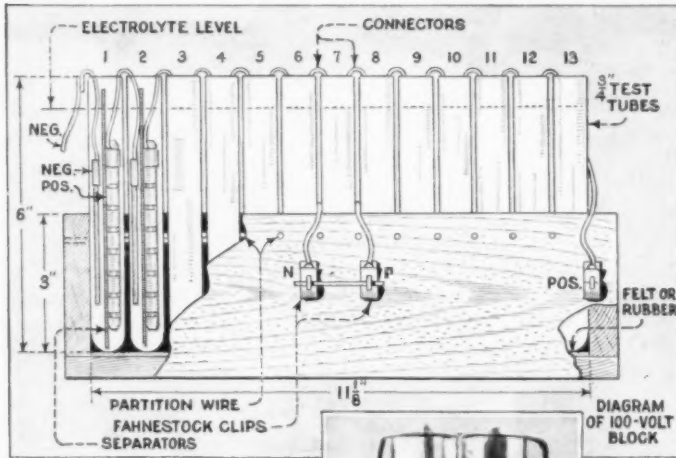
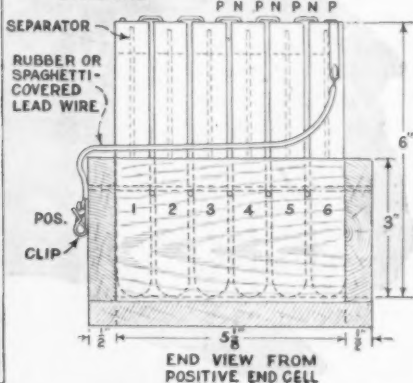
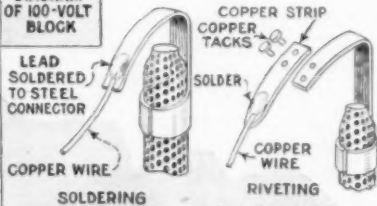
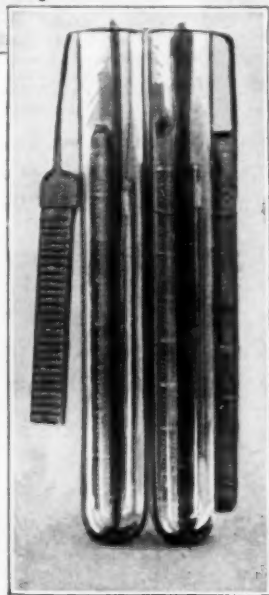


DIAGRAM OF 100-VOLT BLOCK

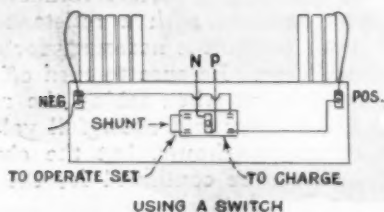
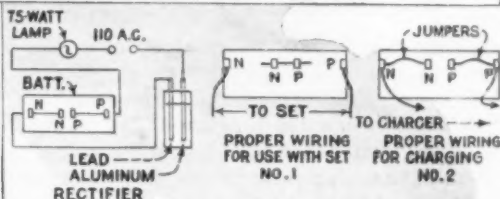
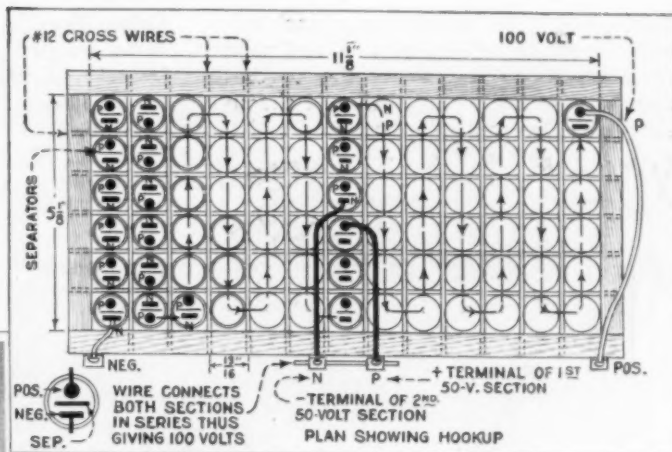
ther. It is tested with an absolutely clean hydrometer (not one that has been used for testing an acid battery). If the reading is higher than 1250, add distilled water, if lower, add more of the chemical. Leave the solution to settle and then filter or decant it to remove the scum.

Preparation of the elements for placing in the test tubes is now in order. Bend the connectors over a strip of wood so that the horizontal portion will be about  $\frac{3}{4}$  in. long, and the length of the part



Upper Left, Sectional Diagram of the 100-Volt Block, Showing the Cell Arrangement; Bottom, Left, Two Completed Cells with Positive and Negative Elements and Separators between Them; Right, Sectional View from Positive End Cell; Above, Methods of Connecting Lead Wire to Elements

either riveted to a narrow strip of copper and the lead wire soldered to the end of the copper strip or the copper lead wire may be soldered directly to the steel connector with special steel solder as illustrated. The riveting method is the better, but, if used, do



Upper Right, Top View Showing Cell Arrangement and Hookup; Below, Wiring Diagrams for Charging; Left, Filling the Cells with Electrolyte; Bottom, Using a D.P.D.T. Switch for Quick Charging Connections

not bend the copper strip over inside the cell so that it comes in contact with the solution. Keep it entirely outside the cell. The copper-wire leads from positive and negative elements are taken to the clips on the side of the case, as shown, the two clips on the left being negative and the two on the right positive. Keep all wiring well separated in order to avoid short circuits.

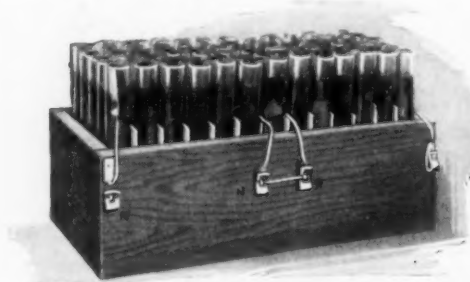
Now assemble the battery, and if there

is any play between the cells take it up by inserting cardboard strips between them. Fill each cell with solution to within 1 in. of the top; the plates will soak up some of the liquid so it will probably be necessary to repeat this procedure once. Next, with a clean medicine dropper, place about six drops of the mineral oil on top of the solution in each cell, and the battery is ready for charging. The oil prevents evaporation of the electrolyte and creeping of the salt on the connectors.

Any type of trickle charger can be used to charge the battery, although the method indicated on this page employs a homemade electrolytic rectifier. This consists of a glass jar (1-pt.) with a wooden cover, a lead electrode,  $\frac{5}{8}$  in. wide and at least  $\frac{1}{8}$  in. thick, and an aluminum strip,  $\frac{1}{4}$  in. wide and  $\frac{1}{8}$  in. thick. The length of the strips depends on the height of the jar and is not important, but both should be of chemically pure metal. Sandpaper the strips and boil them in a solution of caustic soda to remove all traces of grease, and do not handle the part exposed to the solution before inserting it in the jar.



Turn over  $\frac{1}{2}$  in. of the top of each strip, drill the ends for binding posts, and mount them on the underside of the cover by means of binding posts inserted through the top. The depth of the liquid and the



The Completed B-Battery Ready for Use

spacing of the electrodes determine the amperage the rectifier will deliver. One-fourth-inch separation and immersion in the solution to a depth of about  $3\frac{1}{2}$  in. are about right in order to obtain the required  $\frac{1}{4}$ -amp. charging rate. Note that the lead electrode is connected to the negative side of the battery. The electrolyte used in the rectifier is made of common borax and distilled water, adding borax until the water will not take up any more. Let the solution settle and pour off the clear liquid. After filling the jar to the correct height, add about  $\frac{1}{4}$  in. of heavy mineral oil to prevent evaporation. Use either a 60 or 75-watt lamp; the socket for this and a shallow box for holding the rectifier may be mounted on a baseboard.

A low rate of charge is necessary for batteries of the Edison B-type. If 110-volt d.c. current is available, no rectifier is needed and connecting a 50-watt lamp in series with the battery will suffice. When charging, the short jumper wire between the middle N and P-clips is removed and others fitted to connect the two negative and two positive clips as shown. The charging wires are then connected to the positive and negative outside terminals. This arrangement charges the two 50-volt sections in parallel. When this is done, remove the outside jumpers and put the central one back, placing the 78 cells in series. A tap must be connected for the detector supply at either the 22 or 45-volt cell. This may be done with a small spring clip, which should be removed when the battery is charged.

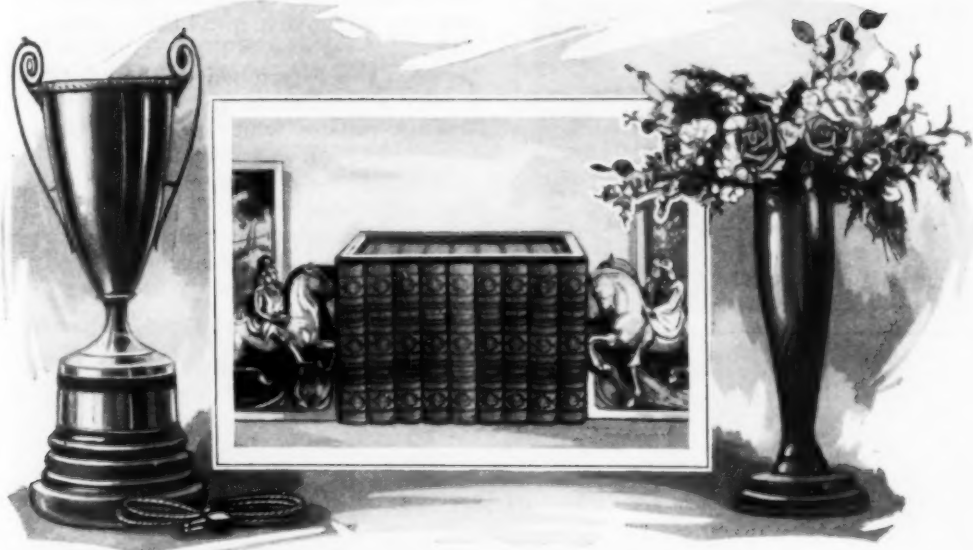
Other B-voltages may be obtained in the same manner. Each cell gives approximately 1.3 volts, and to find the 45-volt tap you count the cells, from the negative end, until the number of cells counted (in this case 35) multiplied by 1.3 gives the voltage desired. For charging the battery from a 32-volt d.c. system the battery will require slightly different wiring. Instead of dividing the battery into two 50-volt sections it must be cut into four 25-volt sections, and, of course, the rectifier is omitted. Continue the charge for 12 hours, for d.c. current, and 15 hours for a.c. current. Overcharging will not injure this battery, even if it is left on charge for two or three days.

When building batteries of higher voltages, do not make any unit much larger than  $67\frac{1}{2}$  volts as they must be charged in parallel. For example, a 140-volt battery may be built up of two, but a 200-volt type should be divided into four 50-volt sections, arranged for charging in parallel as described.

Change the solution about once a year if in constant use, and keep the level up in both the battery and rectifier by adding distilled water as required. As the specific gravity of the electrolyte remains unchanged whether the battery is charged or discharged, hydrometer readings are useless. Hence, a B-battery voltmeter of the type designed with a resistance of 1,000 ohms per volt is necessary for testing the charge. Be sure to turn off the charging current when taking the reading. The battery will show full voltage after about two hours, but the charge should always be continued for the full allotted time.

A large blueprint of the layout and wiring diagrams, as well as additional data on the rectifier unit and methods of adapting standard 2-amp. chargers for use with the battery, if preferred, may be obtained from Popular Mechanics radio department, 200 E. Ontario st., Chicago, for 25 cents to cover cost and mailing. Specify blueprint No. 134.

☞ Popular Mechanics' radio department offers its information service free to all readers of our magazine. We will be glad to help you with your problems, and will promptly answer all inquiries.



The Trophy Cup, Row of Books and Flower Vase Shown Above Conceal an Efficient Loud Speaker in Each Unit and Will Give an Artistic Touch to the Radio Installation

### Artistically Designed Loud Speakers

This attractive group of loud speakers is the result of an effort to make the speaker harmonize with the furnishings of the home. Speakers, concealed in table lamps, or walls or bookcases, have been described and illustrated from time to time, but this group goes a step further and combines the speaker with an artistic decoration suitable for any home. The trophy cup at the left is wrought in sterling silver, either chased or embossed, stands 24 in. high, and is equipped with a powerful speaker unit and 25 ft. of extension cord. The type at the center has a serpentine tonal chamber concealed within a cabinet designed to represent a row of books, bound in cloth, gold and morocco. The bronze book ends may be moved to provide space for real books between them. The vase at the right is made of black walnut, 24 artificial flowers and ferns being supplied with this unit, which stands 20 in. high.

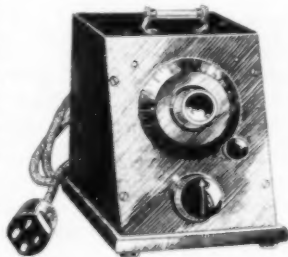
### Detector-Tube Kinks

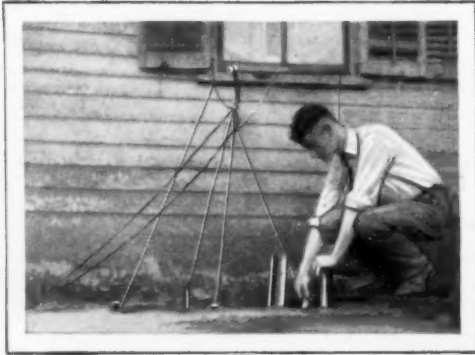
The plate voltage for most tubes now in use as detectors is 45 volts, but this does not mean that 45 volts is specifically required for the plate. It may work well

with 90 volts and usually does work better at some other voltage, such as 50, 40, 22½ or even as low as 17 volts. Detector B-voltage is not critical in modern tubes, but seems to vary in that one particular fixed voltage will give better results than another with individual tubes. If the detector tube used is of the 300-A or 200-A type, one should never exceed the rated voltage of that type. It is far safer and better to try lower voltages.

### Compact Short-Wave Adapter

A compact unit for adapting any receiver for reception of messages on wavelengths between 30 and 75 meters, is now available. The unit shown requires no additional tubes or batteries and no changes are necessary in the set wiring. A short aerial and ground are connected to the instrument and a cable with plug connects it to the set. It operates as a wave changer with superheterodynes and as a detector unit with other receivers.





Ground System Used by Pierce, Showing the Simple but Effective Arrangement

### Extra Grounds Bring DX-Record

A good ground connection is important for DX-reception and the use of several extra grounds in a well-wetted soil adds greatly to the possible range of the standard receiver. An interesting demonstration of this fact was brought to my attention when Walter R. Pierce, Jr., of Saundderstown, R. I., showed proof of extreme distance reception on his two-tube set. The photo indicates the simple method of installing the extra grounds. The wires were fastened to pipes and rods driven into the soil 1 or 2 ft. apart, and a leaking auto radiator was buried to the cap at one end of the row. This was filled with water frequently to insure a good electrical contact with the damp earth.—Armstrong Perry, Westport, Conn.

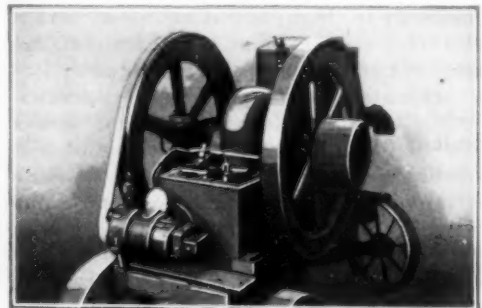
### Causes of Hum in A. C. Sets

A common and troublesome cause of hum in sets employing a.c. tubes is due to coupling in the parts of the circuit that are common to both r.f. and detector circuits. If the instruments in the set are properly located and the wiring carefully planned, most of this hum can be eliminated. Cabled leads and the introduction of loops where crowded parts complicate wiring also help to avoid coupling effects. The use of the grid condenser and leak arrangement for the detector, while highly efficient and sensitive, often makes the area surrounding the detector portion very critical and unstable. Shielding this part, or changing the detector to the grid-bias method may also remedy the trouble. If these changes do not eliminate

the coupling that causes the hum, a simple and very effective method is to insert a .1-meg. fixed resistor in the grid-return lead between the F-terminal of the r.f. transformer secondary of the detector circuit and the resistor which provides the grid bias for the r.f. and detector circuits. A .1 mfd. by-pass condenser should then be connected between the F-terminal of the transformer mentioned and the cathode terminal of the detector tube.

### Auto Generator for Radio Batteries

A discarded auto generator and a small gas engine can be adapted for charging radio batteries. A 1-in. rubber belt on the engine flywheel, and an oil cup of the visible-feed type mounted to lubricate the generator bearing complete the assembly. Small gas engines of the portable 3-hp. variety are quite common around the modern farm of today, and the average garage junk heap will furnish a generator that can be used. The original drivewheel on the generator was toothed to mesh with the timing gears of the auto; therefore, it was necessary to have a blacksmith shrink a steel band on it to form a smooth surface for the belt. To check the charging rate, an ammeter of the inexpensive dashboard type may be mounted on the generator; the brushes are then set so that, at the normal speed of the engine, the output will be 10 amp. for the storage battery, or less, according to the type of



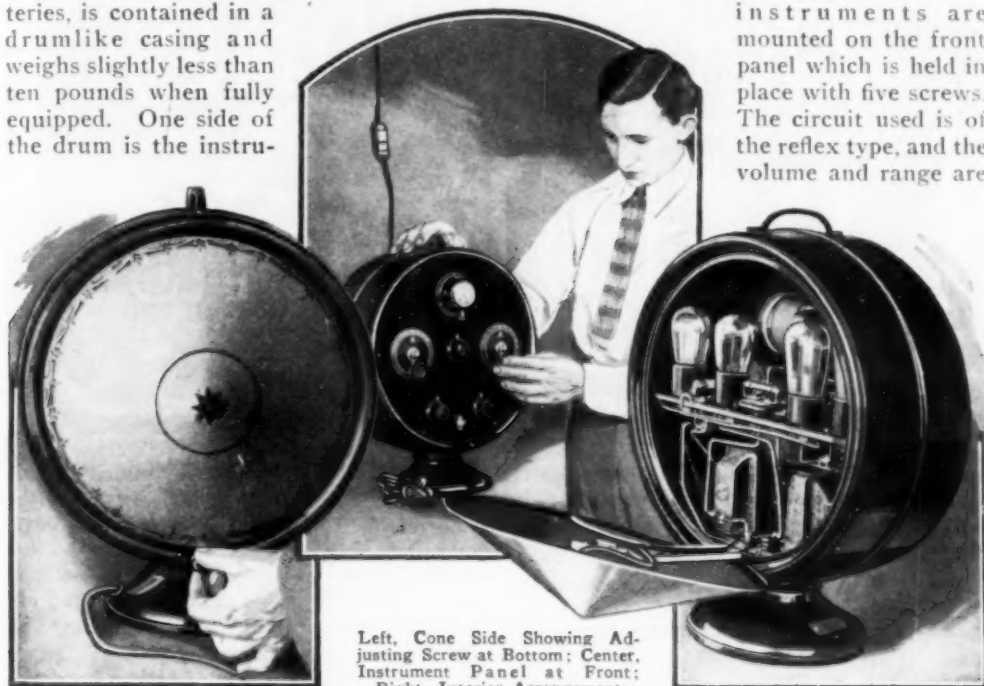
Auto Generator for Charging Batteries, Showing the Method of Belting It to a Small Gas Engine

battery. This device provides a handy means of charging both auto and radio batteries for those who are remote from electric lines and battery-service stations. The outfit, except engine, cost \$2.50

### Radio Set in Loud Speaker

A four-tube radio set built inside a loud speaker is a novelty on the market. The whole set, with the exception of the batteries, is contained in a drumlike casing and weighs slightly less than ten pounds when fully equipped. One side of the drum is the instru-

means of an adjusting screw at the bottom the cone can be swung outward to give access to parts of the set. The dimensions of the unit are 9 in. from cone tip to control knob, by 17 in. in over-all height. All instruments are mounted on the front panel which is held in place with five screws. The circuit used is of the reflex type, and the volume and range are



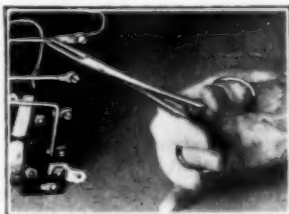
Left, Cone Side Showing Adjusting Screw at Bottom; Center, Instrument Panel at Front; Right, Interior Arrangement

ment panel on which are mounted two tuning dials, switch, rheostat, regeneration control and a small clock. The opposite side consists of a free-edge loud-speaker cone, 12 in. in diameter, the latter unit being mounted on an aluminum arm. By

said to be excellent. The drum rests on a base and may be rotated after the set is tuned to the station desired so that the cone faces the operator. The ground and aerial connections used with this receiver are the ordinary ones.

### Handy Tool for Set Builder

A surgeons' artery clamp makes an excellent tool for wiring a radio set; these clamps resemble a pair of slender-nose pliers with handles similar to those on shears. The handles may be locked together so that a piece of work is held tightly between, the jaws leaving the hands free for soldering. Clamps of this type may be obtained from physicians or hos-



pitals, as they are discarded frequently because corrosion renders them unfit for surgical purposes.

### Testing Amplifier Tubes

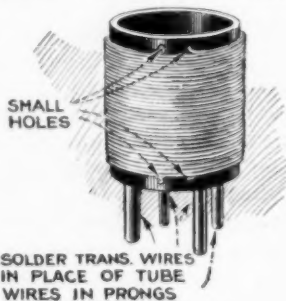
The common practice of using alternating current for heating the filaments of amplifier tubes has provided a new market for a.c. meters. These meters are necessary to determine the volume of current flowing through the filament or the voltage applied to the terminals. Meters designed for direct current and steady voltage cannot be used for this purpose. If a d.c. voltmeter is placed across an a.c. line the needle will not deflect.



THESE valuable kinks have been written especially for Popular Mechanics Magazine by prominent radio experts. They represent not merely ideas, but practical advice from the best technicians in the profession on methods that will help make your set more efficient in operation, more convenient to handle or easier to build.

### Iron-Core R. F. Transformers

Contrary to general belief, r.f. transformers that have distinct advantages may be built with iron cores. The writer has found a special type of these particularly useful in the second stage of r.f. amplification of a standard five-tube receiver, the other inductances being of the conventional air-core type. An iron-core r.f. transformer should have an equal number of turns on the primary and secondary. I prefer to wind the coils on the outside of a bakelite tube base, the glass bulb being broken out of the base or removed with heat. No. 30 d.c.c. wire is used for both coils, which are wound one on top of the other, the ends being brought down through the prongs of the tube and soldered in place



so that the transformer unit may be plugged into a standard socket. After building the coil and connecting it to the rest of the radio circuit, pack small steel laminations, such as may be taken from a broken-down transformer core, inside the tube base and operate the radio set. You will find the amount of iron used determines the tendency of the set to oscillate: the more iron, the less oscillation. Also, contrary to experience with air-core transformers, the set tends to oscillate more on the long wavelengths. Such a transformer, in fact, is deliberately designed to be efficient on long waves and comparatively non-oscillatory on the short waves.—L. J. Lesh, consulting engineer, Chicago, Ill.

### Using Two or More Speakers

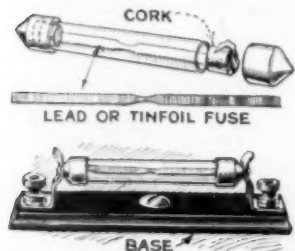
There is an increasing tendency among radio listeners to use two or more loud speakers. There are certain rules for connecting the speakers to obtain the best results. When two or more speakers are placed directly in the plate circuit of the usual output stage, it is best to connect



them in parallel. If they are connected in series, the resulting drop in the combined windings will reduce the plate voltage below that necessary for efficient operation. Conditions are completely changed, however, when a choke filter output is used. With this arrangement, a high resistance in the speaker circuit is of comparatively small importance, as the direct circuit flows through the choke instead of the speaker windings. These chokes are usually designed to have a low d.c. resistance combined with a high impedance at radio frequencies. When an output filter of this type is used, it is advisable to place the speakers in series.—J. B. Bayley, chief engineer, Station WAAT, Irvington, N. J.

### Protecting Tube Filaments

Small fuses for protecting the tube filaments are sometimes difficult to obtain, and the larger types are too clumsy to use in a radio receiver. These fuses can be made from an old gridleak tube, however. The resistance element is removed from the gridleak by taking off the metal caps and pulling out the corks inserted in the ends. This element is discarded but all other parts used. The fuse links are made of tin or lead foil, cut in strips about  $\frac{1}{16}$  in. wide; one end of the foil is pulled through the glass tube and the link is then slipped through the glass tube and the other cork. The foil should protrude about



$\frac{1}{4}$  in. beyond the cork ends, where it is turned up so as to make contact with the metal caps. These are now replaced and the unit is clipped into the gridleak mount. Several of these fuses may be made up at one time for emergencies. Before inserting a new fuse, the cause of the blowout should be investigated and the trouble corrected. These fuses will protect the tubes from damage in case B-battery leads are accidentally touched to the filament line from the A-battery.—H. R. Wallin, radio operator, S. S. "Hahira."

### Vibrator Charger Changed to Tungar

Battery chargers of the vibrator type may be changed over to tungar operation at slight cost. Remove the transformer

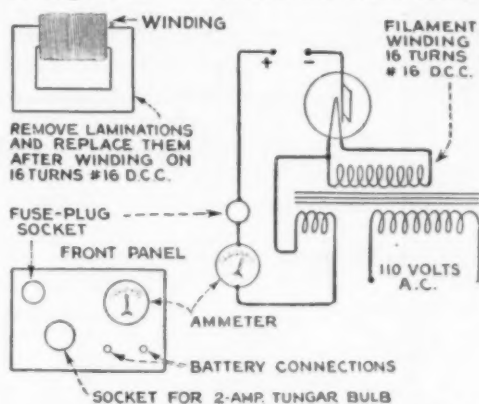


Diagram of Connections for Changing a Vibrator Charger into the Tungar Type

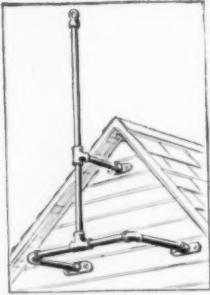
from the vibrator charger and note the 110-volt and low-voltage windings. Next remove the laminations from one end of the core, wind two layers of friction tape on the leg opposite the original windings, and over the tape, 16 turns of No. 16 d.c.c. wire. This winding is for the filament of the tungar bulb; be sure to leave enough wire at each end of the coil for connections. Tape this winding carefully and replace the end of the core. Set the transformer in its original position, and remove the vibrator and its connections from the panel, but leaving the fuse-plug socket with its connections, together with the ammeter, on it. At a convenient place, fasten an ordinary porcelain socket for the tungar bulb, and make the connections as shown. For these use heavy insulated wire and mark the polarity of the battery connections.—C. E. Paulson, operator, Station KFHL, Oskaloosa, Iowa.

### Cleaning the Soldering Iron

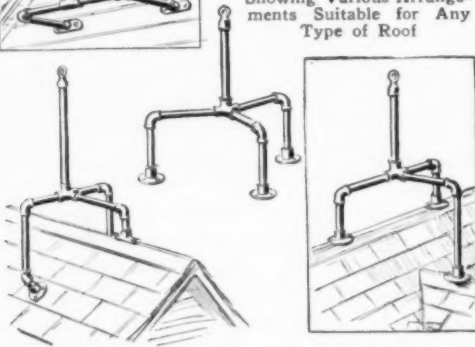
Electric soldering irons, when used with rosin-core solder, become coated with a deposit, making clean joints difficult. To clean the iron, I use a jelly glass filled with sand which is moistened with a sal-ammoniac solution. Plunging the iron into this mixture quickly cleans and tins it.—C. A. Benedict, engineer, Goodell-Pratt Co., Greenfield, Mass.

### Pipe Lengths for Aerial Masts

The writer recently encountered a problem in supplying an aerial mast for an apartment house having a peculiar sloped-roof construction, and finally hit on the idea illustrated in the sketch, applications of which will meet various emergencies of this nature. Plumbers' fittings



Construction Details Showing Various Arrangements Suitable for Any Type of Roof



and suitable pipe lengths are easily obtained from your local supply dealer, who will cut the threads and supply the necessary deck mounts. The sketches show the construction so clearly and it is so simple that further comment is unnecessary.—E. Stuart Capron, consulting engineer, Buffalo, N. Y.

### Worth-While Hints on Wiring

Builders will be well repaid for the time spent in securely soldering the spring contacts in tube sockets to the locking screws. This also applies to the lugs and screws of terminals usually mounted on bakelite strips; a good mechanical and electrical connection makes for efficiency. It is no longer considered good practice to run wires in spaghetti except to prevent short circuits or contact with baseboards, losses frequently having been traced to superfluous use of spaghetti. Many electric soldering irons have a copper element much too small for good work; in attempting to make a soldered connection with an iron of this type, the parts to be joined absorb the heat so fast that the

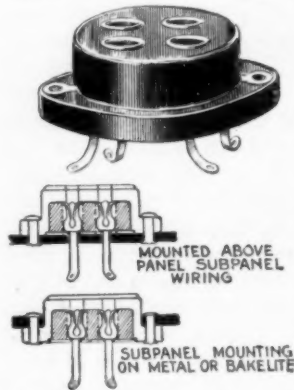
copper is cooled to a point where it will not flow the solder. A joint made with half-heated solder not only breaks off quickly but constitutes a high-resistance connection that will invariably produce poor results.—Arthur H. Jackson, chief technician, Gosilco Radio Products Co., Huntington Park, Calif.

### Look Out for Bad Tubes

Many radio users believe that if a tube is burning it is also working, but this is not always so; it may light and still be worthless. One of the quickest ways of restoring a dead set to life is to insert a good tube successively in each socket, thus quickly locating the bad tube. In a super-heterodyne, one faulty tube may require more than the rated filament voltage to make it function, and by increasing the voltage to satisfy this one tube, the others are overloaded. This will result in erratic operation and greatly shorten the life of the tubes. Tubes of the 199-type are the chief offenders in causing trouble of this nature.—E. L. Watkins, engineer, Trego Radio Mfg. Co., Kansas City, Mo.

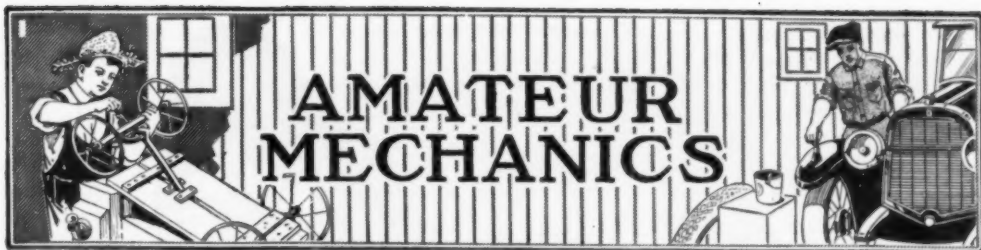
### New Socket of Universal Type

The socket shown herewith has been designed for mounting either on metal or bakelite. It is small, makes a neat appearance and takes up less room on the baseboard than the usual type. A three-point wiping spring contact, the full length of the tube prong, insures a good tight electrical connection. The top of the socket



is exactly the same as the standard tube base. The upper diagram shows the method of mounting the socket above the panel for subpanel wiring. Six small holes or one large and two small ones are

drilled in the panel. The lower diagram shows the subpanel-mounting method.



## How to Make Jewel Trees

By H. C. McKAY

ONE of the most recent and most popular of table ornaments is the jewel tree. The first models introduced were of blown glass and very fragile; then came trees with solid stems and pressed-glass leaves and blossoms, and now the true "jewel tree," with its stems of jewels made in the weeping-willow effect has

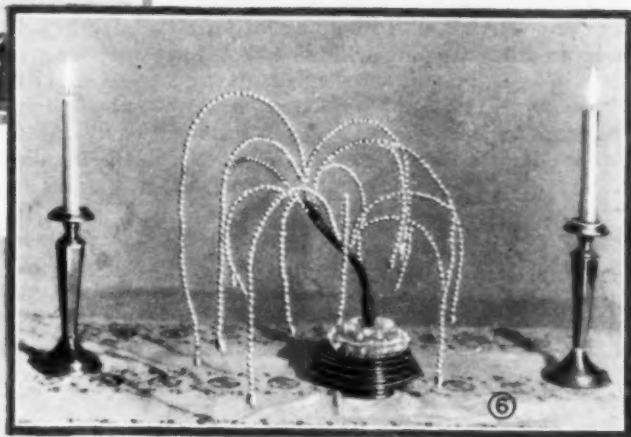
For the tree illustrated, the following materials are needed: 25 ft. No. 18 bare copper wire; 12 ft. pearl (or other) beads; 1 black-glass base; 1 transparent-glass flower holder; 1 ball heavy crochet thread; 1 jar shellac; 1 tube ballotini; 1 short string gold beads; 1 spool No. 28 d.s.c. copper wire; 1 tube celluloid cement.

Cut 11 or 12 lengths of the No. 18 wire about 2 ft. long. Bind them temporarily with the fine wire, once near the end of the bundle, once about 3 in. from the end, and once about 8 in. from the end. Put this bundle of wire in the flower holder and wedge it temporarily in place. Now bend the wires in curves resembling the drooping branches of the weeping willow. This is shown in Fig. 1. To make the tree hold its shape at this stage, it will be necessary to add temporary wire bonds where two or more branches follow the same stem



found even greater favor than the first two forms. The jewel tree is one of the most easily made of all modern art ornaments.

above the first branch. When the tree has been shaped satisfactorily, wrap the bottom of the bundle with No. 18 wire to shape the base to the opening in the flower holder. Make this a loose fit, as a cord wrapping goes on top of the wire.



The next step is applying the crochet-thread wrapping to the stem. This is neither a long nor difficult task if started from the bottom. Wrap the base to fit the holder; then wrap the stem, keeping the turns of cord touching. As a branch is passed, the thread is passed over it instead

of under, so that the entire length of the main stem can be wrapped, leaving the branches free at the proper places. This will be understood better when actually doing the work. A good job of wrapping is almost impossible to do if the start is made at the top. Fig. 2 shows this process.

When the tree is wrapped, the pearls are unstrung and pushed onto the wire branches, one at a time. The cheap paraffin-filled pearls will retain their places. Each pearl is pushed firmly home before the next is applied. Fig. 3 shows this step. In this stringing, a space long enough for two beads is left at each branch tip.

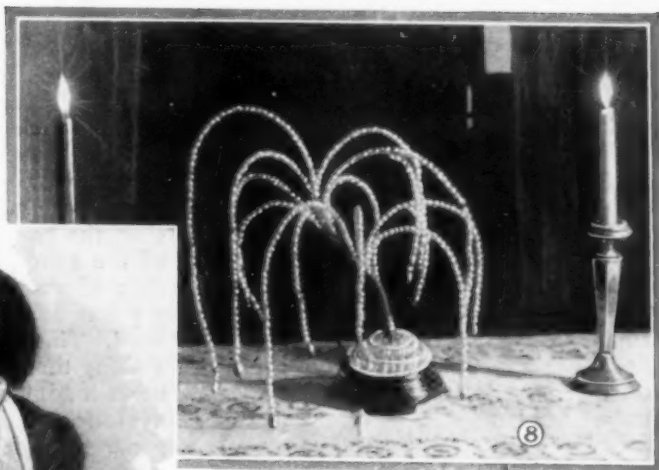
After the branches are strung, the trunk is coated. It and all branches, up to and including the base of the first pearl, are covered heavily with white shellac. Be-

fore this sets, the trunk is sprinkled with the tiny glass beads (ballotini) made for coating lamp shades. These may be silver, gold, green or variegated. Figs. 4 and 5 show the coating and beading respectively.



Now set in its holder and attach the "droops." For this purpose pearls are strung upon the fine wire. A large gold bead forms the "anchor" through which the wire is twisted. Then a colored bead is strung, next small gold beads and finally pearls until the desired length is attained. About 3 in. of wire should be left exposed.

The protruding end of a branch is now nicked with cutting pliers and coated heavily with celluloid cement. The end pearls of the droop are pushed up along this wire. Then the fine wire is pulled up until no space shows, and the end is cut off short. The celluloid cement soon dries hard and holds the droop firmly. Fig. 7 shows a droop being attached. This completes the tree. Its appearance is improved by taking care to balance the branches in the first step. This does not mean symmetry, however. The branches are curved until they look right and then



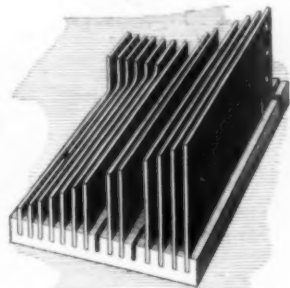
any surplus length is cut off. The black-glass subbase also adds greatly to the artistic effect. Fig. 6 shows the tree under illumination by candle and daylight, and Fig. 8 by candle light alone.

The bill for the tree amounted to \$1.15, all materials being purchased in a local ten-cent store. An almost exactly similar tree, but less finely finished, is now on sale for \$49.50 in a large New York department store.

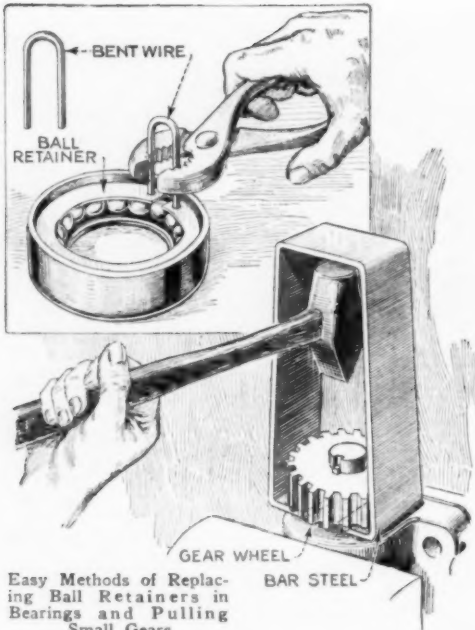
#### Holder for Linotype Ejector Blades

Where the earlier designs of linotypes are in use, it is necessary to stock a variety of widths of ejector blades to accommodate the different lengths of slugs being cast. These blades are usually hung on nails, placed in a drawer or on a near-by shelf. The drawing shows a simple, inexpensive and convenient holder for them. It consists of a block of hardwood of suitable size and thickness, grooved length-

wise with a saw, to receive the blades. A cross groove is cut at the rear end and in it is inserted a strip of wood furniture, against which the blades are pushed to keep them in alinement. The holder is attached to a near-by shelf.







Easy Methods of Replacing Ball Retainers in Bearings and Pulling Small Gears

**Replacing Ball Retainers and Pulling Tight Gears**

Difficulty is often experienced when replacing ball retainers in bearings. Prying the retainer into place is an awkward procedure, and is likely to bend the retaining ring. A quick, practical method of doing the work is shown in the drawing. Take a length of wire, bend it to a U-shape, so that the ends will readily fit into the holes in the retainer. Then, with a pair of pliers, grip the wire as indicated and force the ends together so that it can be slipped in place. When a gear puller is not available, a simple serviceable tool can be improvised, which is very effective on small gears that are almost inaccessible. It consists of a piece of bar steel, long enough to be bent to the shape shown and allow the swinging of a hammer inside.

**How to Prevent Sweat Marks on Felt Hats**

The life of the average felt hat is often reduced at least one-half by the sweat mark, which appears on the band and around the edges. New bands will, of course, prolong its usefulness, but by putting into practice the following suggestion, the sweat mark, as well as the cost of the bands, will be eliminated. Cut a strip of waxed paper slightly larger than the hat band and fit this inside of the band. This will prevent perspiration from soaking through the band and hat. Sometimes a doubled strip of waxed paper will not affect the fit of the hat. Ordinary paper will not do, as it absorbs moisture readily.—Henry A. Courtney, Atlanta, Ga.

**Wave Cradle for Ship Models**

When one has a ship model completed, it may be provided with a realistic cradle of the kind shown in the drawing. It is made from five pieces of wood, one serving as the base and the others as wave profiles, which are arranged parallel to each other and nailed to the base. Make the base of fairly heavy wood and about as long as the model. Cut out four pieces of thinner wood, the same length as the base and of sufficient width to permit waves to be drawn upon them. Adjacent pieces should be arranged so that the crests of one are between the crests of the other. Saw them out to shape with a jig or coping saw, or whittle them out with

a knife. Paint the wave pieces and set them away to dry. When dry, they are fastened to the base as indicated, two on each side of the ship's keel. The two central ones form the support for the ship and the others are set about 1 in. farther from the keel. When the model is set on such a cradle, it should be located on a stand or shelf just below the level of

Wave Cradle for Small Model Ship Gives Realistic Touch



the eye, and it will then appear as if riding a heavy sea when viewed from either side.—L. B. Robbins, Harwich, Mass.

### Repairing Locks

In taking some kinds of locks apart, it is necessary to file off all the riveted metal, but this procedure leaves one handicapped when it comes to reassembling. Many times the riveted portion is a little extension of one side of the lock case itself. An easy way out of this difficulty is to take a small drill and countersink the rivet hole, even if this is square, as is often the case on auto-door locks. After assembling, rivet the metal down into the countersink, and the lock will be held together securely.—Sherwood J. Gee, Salt Lake City, Utah.

### Sturdy Support for the Garden Hose Nozzle

When a lawn sprinkler is not available, you can readily improvise one, as shown in the illustration. It consists merely of a wooden support on which the nozzle end of a garden hose is mounted, a couple

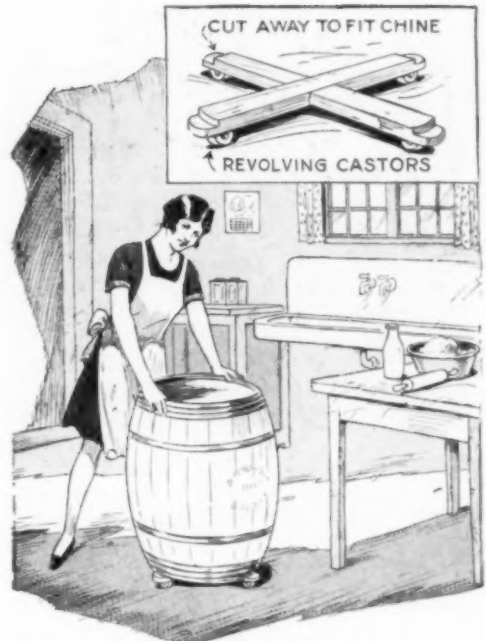


of nails or screw hooks being used to hold the hose in position securely. The base and vertical piece are made of 2-in. wood, while the pivoted leg is a strip of 1-in. wood.

The latter can be swung out to serve as a leg holding the base in an inclined position. This enables the user to get at the support and move it about without getting wet.—Chas. F. Goldthwait, Waterbury, Conn

### Wheeled Truck for the Home

Besides being useful for moving flour barrels in the storeroom or pantry, the wheeled truck shown in the drawing has been found convenient when heavy boxes, chests and pieces of furniture have to be



Simple Wheeled Truck for the Home Is of Considerable Utility for Moving Heavy Articles About

moved during house-cleaning time. The construction of the truck is clearly indicated in the detail. It consists of two crosspieces, equipped with revolving casters, the ends of the crosspieces being cut away to fit the chine of the barrel, if the truck is used for this purpose.—E. L. MacFarlane, Frederickton, N. B., Can.

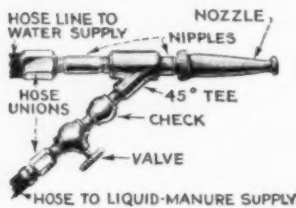
### Light Reflector Made of Tinfoil

In many cases where electric lamps are provided on walls over tables or workbenches, a reflector is desired. The common type of tin reflectors used on drop cords cannot be attached to wall lights to throw the light down. A good reflector can, however, be provided by getting a sheet of tinfoil and fitting it around the lamp as shown. Two-thirds of the lamp is covered in this way, and the light is reflected where it is needed.—Irvin L. Oakes, Pleasant Hill, Ohio.



### Spray Gun for Fertilizer

Many small crops are greatly benefited by an occasional feeding of liquid fertilizer. This is usually kept in diluted form in large barrels and spread by means of small garden sprays or even with an old broom.



The home gardener can make a spraying outfit to use with the garden hose, at regular water pressure, as shown in the cut. This will distribute the fertilizer thoroughly with a minimum of labor and is well worth the making. Assemble an ejector of pipe fittings about as shown. The fittings should be of such size that they can be coupled to a  $\frac{3}{4}$ -in. hose union. The tee must be a  $45^\circ$  fitting with the side opening pointed toward the hose. Screw the hose nozzle ahead of the tee on a close nipple as shown. Below the side opening of the tee is a check valve that keeps the water pressure from driving the liquid down but allows it to rise, and a valve to control the flow. The length of hose on the end dips into the fertilizer receptacle. Fasten the regular hose line to the water cock and place the bottom hose in the fertilizer. Then turn on the water pressure and adjust the nozzle. The stream, passing by the tee, will draw up some of the fertilizer and eject it in the form of a spray. This flow of fertilizer is regulated by the valve.

### New Dowels in Chairs

Two or three times while gluing up loose chairs, I had to replace broken dowels. When drilling out the old ones, I always used a  $\frac{3}{8}$ -in. drill for a  $\frac{3}{8}$ -in. dowel, but found that it was almost impossible to get the drill centered exactly

and bore the hole at the same angle as the old dowel. I stopped at a cabinet shop and noticed that a workman was replacing an old dowel by using a  $\frac{5}{16}$ -in. drill for a  $\frac{3}{8}$ -in. dowel. He said that he always used a drill just a trifle smaller than the dowel to be removed. With a small scratch awl, he then chipped away the outer shell of the old dowel, which left the original hole ready for the new one.—Frederick J. Pease, Wauwatosa, Wis.

### Effective Cleaner for Fabrics

A large New England industrial plant, which operates its own laundry, has discovered that an emulsion made of soap flakes and benzol will remove many spots from clothing that are hard to efface by other means. The mixture is thoroughly shaken up in a bottle until it is emulsified into a thick creamlike fluid. It is then applied to the spot with a sponge or cloth and rubbed in lightly, after which the spot is washed out with soap and water. This treatment leaves no ring and is a solvent for troublesome paint spots and other foreign substances.

### Removing Old Wick from Oil Stove

Kerosene-burning stoves with cylindrical burners are in use in many homes



in rural districts and small towns. Often considerable trouble is experienced in removing burned-out wicks. This task can be facilitated by using a simple tool made from an old hacksaw blade. The end of the blade is

ground down on an emery wheel to the shape shown. In use, the sharp point is inserted between the wall and the wick, as shown, allowing the latter to be caught and pulled out easily.—W. C. Wilhite, Hornsby, Ill.

### How to Hold Flowerpots on Shelves

People who live in upper flats often keep a row of flowerpots on the outside window sill or on a board fastened to the sill. Every time the window is opened there is danger of accidentally knocking a pot off the board, which means a pot and plant destroyed, to say nothing of the danger to persons who might be below the window. This hazard was minimized by one woman who drove a number of screws into the shelf, letting the heads project about 1 in. The pots were then placed so that the screws entered the drain holes in the bottom. So set, the pots cannot readily be pushed or knocked off the board.—J. E. Noble, Toronto, Can.

### Water Wings Made from Rubber Balls

Anyone desiring support in the water, when learning to swim, will appreciate the improvised water wings shown in the drawing. They can be made in the following way: Tie the ends of a length of wide tape, which will fit around the chest and pass under the arm pits, to the ends of some ordinary adhesive tape, or electricians' friction tape. Pass the tape around the circumference of two large rubber balls. The tape can be more securely fastened to the balls by using several short crosspieces over the long piece, as indicated, to prevent it from slipping or pulling off.—L. B. Robbins, Harwich, Mass.



Water Wings Improvised from Large Rubber Balls Have Considerable Buoyancy



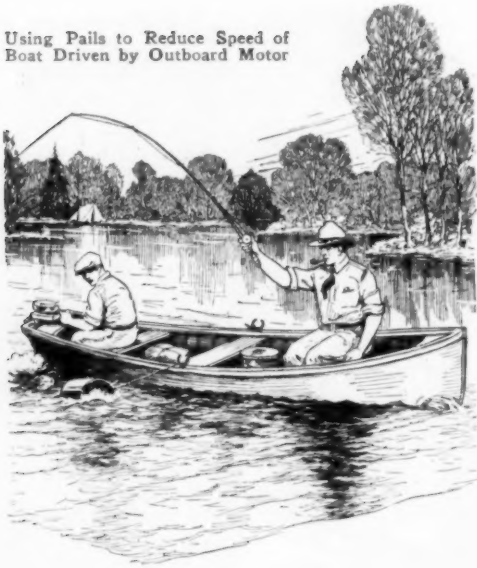
Collapsible Drawing Table Is Attached to a Closet Door in Home or Apartment

### Drawing Table Attached to Door

In apartments and homes where space is limited, a collapsible drawing table, attached to a closet door, will be found convenient. It consists of a few boards, hinges and an electric-light fixture, arranged as indicated. The whole assembly is attached to the door by means of two large wood screws. When not in use, the prop under the table is let down and the table is dropped to a vertical position so that the door can be closed. Just above the table a small shelf is provided for pens, pencils, erasers and ink. The underside of the table is fitted with a strip of wood, in which a number of holes are drilled to receive the end of the prop. This permits the user to set the board at any convenient angle. The T-square can be hung on a small nail driven into the supporting board on the door. The light fixture will, of course, have to be equipped with a lamp-cord long enough to extend to the nearest socket of the house-lighting supply.—L. E. Wilcox, Minneapolis, Minn.

☛ A bone collar button makes a good substitute for a plug in repairing a puncture in a single-tube bicycle tire.

Using Pails to Reduce Speed of Boat Driven by Outboard Motor

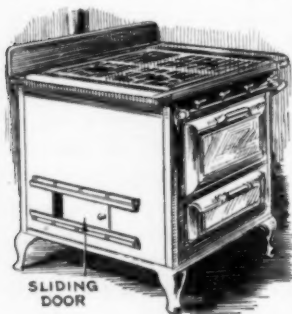


### Checking Boat Speed for Trolling

Some outboard motors, attached to a light rowboat, cannot easily be throttled down sufficiently to permit the slow, deep trolling necessary to get the "big fellows." A simple method of checking the speed of the boat is to drag a pail on each side, as shown in the illustration. The motor can then be set to any desired speed.

### Improving Gas-Stove Oven

In many gas-stove ovens it is almost impossible to burn both the upper and lower flames at the same time, since not enough air is fed for proper combustion of the gas. Anyone handy with tools can easily overcome this trouble with a little careful work. Cut a hole, about 2 by 5 in. in size, in the side of the oven, as far back and as low as possible. Then cut



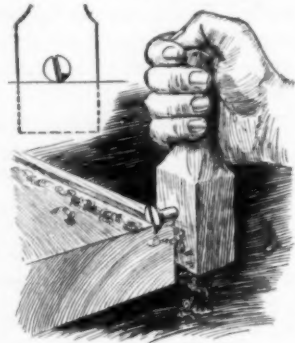
and bend two lengths of light galvanized iron to form slides and rivet them to the oven side, above and below the opening, as shown in the illustration.

Another piece of galvanized iron is cut to form a sliding door that will cover the opening completely, and slipped into the slides. A wooden knob is fitted to form a handle, and a stop arranged at the "blind" end of the door, to complete the job. When both flames are used in the oven, they should be watched and if it is observed that one of them seems to "wander round," indicating lack of air, the sliding door should be opened and adjusted until the trouble is corrected.—George L. Michel, Jersey City, N. J.

### Homemade Beading Tool

Sometimes it is desirable to cut a bead on the edge of a board or a pair of rabbeted doors, and on similar work. This is not a hard matter where one has a beading plane at hand, but can also be done very neatly with the aid of the improvised tool shown in the drawing. Take a little block of wood and run a rather large flat-head screw into it, allowing the head of the screw to project from the side of the block the same distance as the width of the finished bead. Before driving in the screw, take a file and cut away one edge or corner of the slot on the outer

edge of the screw head and turn the screw so that the long corner will cut into the wood that is to be beaded. Run the screw-head cutter back and forth like a marking gauge; this will cause the screw head to cut down into the wood until stopped by the body of the screw. Then round up the outside edge of the work with a block plane and finish with a piece of sandpaper. Folding the sandpaper will cause it to go down into the bead better. The finished result will be a bead that cannot be told from one cut with a regular plane. The same method may be used for cutting a bead on the edge of curved work. When working on the inside sweep, the block into





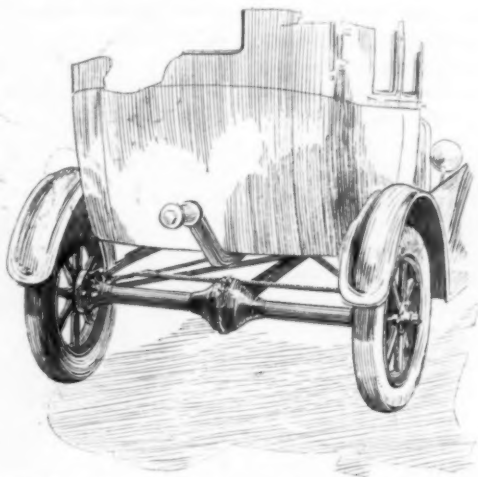
which the screw is driven must be rounded off to fit the curve. The outside edge can be worked off better with a spokeshave than with a block plane.—F. R. Rodgers, New Palestine, Ind.

### How to Make a Bicycle Coaster

Have you an old bicycle rusting away in the cellar? If so, why not make some use of it by converting it into a scooter or coaster for the boy, or, better still, let him do the work himself? The procedure is simple: Remove the wheels, handlebar, seat and driving gear so that nothing is left but the framework itself, and attach a pair of small baby-carriage, or similar, wheels to the rear and front forks with suitable bolts and nuts. The wheels must be small so that the frame will almost touch the ground. Drive a round hardwood stick through the hole formerly holding the crank bracket. This forms the necessary support for the feet. Another stick of wood, with a crosspiece, is driven into the handlebar hole to serve as the handgrip, and a similar piece, with a broader crosspiece, into the saddle hole, for a backrest.—Horace E. Goodwin, St. John, Can.

### Cure for Rattling of Brake Rods

Rattling brake rods are more or less annoying and the rattle is somewhat difficult to cure. However, by stretching an ordinary screen-door spring across both rods, near the rear end of the car, as shown, the trouble is readily overcome. The ends of the spring are securely attached to the brake rods, the tension required depending on the looseness of the rods. The installation of a spring in this way does not hinder the operation of the brake.—M. N. Stanley, Brookline, Mass.



Installation of Coil Spring on Auto Brake Rods Prevents Rattling



Splash Guard Consisting of a Large Tin Can, Cut Open and Fitted around the Pump Base

### Guard for Pump Prevents Splashing

Anyone who has used an outdoor pump has been splashed on more than one occasion, especially during windy weather. In order to prevent such trouble, a simple sheet-metal guard may be provided. That shown herewith was made from a discarded carbide can, although any other can of similar size can be used. Open the can along the seam with a pair of tin shears, trimming the sharp corners. Cut out a portion of the bottom of the can, leaving a crescent-shaped piece to be slipped under the pump base, the lagscrews being temporarily loosened for this purpose. After the bottom of the guard is slipped in place, the screws are again tightened and the guard will be held securely.

Secret Compartment  
for Valuables Built in-  
to Kitchen Cupboard



### Secret Compartment for Valuables

A secret compartment with nothing to betray its presence may be built into any small, deep cupboard in the house, preferably in the kitchen. Merely add a new partition or back of tongue-and-grooved stock, a few inches in front of the old one, somewhat like the false bottom of a trunk. Before toe-nailing the pieces to the ceiling and floor lining of the cupboard, glue together or nail to a connecting strip on the back side, three or more pieces for a door, which will slide up through a slot in the ceiling of the cupboard. Clean the joints or grooves adjoining this sliding section, and apply paraffin to make the door move easily. Conceal the toe-nailing of the solid part of the partition to the floor and ceiling by neat strips of quarter-round set in front. One or two nail holes on the back wall of the cupboard, which will not attract any attention, furnish the "key" to the secret compartment. Insert a nail in one of these holes to serve as a lever for lifting the sliding door. Anyone can make such a compartment.—A. May Holaday, San Jose, Calif.

☞ To prevent water colors from crawling, add a few drops of ammonia or lime water, or a solution of sal soda.

### Anti-Rattlers for Auto Hoods

After hood clamps of an auto have lost some to their tension through constant use, they become loose. New springs can be installed, but this is a rather difficult job, and, in the end, the hood becomes just as rattly as before. One method of preventing this trouble is to cut out anti-rattlers from solid squares of rubber. Slots are cut in the squares so that they can be slipped on the lower edge of the hood near the clamps. Thus the hood will be raised slightly and the clamps will take a firmer hold.—Glen F. Stillwell, Collinsville, Ill.

### "Shadow-Sketching" a Fine Pastime

Few people can hold a nicely sharpened pencil over a clean sheet of paper without automatically writing, scribbling or drawing. Here is an amusement that anyone can follow in order to draw weird and grotesque figures of which a few examples are given in the illustration. The term "shadow-sketching" describes this pastime quite accurately, drawings being made simply by tracing the outline of a shadow cast by a crumpled piece of paper on a clean sheet. The figure drawn in this way resembles some object and can usually be made to represent a head, the missing details of which may be filled in later according to one's fancy. It is claimed that some cartoonists resort to this practice when they desire a distinctive type of face.



Distinctive Heads and Faces Can Be Drawn by Merely Tracing Shadows

# STENCIL DECORATING WITH LACQUERS

By Hobart N. Durham



STENCILING, while mechanical and so simple in its essentials that anyone can master it, nevertheless presents an opportunity for the exercise of one's artistic taste to beautify many of the plainer types of objects found in the home. Above all, the process is flexible, readily adapting itself to the decoration of any material in as simple or as ornate a manner as desired. With a view to showing the basic process and some of its more practical applications, this article describes well-tried methods, which can be readily carried out in the home at a very small outlay, leaving to the reader the choice of combining the essentials and adapting them to his own taste or using them as set forth.

For stenciling of the type to be described, one need purchase only a small quantity of spraying and brushing lacquers of various colors; stencils, which may be bought or easily made, and a sprayer of a type similar to those commonly employed with insecticides. In the commercial adaptation of these processes, air brushes are used, but their price, as a rule, is too high for the amateur who has only a limited amount of the work to do. The sprayer should have a comparatively small reservoir and a well-made pump, as shown in Fig. 4. This size will make a better spray and waste less of the lacquer in cleaning. Such a sprayer can usually be bought for about 25 cents. As to the lacquers, any of the quick-drying nitrocellulose lacquers will be suitable and small cans of several colors should be on hand. For priming the surface of the material, if of wood, a can of priming lacquer will be found very useful. It is applied before the sprayed coatings.

The stencils can be bought quite cheaply

and decorators' stencils will answer very well. If you wish to use your own designs, the stencils may easily be cut at home from either oiled paper or thin celluloid. The designs most suitable for stenciling are massive and should present but little detail, as this complicates the cutting and generally lessens the effect of the completed work. The various illustrations in this article show simple designs which can be artistically arranged, and represent a type best suited to reproduction by the stenciling process.

To cut the stencils from paper or celluloid, one may use either a sharp knife or a safety-razor blade to sever from the sheet those parts which are to be removed. The designs should first be drawn on the sheet. If you are a poor, free-hand artist, use celluloid, place the sheet over a design and trace it. In cutting, care should be taken to avoid joining the two ends of a curved line, for if this happens, that portion included within the line will be left without support and will drop out. To avoid this, small "ties" should be left, as shown in Fig. 1, running from the outside of the design, to support the central portion of the stencil. It will also be well to leave these ties in case the design has unstenciled parts jutting into the areas to be stenciled.

Old photographic film, particularly the

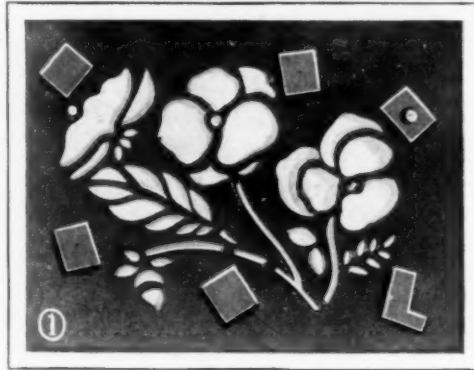
larger sizes, will be found a good substitute for new celluloid, the emulsion being first removed by soaking the film in hot water. After this cleaning, there still remains a thin coating of gelatin, which will readily take ink, so that the design can easily be drawn on it. One advantage of thin celluloid over paper, is that it need not be cut completely through. It is sufficient to scratch the surface deeply and then bend the celluloid sharply at the scratched line, when it will crack along the line just as if the cut had been made completely through the sheet.

If the ties are accidentally omitted or cut by mistake, a small narrow piece of celluloid or paper, cemented across the gaps, will serve equally well. The cementing can be done with some of the clear lacquer.

For complicated work, which would necessitate an extraordinary number of ties, it is better to use a different type of stencil, which may be made in the following manner: A piece of rather coarse organdie, or other open-mesh fabric, is stretched taut in an embroidery frame of a size considerably larger than the design to be stenciled, and the parts which correspond to the unpainted parts of the design are stopped out with a rather thick solution of glue or gelatin. This may be done with a brush, being careful to apply it only to those parts which are not to allow the color to pass. The glue should be sufficiently thick to fill the meshes, as any pinholes left in the coating will cause undesirable spots of color in the finished work. By holding the stencils to the light after they have been coated and dried, these pinholes may be detected. If any are found, they can be filled in with drops of glue. When the glue has dried, the stencils are ready for use in the same manner as the paper or celluloid stencils, except that, after use, they must be cleaned of the lacquer, which otherwise would remain in the unglued part of the fabric and make the stencil un-

fit for duplications of the same design.

Having the stencils, the object to be decorated should be given a coat of primer, or undercoat, followed with a coat of lacquer of the color desired for the article as a whole. Thus, if it is desired to produce a gray table with designs of blue, the table should first be given a coating of primer, then a coating of gray lacquer, after which the stencil should be placed on the surface and the blue lacquer applied through the openings in it.

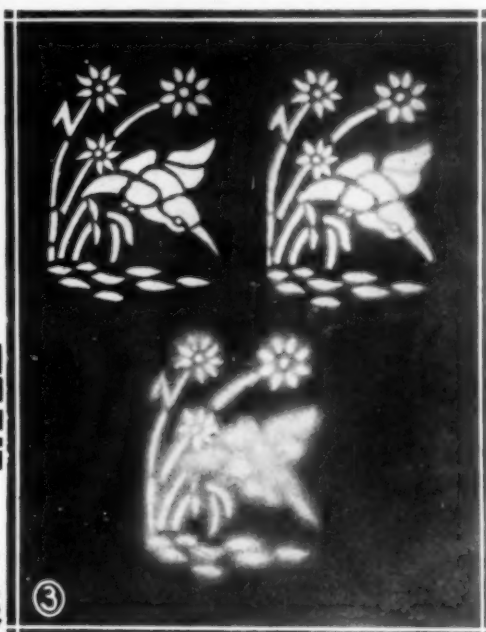
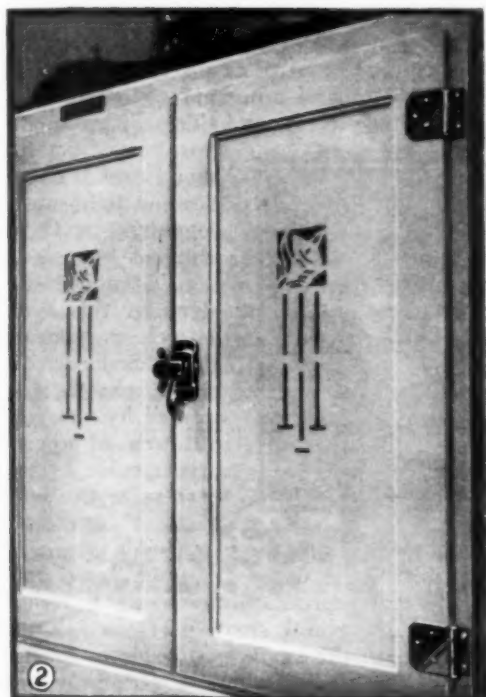


The attaching of the stencil to the surface may be done by means of pins, weights around the edge (if the stencil is to be used in a horizontal position) or in some other way. One very convenient method of fastening stencils is to punch

small holes, about  $\frac{1}{4}$  in. in diameter, around the edges, as well as in the large interior parts, and stick small squares of adhesive tape over these holes on the upper side of the stencil. After a stencil has been applied to the object in the proper position, it may be fastened firmly by pressing the tape through the holes into contact with the surface of the object. This in no way interferes with the work, and the stencil can be removed readily without marring the finished surface. Enough of these holes and adhesive patches should be provided to insure that all parts of the stencil will lie flat against the work. Should it happen, on removing the stencil, that any of the adhesive remains, it can be wiped off with a cloth moistened with a small amount of lacquer thinner, or carbona.

Of course, the design should be appropriate to the object to be decorated, and equally important, its position should be carefully determined so it will be symmetrical and occupy the proper space, as in Fig. 2. Wrongly placed, a design will mar the general appearance as much as it will enhance it if properly placed.

With the stencil firmly secured to the work, the sprayer should be filled with



lacquer and pumped a few times to insure a ready, even flow from the nozzle. It is better to have the work in a vertical or tilted position, as in this way the sprayer can be pointed directly at the open parts of the stencil without spoiling the result by any lacquer which might collect on and drip from the nozzle. If the sprayer is held so as to direct the spray perpendicularly to the surface, as shown in Fig. 4, and then moved about while spraying, an even coating will be easily obtained, while, if held at an angle, the spray will diminish in intensity as the distance from the nozzle becomes greater, resulting in an uneven coating. Advantage can easily be

taken of this usually undesirable feature, and by intentionally spraying at an angle, the color may be shaded from full strength to a faint suggestion, producing highly decorative effects.

Beautiful blended color effects may be obtained by directing the spray at an angle to produce the greatest intensity at one side of the design and then repeating the process with a different, but harmonious, color from the opposite side. Both colors should be sprayed before the stencil is removed and, if carefully done, the colors will merge into each other in the central portions of the design, enhancing the appearance greatly.



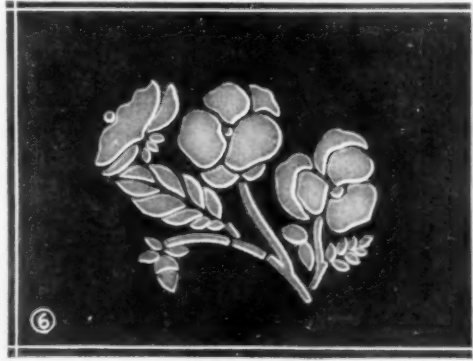
After the spraying has been completed, the stencil is removed. Unless the lacquer has dried thoroughly, this should be done without sliding the stencil over the surface, to avoid smudging the surface and spoiling the work. In any case, the best practice is to form the habit of lifting the stencil at one corner and pulling it up and away from the surface of the object.

If the stencil has not been held tightly against the surface, it will probably be noticed that the design will have a fuzzy or blurred edge extending slightly beyond the parts which were intended to be colored during the stenciling. The farther the stencil is spaced from the surface, the greater will be this softened edge and the more indistinct the design. If the stencil is spaced only a slight distance from the work, however, this may be put to good advantage in producing soft, pleasing designs of indistinct outline. The effects of various spacings are shown in Fig. 3. The most distinct of these designs was produced by having the stencil in close contact with the surface to be decorated, while the most diffuse was made with the stencil separated from it about  $\frac{3}{8}$  in. The design at the upper right shows the proper spacing, about  $\frac{1}{8}$  in., which gives a desirable degree of diffusion.

Where comparatively small stencils are used, some means should be provided to keep the parts of the work outside the area of the stencil from receiving any of the mist which always envelops the spray. This may be effected by cutting a hole, slightly smaller than the stencil, in a sheet of wrapping or newspaper and placing this over the object before the stencil is attached. The stencil is then fastened over the hole and the sheet forms a mask that protects the finished parts of the work. (See Fig. 4.)

In addition to the stencils already mentioned, ferns and other leaves can often be used with good results for certain types

of work. They are either held flat against the surface to be stenciled or merely laid on it. In the latter case certain parts will be close to and other parts slightly away from the surface, and this will produce a combination of sharp and blended designs whose irregularity will be unusual but pleasing. Stenciled designs of this type as well as some of the other larger designs, may be improved by spraying a touch of appropriate color in the centers of the bold parts of the design,



slightly relieving the expanse of the single color. Some designs can be more conveniently reproduced by using a stencil made of several small parts, which are applied to the surface to serve as masks, as for example, where a stripe or line border is desired. In these cases, the surface is first sprayed with the color desired for the border. The entire surface need not be covered and the spray may well be limited to an area slightly greater than that which is to form the border. Over this area is then pasted a narrow strip of paper of exactly the same width as the stripe or border to be produced and the remainder of the surface is sprayed with the desired color of lacquer. When the second coat has fully dried, the paper strip is removed from the surface, revealing the even stripe, of the same color as the underlying first coating of lacquer. This process avoids cutting a long slit in a stencil, which could not be as readily secured to the surface, and, when used for designs other than stripes, eliminates much of the work.

Silhouettes may also be used as masks by lightly attaching them to the surface to be decorated and spraying the color on them and around the design. If desired, the color may be shaded off around the silhouette by directing the spray principally at the mask and allowing only the edge of the spray to fall on the background surrounding the mask. Either silhouette or reversed effects may be ob-

tained in this manner, depending on whether the surface is dark or light relative to the color of the lacquer. Such designs may be effectively used for decorating lamp shades, spraying the lacquer on a sheet of parchment either before or after it has been made into a shade. A cut-out silhouette design of this type, with the lacquer sprayed around the design, is shown in Fig. 5. Only one coating of lacquer should be used in this case, in order to leave the light portions of the parchment transparent.

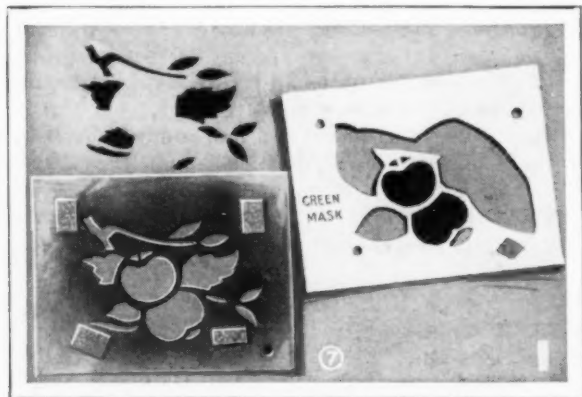
A type of work which lends itself very readily to some objects is done by using a

piece of lace as a stencil. The lace preferably should be rather coarse and need not be new. First, it should be given a thorough coating of lacquer to render it stiffer and less absorbent, and, when dry, it may be tightly held to the work by pinning or sewing. When the lace stencil is applied, the color is sprayed to strike the surface perpendicularly and thus avoid creeping under the threads of the lace.

A relief effect can be produced by stencils used for other designs with a slight change in manipulation. After the design has been finished by spraying, the stencil is removed and replaced in a posi-



tion slightly shifted, in a single direction only. With the stencil thus displaced, a very light spray, or, better, a spray slightly different in color, is directed on the parts not previously colored by the first stencil-



ing operation. Too much lacquer should not be sprayed in this second step, if the color is used, and the best effects are produced by spraying only a light cloud of color in these unstenciled parts. If too much lacquer is sprayed, the effect will be totally lost and the design will appear as though the stencil had been incorrectly cut. This is avoided by using lacquer of a different color. Properly done, the stenciled design will appear as if in relief, casting a shadow to one side, as may be seen in Fig. 6.

Stenciling in more than a single color presents a few complications in the cutting of the stencils, but with simple designs the cutting does not involve extraordinarily difficult work. One of the easiest ways is to cut the stencil as if the design were to be done in one color, that is, so all the parts of the design will appear on a single stencil, and then cover certain parts with small pieces of paper. Attach this stencil to the object, stencil the first color, remove the paper and cover the remaining openings with paper so that the uncolored parts alone will receive the color on the second spraying. An example is shown in Fig. 7. In this, the leaf and stem portions, which are to be stenciled in green, are covered with a paper mask, while the red is applied through the fruit parts. When dry, the stem and leaf portions are uncovered and sprayed with green. In doing multicolor work, it will

be found convenient to leave the stencil on the work while the paper masks are changed, as in this manner the question of register will be avoided. If it is necessary to remove the stencil from the surface of the object, or if more than a single stencil is being used, some marks should be made on the surface to insure that the following stencils will be properly placed with respect to the parts which have already been sprayed. One way of doing this is to mark lightly on the object the outline of the opposite corners of the first stencil.

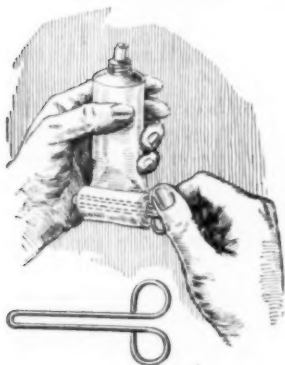
Instead of pasting small pieces of paper over the openings in the stencil, it may be better for the particular design to use masking sheets over the stencil, each masking sheet being so made as to block out the proper portions of the stencil. To make these masks, lay the stencil successively on top of several sheets of rather heavy paper, cut to the same size as the stencil, and trace the design on each of these sheets by passing a pencil around the edges of all the openings in the stencil. The parts of the design to be in a particular color, say, red, are then removed from a single sheet; the parts for another color are removed from a second sheet, and so on. This need not be done as accurately as the stencil cutting, the only requirement being that the removed parts should be at least as large as the stencil openings, but not so large as to cover a portion of the stencil intended to pass another color. In use, the stencil is first attached to the object and one of the masking sheets is laid over and in register with the stencil, blocking for all but the color to be sprayed. After spraying the first color, the surface should appear as in the upper-left part of Fig. 7. Then the second mask may be put in place and sprayed with the proper color, the process being repeated until the entire design has been stenciled in the several colors. If the colors of a multicolored design are to be placed close together, it may require a separate stencil for each. These should be made on sheets of the same size, to insure that they will properly register, and the portions for each color may be cut after tracing the design

on each of the sheets in exactly the same position.

All of the stenciling processes may be used equally well on furniture and other woodwork or even on draperies and walls. The latter have generally been decorated by stenciling with brushed paint, but by spraying paint or lacquer in the manner described, many unusual effects are obtained that can be produced as well by no other method.

After using the spray gun, or when a different-colored lacquer is to be applied, it should be thoroughly cleaned by draining the reservoir, pumping until all the lacquer has been removed that can be sprayed out and then washing the can with a small quantity of lacquer thinner, some of which should be sprayed to clean the nozzle. If the sprayer is to be left unused for only a short time, the cleaning may be avoided by dropping into the pipe leading to the reservoir a small-headed nail, to keep the lacquer from drying and clogging the nozzle. In using the sprayer with lacquers, there is only one precaution which need be observed: work in a well-ventilated place away from open flames. The solvents employed for the lacquers are inflammable and have an objectionable odor which will sometimes, and with some people, cause a slight headache. Otherwise, there are no dangerous or disagreeable effects.

#### Key Deflates Toothpaste Tubes



drawing, which can be made in a few moments, will be found handy for this purpose. After a tube has been emptied, it is unrolled, and the clip removed for reuse.—G. M. Beerbower, Tarrytown, N. Y.

#### Rubber Splash Guard for the Washboard

One housewife, inconvenienced in the use of a washboard by water splashing



Splash Guard for the Wash-tub Made from an Old Inner Tube

on her clothes and on the floor, remedied the trouble by providing a guard on the board, as shown in the drawing. It was made from a section of discarded inner tube and was tacked onto the edge of the board so that it deflects all the water back into the tub. As the guard is made of pliable rubber, it has no rough edges and there will be no possibility of garments being torn nor risk of injury to one's hands.

#### Kinks for Using Plaster of Paris

A plaster-of-paris mixture will remain soft longer if it is added to the water instead of stirring the water into the plaster. The mixing is easier, too. If it is found desirable to keep the mixture soft for a very long period, add ten per cent vinegar to the water before the plaster is put in. To make the plaster hard when finished, add five per cent table salt to the water when mixing. Asbestos powder, about fifteen per cent by volume, will increase the toughness of the plaster and make it durable and hard, so that it will neither flake nor crack.—Frederick L. Minter, Milwaukee, Wis.



A Lawn Roller Made from a Sewer Tile Filled with Concrete and a Mounting of Pipe

### Easily Made Concrete Lawn Roller

To keep the lawn in good condition, it is necessary to have a lawn roller. One can readily be made of concrete, as shown in the accompanying illustration. Get a drain tile, 2 ft. in diameter. If it has a bell or flared end, cut this off with a cold chisel and hammer. Set the tile on a wooden platform, so that the concrete can be poured in. Before pouring the concrete, a length of pipe should be placed in the center of the tile to serve as an axle, the centering being done by making a cross to fit over the open end of the tile, and cleats nailed to the ends of the cross-pieces to hold them in place securely. A hole drilled equidistantly from four points on the side of the tile, where the crosspieces fit

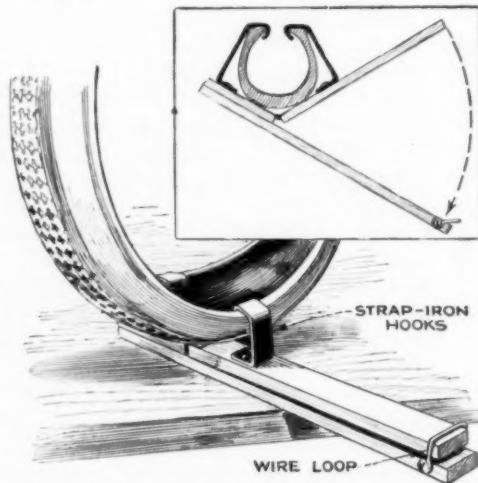
over it, will be in the exact center. A hole is also drilled in the wooden platform to receive the lower end of the pipe, which also must be centered accurately. With the pipe in place, pour in the concrete. After it has been allowed to set for a few days, the ends of the pipe axle are cut to the most suitable length and threaded for caps. The mounting for the roller is made of pipe and fittings, all of which as well as the construction are clearly indicated.—A. J. R. Curtis, Chicago, Ill.

### Improvised Corn Planter Works Quickly and Saves Stooping

A corn planter that eliminates much hoeing and stooping can be made by anyone in a short time. Wire a 3-ft. length of iron pipe to a broom handle, 4 ft. long, and cut the bottom end of the latter to a point. Insert the spout of a tin funnel in the upper end of the pipe and fasten it so that it will not fall out. Walk along the row and, at the proper intervals, force the point end of the handle into the earth and drop three or four kernels of corn through the funnel into the hole. Then scrape some earth over them with the foot.—L. B. Robbins, Harwich, Mass.

### Homemade Tire Spreader

To make inspection of the inside of tires, the homemade spreader shown in the drawing will be found of considerable utility. It consists of two strap-iron hooks, cut and bent to the shape indicated and attached to wooden arms, which are hinged together, as shown. When the arms are brought together and locked in that position by a wire loop, the walls of the tire will be held apart, enabling the workman to examine the inside.—Lowell R. Butcher.—Des Moines, Iowa.



Simple Tire Spreader for the Small Garage Proves Entirely Satisfactory



# Make This "Tim Turner" Windmill

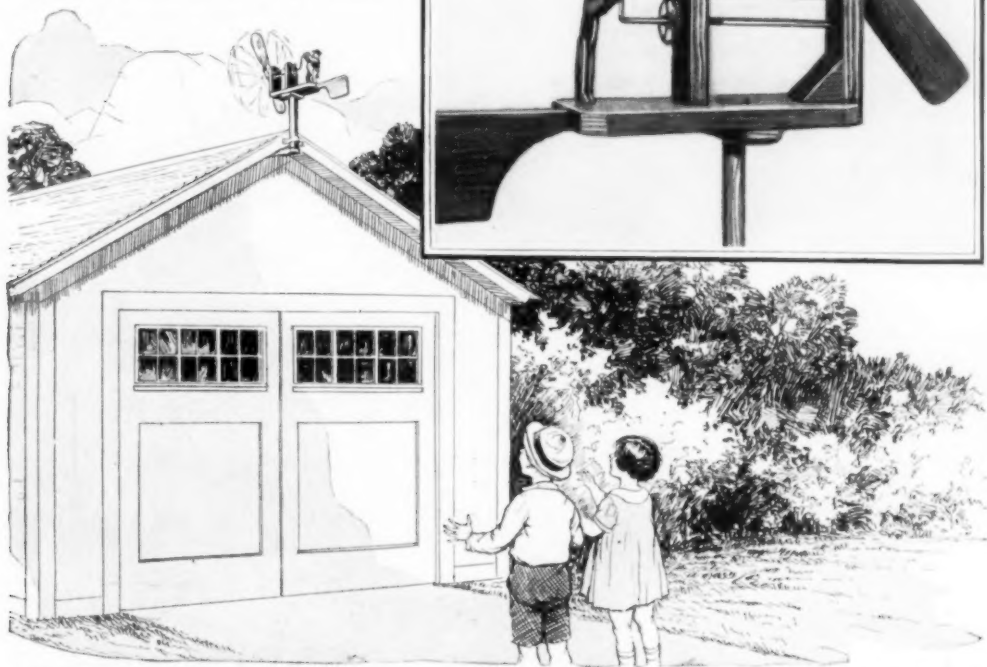
By L. R. BROWNE

THE novel "Tim Turner" windmill shown in the illustration consists of the following parts: 1 piece of  $\frac{5}{8}$ -in. wood, 4 by 10 in.; 1 piece of 1-in. hardwood, 1 by 12 in.; 1 piece of  $\frac{1}{8}$ -in. hardwood, 4 by 12 in.; 1 piece of  $\frac{3}{16}$ -in. brass or iron rod, 20 in. long; two alarm-clock gears; one brass bushing,  $1\frac{1}{4}$  in. long and having an inside diameter of  $\frac{3}{8}$  in.; one  $\frac{3}{8}$ -in. bolt, 4 in. long; two  $\frac{3}{16}$ -in. washers, and two cotter pins.

The 4 by 10-in. piece is used as a base. The two uprights that support the shafts are made of oak or other hardwood, and are fastened to the base with two long wood screws, driven up through the base. Drill two  $\frac{3}{16}$ -in. holes through each upright, the upper hole about 1 in. from the top and the position of the lower hole being determined by the size of the gears used. These holes are to hold the shafts and must therefore be in alinement. The propeller is made of strong straight-grained wood, 1 in. square and 12 in. long. Start

to form each blade as near the center of the piece as possible, leaving a square portion uncut at the point where the shaft enters it. The vane is attached by cutting a notch,  $\frac{1}{8}$  in. wide and 2 in. deep, in the center of the rear part of the base, as shown. The vane must fit in the notch snugly; it is glued in place and then nailed.

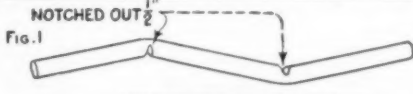
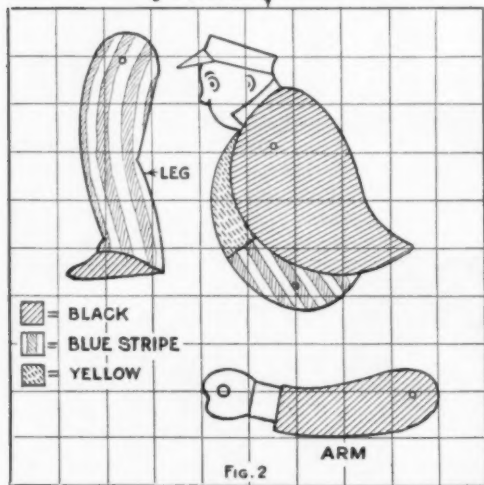
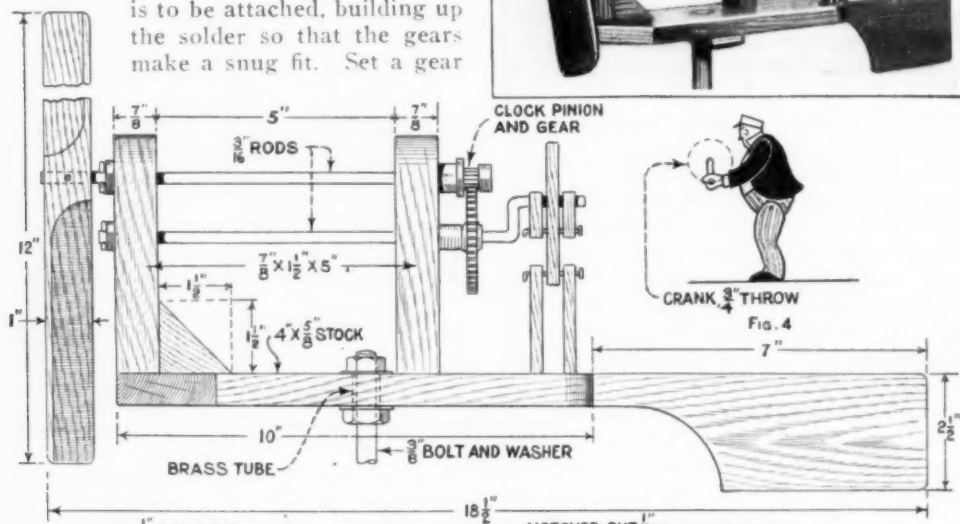
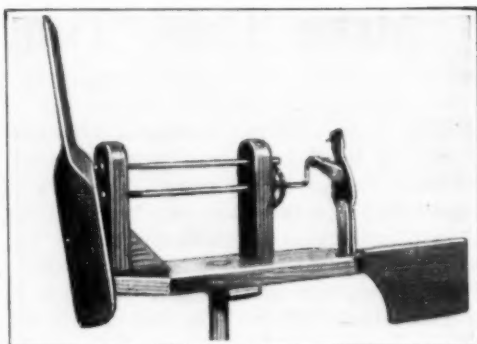
By laying out  $\frac{1}{2}$ -in. squares on a piece of paper, as shown in Fig. 2, a pattern for the man can be easily made. Cut the figure out of  $\frac{1}{8}$ -in. hardwood with a coping saw. The arm and leg pivots are made of small nails, bent over at each end after placing. Leave the joints rather loose and free, to allow easy motion. To make the sharp right-angle bends, in the  $\frac{3}{16}$ -in. shaft, which form the crank, file notches in the rod about halfway through, and bend toward the notches. Two of these



When the Propeller of This Unusual Windmill Is Driven by the Wind, the Wooden Figure Appears to Be Cranking the Propeller by Hand

bends,  $\frac{3}{4}$  in. apart, will give a good throw to the crank. Fig. 3 shows the shaft notched and partly bent.

An old alarm clock will furnish a suitable pinion and gear for the mill, a pair having about 6 to 1 ratio being most satisfactory. Drill holes through both gears to fit the shafts, and tin the shafts well with solder at the point where each gear is to be attached, building up the solder so that the gears make a snug fit. Set a gear



METHOD OF BENDING CRANK  
FIG. 3

Fig. 1, Assembly View of the "Tim Turner" Windmill; Fig. 2, Template of the Parts for Making It; Fig. 3, How to Form the Crank

in position and heat the shaft until the solder begins to flow. When the solder is cold, the gears will be firmly held in place. A shoulder of solder and a number of small washers, slipped on the shaft, form the thrust bearings of the gear and the propeller end of the shaft, respectively, as shown in Fig. 1.

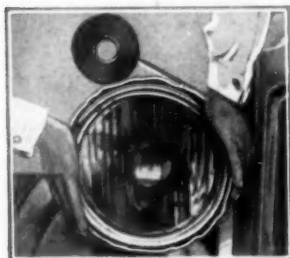
The propeller is fastened to the shaft by drilling a small hole through both and pinning them together with a finishing nail. In centering the base for the pivot, allow a slight extra weight at the front to compensate for the pressure of the wind. A  $\frac{5}{8}$ -in. block is used on the bottom of the base at the pivot point to give a firmer bearing. Make the brass bushing a tight fit in the base and run the 4-in. bolt through this and into the end of a 2 by 2-in. upright, which is fastened to the roof of the garage or house. Do not use glue in any part of the construction as moisture will soon destroy it. Paint all the parts in contrasting colors, suggestions concerning hues being given in Fig. 2. Either lacquer or one of the new quick-drying enamels is suitable for finishing, as these come in bright, glossy colors.

### Protection against Clogged Gutters

Thousands of home owners who have shade trees around the house are troubled each year by leaves falling into the rain gutters. The first rain washes them into the downspouts, clogging these so that water cannot pass as it should. Later on, in the winter, ice collects in the pipes, the rusting process begins and the ice may even crack the pipes, which means renewal. Save yourself this trouble by getting a wire guard of the kind used for electric lamps. Put one in the top of each pipe to serve as a strainer, which will prevent the leaves from going down. It will be necessary to remove accumulations of leaves and small branches above the strainers occasionally or at least twice a year, in the spring and fall.—L. A. Heinle, Toledo, Ohio.

### Removing Stubborn Headlight Rims

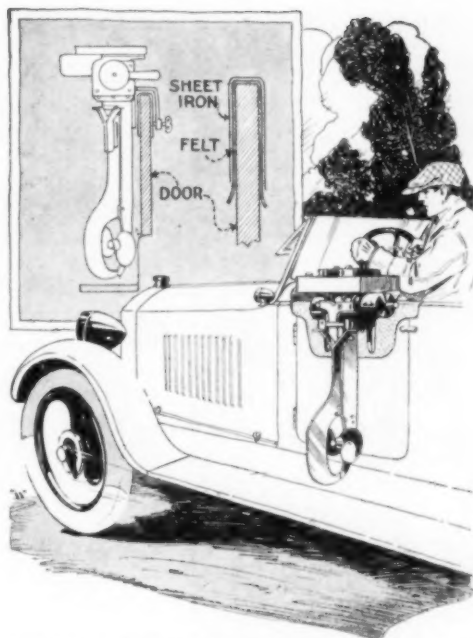
Headlight rims on autos are often rather difficult to remove when it is necessary to replace a burned-out lamp, dust off the reflector or do some other work on the light. The task is especially difficult if the surface of the rims is highly polished. However, by merely wrapping a strip of friction tape around the edge, as shown in



the photo, enough friction will be provided to permit one to loosen the rim without much trouble. Gasoline can be used to wipe off all traces of the adhesive after the tape has served its purpose and has been removed.—W. J. Douglass, Missouri Valley, Iowa.

### Carrying Outboard Motor on Automobile

A convenient method of carrying an outboard motor on an automobile is shown in the drawing. A U-shaped piece of sheet metal is fitted over the front or rear door on the left side of the car and the motor is clamped to this in the same way that it is clamped to the stern board



Carrying an Outboard Motor on the Door of a Touring Car without the Risk of Hurting Either

of a boat. A piece of soft material, such as felt, outing flannel or the like, is first placed over the door to protect the finish and door upholstery. The sheet metal piece should be a little longer than the width of the door so as to overlap the door frame. This is advisable, if not necessary, in order to remove some of the weight from the door and prevent it from opening accidentally.

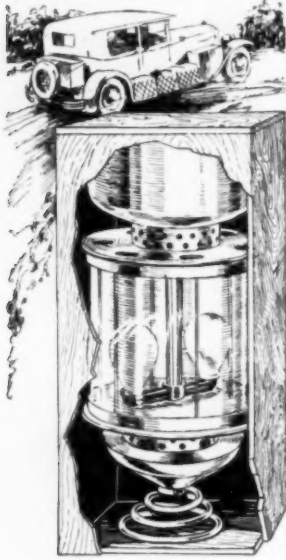
### Holder for the Flashlight

If it is necessary to use a flashlight while working alone, difficulty is often experienced in focusing the light on the work, while both hands are engaged. A good support for the flashlight can readily be made from two clothespins, wedged together as shown in the photo. The height of the support can be varied by pressing the tops or feet of the clothespins together to change the distance between them.



### Carrying Case for Gasoline Lanterns

A gasoline lantern is a valuable addition to a motor camper's equipment, but many



tourists object to its use because of the frequent breakage of mantles, due to the vibration of the car. The risk of breakage can be eliminated if a coil spring is provided under the dome nut of the lantern as shown, and the lantern is carried in an inverted position in a suitable con-

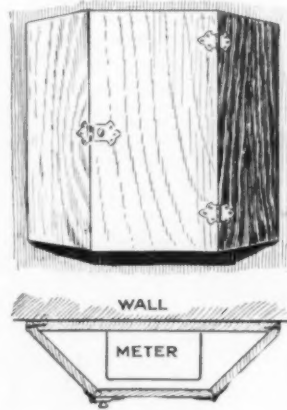
tainer. The spring should be made of No. 22 or 24-gauge piano wire. The carton in which the lantern was originally packed will serve as a temporary container until a suitable carrying case can be made. The most important thing is to fit the spring and always carry the lantern upside down.

### Proper Care of the Saxophone

The saxophone is a finely machined instrument that seldom gets out of order if properly handled, but, like every other piece of mechanical apparatus, needs occasional adjustment. The most frequent trouble is leakage around the pads. This is caused by the condensation of moisture from the breath on the pads and the neglect of wiping it off when the instrument is put away. Moisture also condenses on the inside of the metal body and settles at the bottom of the bow bend. This is later blown out of the tone holes and sprayed onto the pads, which, being made of the finest kid skin backed by wool felt, gradually harden and crack from it. Be careful to wipe out the instrument thoroughly with a soft cloth when finished playing. This can be done best by tying one end of a string to the cloth and the

other to a cloth-covered sinker. Drop the latter through the bell of the horn and let it come out of the small end when the gooseneck is removed. The cloth can be pulled through without difficulty. Two or three such wipings will thoroughly dry the inside of the horn. Wipe off the pads and remove the mouthpiece from the gooseneck. Clean the gooseneck by pulling the cloth through it. Also clean the mouthpiece in the same way after the reed has been removed. Carefully pat the moisture from the reed with a dry cloth, reset it and put on the cover. In all cases, when the horn is wiped and dried, put it into its case. Twice a season, the pins and long rods that act as bearings for the various pads should be oiled with a drop of the best quality light machine oil, which will not gum. Be sure to keep the oil away from the pads as it will ruin them. If oil is accidentally spilled on them wipe it off at once and then apply talcum powder. This powder is good for a sticking valve pad also. When tuning up in cold weather, warm the saxophone a few minutes before attempting to play it, otherwise the pitch will be flat.

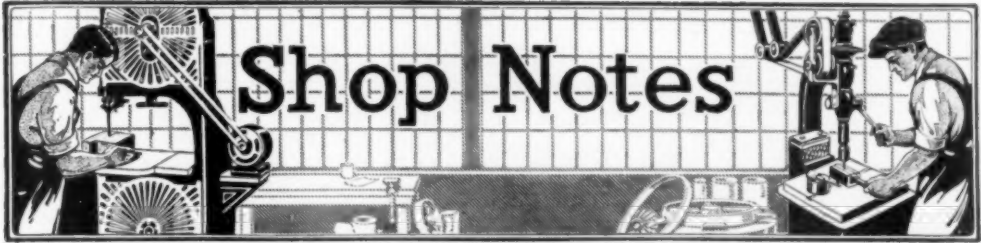
### Cabinet Hides Electric Meter



While building my home, I had intended to put the electric meter in an out-of-the-way closet, but found that this was against the rules of the electric company. As there was no basement, the

meter was installed in the kitchen. Here, however, it presented a very objectionable appearance, which I improved by building a cabinet around it, finishing the inclosure to harmonize with the rest of the woodwork.—John T. Neufeld, Chicago.

☞ Sew straps to the mattresses so that they can be handled more easily.



All Shop Notes published in 1927, in book form—Fifty Cents—from our Book Department

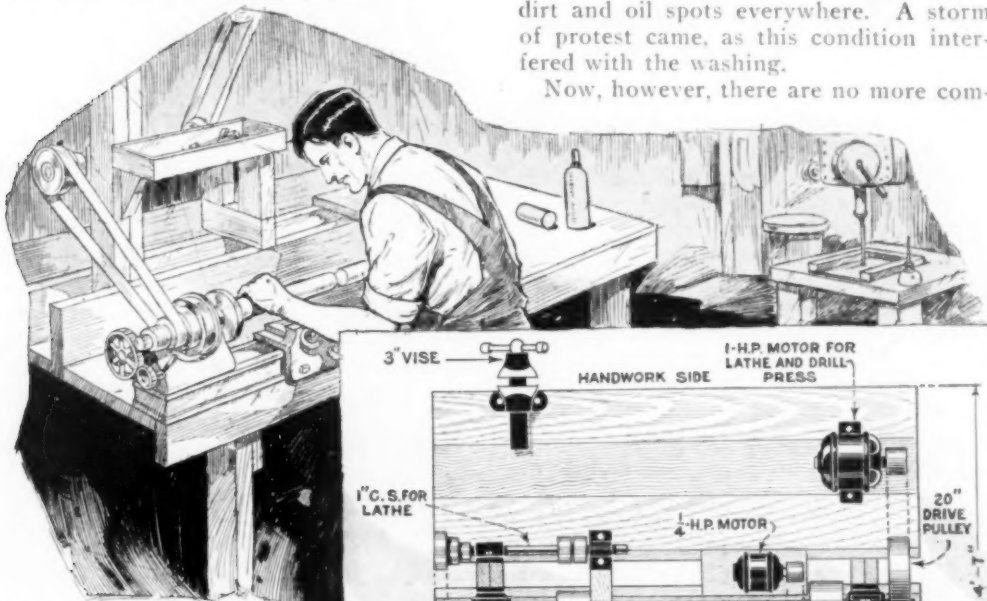
## Handy and Compact Home Workshop

By F. L. COAKLEY

ORDINARILY the basement is the best place, if not the only one, to locate the home workshop, but space is often rather limited and it cannot be entirely devoted to this use. Other household duties are also performed there, and it is quite necessary to arrange the shop as compactly and orderly as possible.

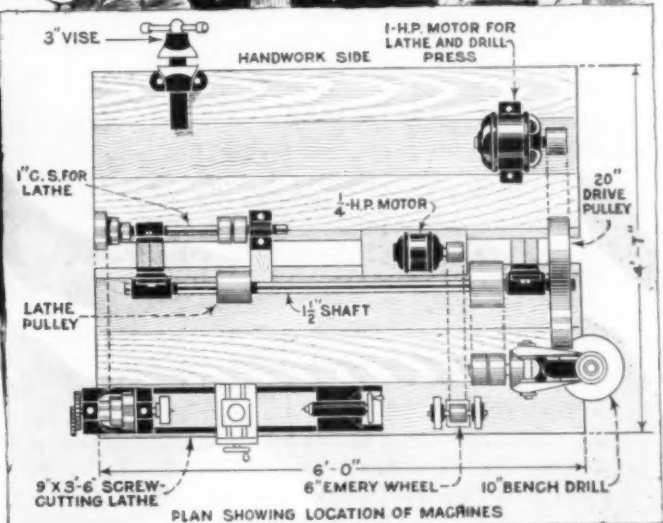
meal, beginning with a few hand tools. Not being satisfied with these, I installed a small lathe, then a grinder and a drill press. By this time the equipment was pretty well scattered all over the basement, as my workbench was not large enough to accommodate everything. There were shavings here, chips there, dirt and oil spots everywhere. A storm of protest came, as this condition interfered with the washing.

Now, however, there are no more com-

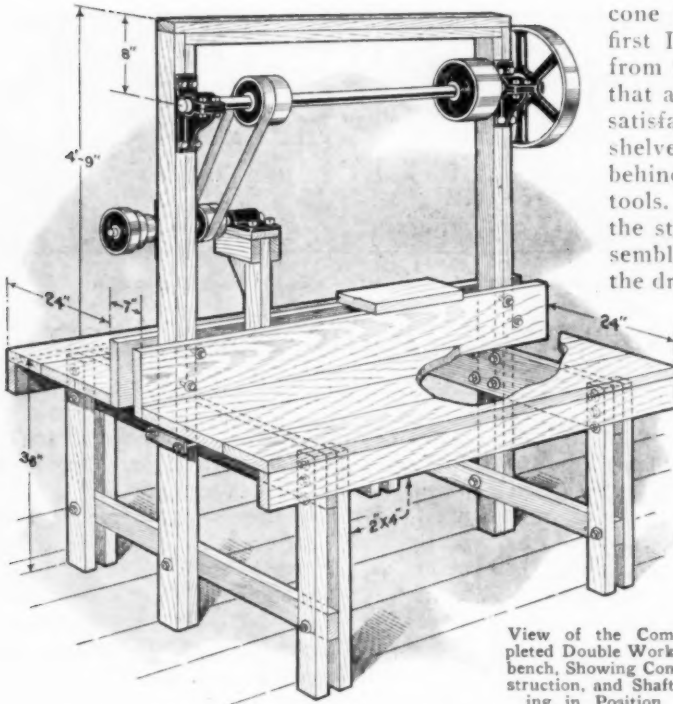


Installation of the Home Workshop on a Sturdy Double Bench, Which Is Bolted Together to Permit Dismantling and Moving; the Plan View Shows the Arrangement of the Machines, Motors and Shafts

When I first considered the installation of a home workshop, I purchased the necessary equipment piece-







View of the Completed Double Workbench, Showing Construction, and Shafting in Position

plaints, for the basement is clean and tidy, and my workshop is confined to the double bench shown in the drawings. This is located in one corner, and if necessary, I can build a partition around it and provide a padlocked door.

The frames of the bench are of 2 by 4-in. stock, the upper rails being 1½ by 8 in. The top and back ledges are also made of 1½ by 8-in. boards, and the framework is bolted throughout. The center frame that supports the line and countershafts is made up from doubled two-by-fours, and in the manner shown clearly in the illustration. No further dimensions are necessary, as the length, width and height of the bench may have to be varied to suit individual conditions.

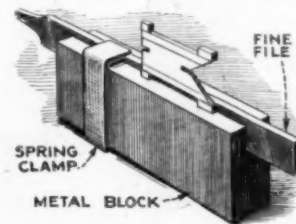
A 9-in. screw-cutting lathe, grinder and a 10-in. drill press are mounted on one side, while all the hand tools, including a 3-in. vise, are kept on the other side. A 1-hp. electric motor is used to run the lathe and drill press, while one of ¼ hp. drives the grinder. The former is located on the left-hand side of the bench, and is belted to a 1½-in. shaft, which is held by suitable hangers. This is in turn belted to the countershaft, which carries the

cone pulley for the lathe. At first I drove the grinder directly from the countershaft, but found that a separate motor gave more satisfactory results. Two small shelves are conveniently located behind the lathe to hold the lathe tools. All the dimensions, size of the stock, and the method of assembly are clearly indicated in the drawings. Bolts were used to hold the parts together, so that tightening could be done when necessary, and so that the bench could be dismantled and moved, if desired.

Several friends predicted that the bench would prove weak, and would soon loosen up, but after three years of use, it is still perfectly solid, and the machines operate with a minimum of vibration, although the bench is neither fastened to the floor nor to the wall, and stands away from all other support.

### Burr Remover for Matrices

An operation occasionally necessary in linotype maintenance is the removal of burrs on the ears of matrices, caused by their repeated striking on the front plate, or on the entrance of the matrix into the assembly stick. This is a detail that requires exceptional care on the part of the

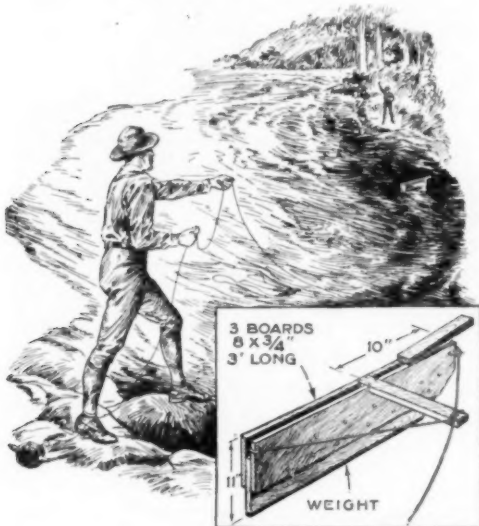


operator, as inexperience in the use of a file may damage the type face. The drawing shows a simple and effective way of doing this work without risk of injury to the working faces of the matrix. Along one edge of a piece of furniture, a metal block being preferable, a narrow slot is cut to receive a thin fine file, having a safety edge. The slot should be just deep enough to allow the file to project a distance equal to about one

point less than the width of the ear or lug on the matrix. A small spring clamp, made of brass, is used to hold the file in the slot. This accessory has proved both speedy and accurate.

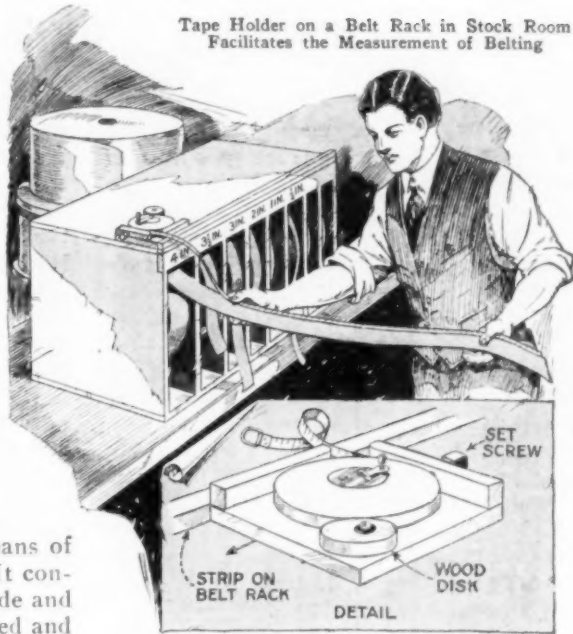
### Getting Telegraph Line over Flooded River

A telegraph engineer, engaged in restoring telegraph service over a large flooded river, which had washed out the only bridge in the vicinity, found that the main river had changed its course. The torrent could not be crossed by boat nor by the most daring rider on horse and the use of harpoon guns and rockets was impossible. The difficulty was overcome by means of the device shown in the drawing. It consists of three boards, about 8 in. wide and 3 ft. long, nailed together as indicated and provided with a metal strip to serve as a weight, which holds the device upright when it floats. A short crosspiece of 1-in. wood is securely fastened about 10 in. from one end, and a light but strong line is attached as indicated. The current propelled this device across the river, the light rope was tied to a heavier rope and this to the telegraph wire.—O. Johnson, Pahaitua, New Zealand.



Device Which Proved of Great Help to Get a Telegraph Line across a Flooded River

Tape Holder on a Belt Rack in Stock Room Facilitates the Measurement of Belting



Tape-Line Holder for the Stock Room Saves Time and Material

The holder shown in the drawing will save many broken tape lines in the stock or supply room when used to measure belting, etc. It consists of a square wood base, with two strips nailed at right angles and a space left between them at one corner for the line to run through, and a wood disk, such as a barrel bung, fastened to the base with a wood screw. The screw is placed off center so that, when the disk is turned, it will clamp the tape securely. The holder can be moved along the top of the rack to the belt to be measured, a wood strip being nailed on the top edge of the rack to prevent the holder from pulling off when the measuring is being done.—D. S. Jenkins, Xenia, Ohio.

### Cutting and Bending Sheet Iron

We had considerable cutting and bending to do on a piece of sheet iron. Instead of marking the iron, we made an ink drawing on paper, which was much easier to do than marking off the design on the iron. The drawing was glued to the iron, and drilling, cutting and bending were then accomplished without any trouble.—W. L. Miles, Providence, R. I.

# Trucks for Unloading Autos

By L. M. JORDAN

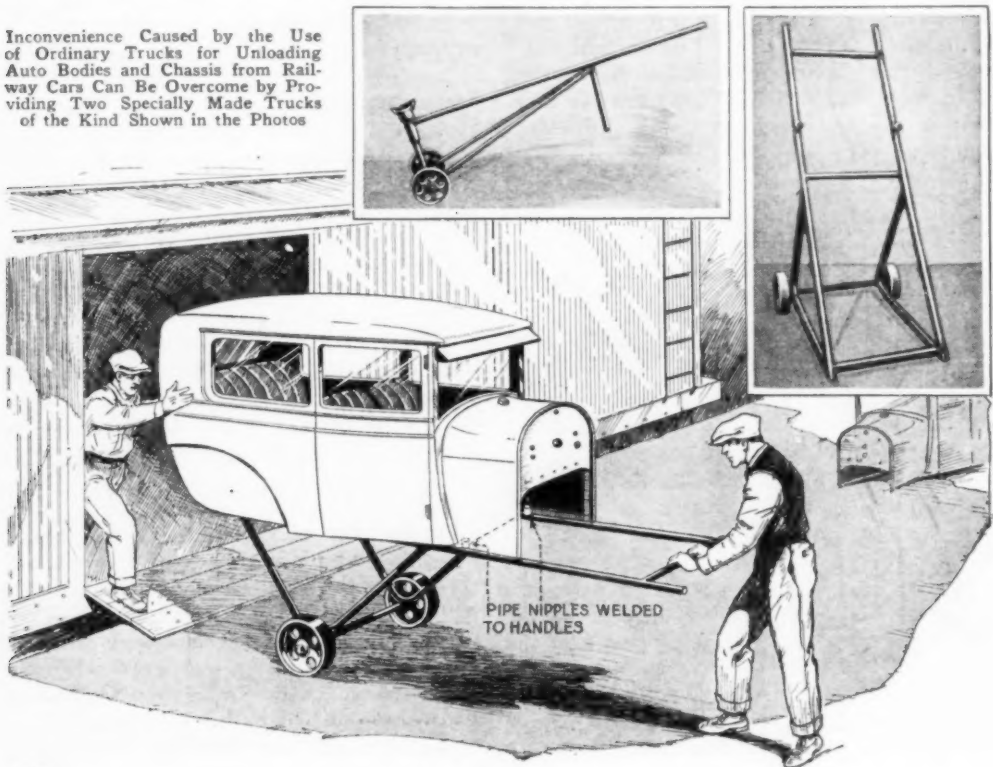
**T**HE task of unloading automobile bodies and chassis from railway cars with ordinary trucks is quite hard. To make it easier, a Ford dealer built the two special trucks shown in the accompanying drawing and photos. They were constructed of iron pipe and fittings, securely joined by welding.

The right-hand photo shows a truck which is used for unloading bodies. The wheels and axle of an ordinary loading truck are used. Two lengths of 1½-in. pipe, bent to a V-shape, are bolted to the axle and serve as braces for the frame, to which they are welded. The latter, of 1½-in. pipe, consists of two sidepieces, which extend to serve as handles and are welded to the braces, three crosspieces and two short pipe nipples welded to the top of the sidepieces near the handgrip end. In use, the car body is lifted at one end until the truck can be run under it and the front of the body passes

over the two nipples on the handles. These prevent the body from slipping on the truck when the handles are pulled down.

The other photo shows the truck made for unloading chassis. Another set of loading-truck wheels with axle is used. A V-shaped or triangular frame is attached to the axle and the ends are welded to a single 2½-in. pipe, serving as a tongue. A 20-in. length of the same stock is welded to the underside of the tongue near the handle end, to serve as a rest when the truck is set down. A smaller V-shaped frame, of the same-size pipe, is welded, vertically to the axle, to the rear end of the main frame. A piece of 3-in. pipe, 8 in. long, is welded on top of the smaller frame and to the tongue. A ¾-in. sleeve union, drilled to receive two short pieces of ½-in. iron rod, which are welded in the holes and extend horizontally on opposite sides, is slipped over the 3-in. piece and left loose. The outer ends

Inconvenience Caused by the Use of Ordinary Trucks for Unloading Auto Bodies and Chassis from Railway Cars Can Be Overcome by Providing Two Specially Made Trucks of the Kind Shown in the Photos

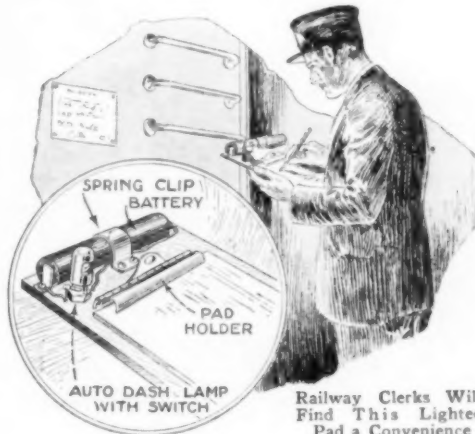


of the rods are bent upward, as shown. When loading, the rear end of a chassis is raised until the truck can be run under it to a point where the oil-drain plug in the underside of the flywheel or clutch housing can be let down into the sleeve, while the housing rests on the bent rods. This holds the chassis securely. The handle or tongue is then brought down, balancing the chassis on the truck so that it can be readily wheeled about. The drive-shaft housing rests between a fork of bolts near the handgrip.

### Torch Illuminates Writing Pad

Night clerks in railroad yards or manufacturing plants, or anyone who has to do writing at night out of doors, will appreciate a light on the writing-pad holder, as shown in the drawing. It is made up of a 3-cell flashlight battery, an auto dash lamp with switch incorporated, two small angle brackets, a spring clip and a few lengths of wire. Attach the battery to the top of the writing-pad holder. In order to make room for it, the writing-pad clip may have to be moved down. Screw the angle brackets to the board so that they make contact with the positive and negative ends of the battery. Also attach the spring clip so that the battery will not easily be dislodged. The dash lamp is fastened on next, the method of doing this depending on the particular construction of the lamp used. Connect the wires to the lamp and to the brackets. A good electrical connection to the latter can be made by inserting a soldering lug over the end of one of the screws holding the bracket and then driving the nut down tightly.—William C. Thomas, Chicago, Ill.

White woodwork can be kept fresh by rubbing it with a moistened cloth dipped in whiting; the surface should then be washed with clear water and dried.



Railway Clerks Will Find This Lighted Pad a Convenience



High Folding Ladder for the Tree Trimmer Is Attached to an Auto Trailer

### Help for the Tree Trimmer

For years Mr. Corliss, of Alhambra, Calif., has worked at trimming trees, and has experienced difficulty in finding a secure platform of adjustable height, which was at the same time portable. He devised an auto trailer fitted with an extension ladder, as shown, and this was found satisfactory. It folds to a height of 10 ft., can be extended to about 25 ft., and is secure so that the worker can mount it with perfect safety. It is also provided with wheels and fitted with a connecting tongue by which it can be towed. The ladder support is lifted off the ground when the trailer is being towed.—John Edwin Hoag, Los Angeles, Calif.



This Motion Sign Is Actuated by the Printing Press and Attracts Considerable Attention.

#### Motion Sign Advertises Printer

Motion usually increases the effectiveness of advertisements. The sign shown in the drawing was arranged by a printer in the following manner: One of the Gordon presses was located near the front window. A pulley was driven into the top of the window frame near the glass and a length of stout cord run over it, one end of the cord being attached to the roller frame of the press, and the other to the sign. When the press is in operation, the sign moves up and down. If the press is not situated near the window, a longer cord can be run over two or more pulleys to reach the press.

#### Draining Oil from Wooden Barrels

In some places where heavy fuel and lubricating oil is delivered in the ordinary 40 to 50-gal. wooden barrels, the bung is taken out and the oil removed by allowing it to run out. Then the bung is replaced and the barrel placed in a tank of hot water for about an hour. This treatment heats and thins the oil so that it drains out completely when the bung-hole is again opened. Unless wooden barrels containing heavy oil are subjected to such treatment, from 3 qt. to 2 gal. of oil will

be left in each. This is no exaggeration, as I have taken barrels which had been set out as completely empty, placed them in a hot-water bath, as described above and then drained more than a gallon of oil from some of them. The treatment is particularly useful during winter when the oil is congealed. Storing the barrels in a hot and dry place will help to make the oil more fluid but will soon destroy empty barrels. The hot-water treatment will not injure them in the least.—James E. Noble, Hollyburn, Can.

#### Closing Small Leaks in Pipe Fittings

To close a pinhole in a cast or malleable-iron pipe fitting, take ordinary tin or lead foil, fold it to form several thicknesses and place it over the hole. With a small hammer drive the foil into the hole. This will usually stop the leak permanently, whether the pipe carries air, gas, hot or cold water or other liquids. But the method is not effective for leaks in steam pipes. Sometimes a pinhole in a malleable-iron fitting on a steam line can be closed by hammering the metal over the hole, but this cannot be done, of course, in the case of cast-iron fittings.

#### Tool for Driving Fence Posts Single-Handed

Usually it takes two men to set steel fence posts, one man to hold the post



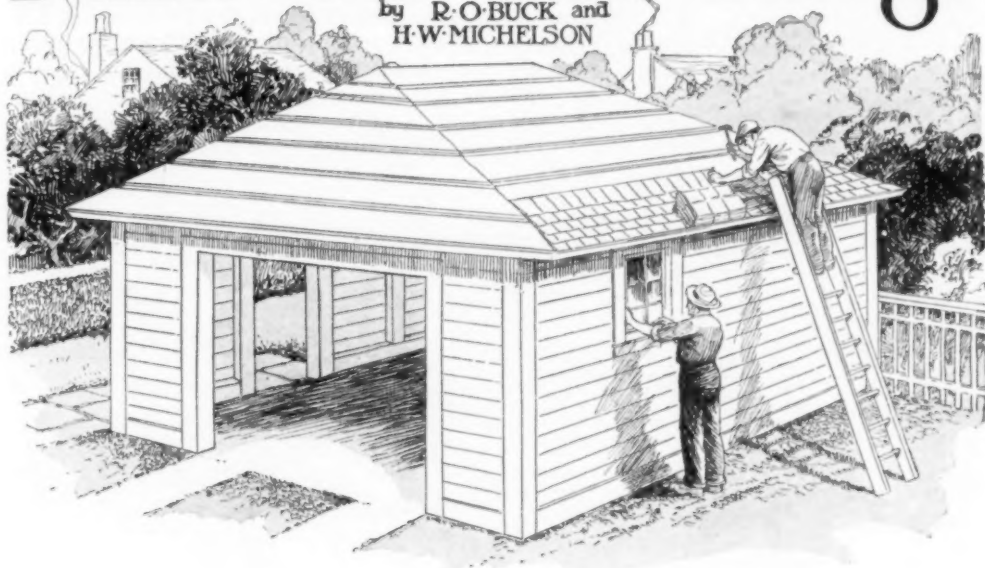
while the other is driving it into the ground with a sledge. The work can, however, be done single-handed by using the home-made tool shown in the drawing. It consists of a

length of pipe, large enough to be slipped over the fence post, and a weight securely attached to the top end. The weight can be made by setting one end of the pipe in a pail and pouring concrete around it.—John B. Smoller, Atlantic, Iowa.



# Build Your Own Garage

by R. O. BUCK and  
H. W. MICHELSON



## PART I

A GREAT many men who are handy with tools and build little conveniences into their homes hesitate about tackling so large a project as a garage, because they fear it will be beyond their ability. With this in mind, it should be stated at the outset that one of the writers constructed the garage illustrated herewith during a two weeks' vacation, altogether unaided, and derived considerable pleasure from it, not to mention the profit.

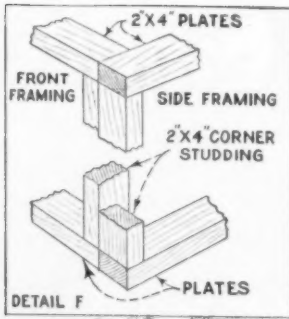
There were two considerations which led me to build my own garage; first, because I wanted the pleasure of building it, but principally because I had more time than money. My experience was so altogether satisfactory that I think it is worth passing on to you.

My garage is a well-built and

roomy structure, large enough to house any make of car and with sufficient space on the sides for a workbench, shelves, etc. The floor is of concrete, pitched so that water will run off through a drain at the center. The garage faces the front, making it necessary to build tracks of cement to the street. This part of the work I did not attempt, but had a contractor put them in after the garage was completed, at a cost of \$140. For an additional \$60 he

would have put in my cement pad also and I would have been saved some rather hard labor. However, I did this work myself at a fraction of the cost. If you have a good alley that stays dry and is passable the year around, you can save the expense of the tracks; mine is low and inclined to be bottomless at some





seasons of the year.

In locating the garage, I made use of some valuable tips from my neighbor, who had always

about 6 in. of surface soil between the wall trenches for the floor. Around the outside of the trench, I placed wood forms, as shown in the sketch.

In order to fasten the structure securely to the cement pad, a set of bolts were used as shown in both Figs. 1 and 2. I cut the 2 by 4-in. wood sills to exact length, drilled holes as shown, and placed 1/2-in. bolts in them, with the heads down and

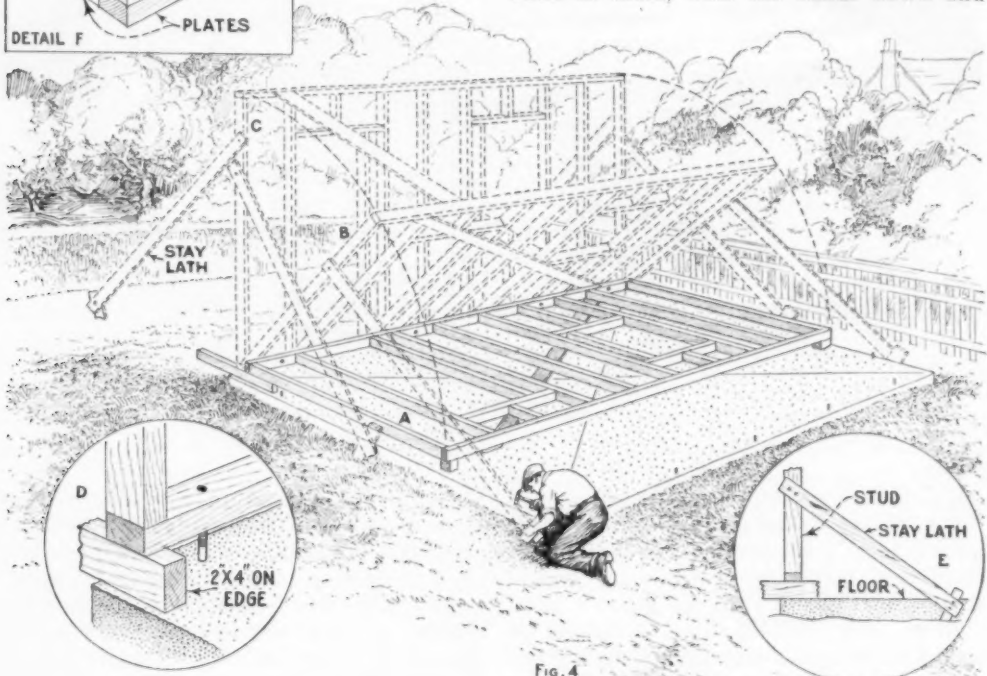


Fig. 4

encountered considerable difficulty in backing his car from the garage to the street without running off the tracks, because he had to round a curve and back up a grade as well. I placed my garage directly in line and nearly level with the street for this reason.

It took me two days to lay the cement pad which served as both wall and floor. Incidentally, this proved to be the hardest part of the whole job from the standpoint of physical labor.

The floor of the garage was laid 2 in. above grade so that surface water would not come in under the door in the spring or during rainy weather. A section through the floor and wall is shown in Fig. 1. I dug a trench, 18 in. deep, all around the outer edge of the plot I had staked off for the pad and also removed

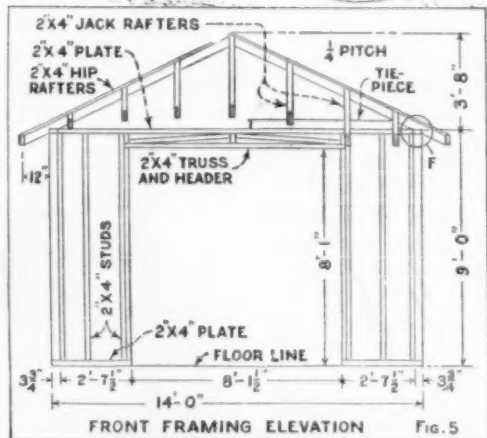


Fig. 5

the nuts turned on. The sills were then put in position across the forms and fastened with light strips of wood for brac-

ing. The purpose of all this, of course, was to space the bolts in the concrete to coincide with the holes in the sills. Do not fail to mark these pieces both as to side and end so that you can replace them later.

To square up the sides and ends, I took

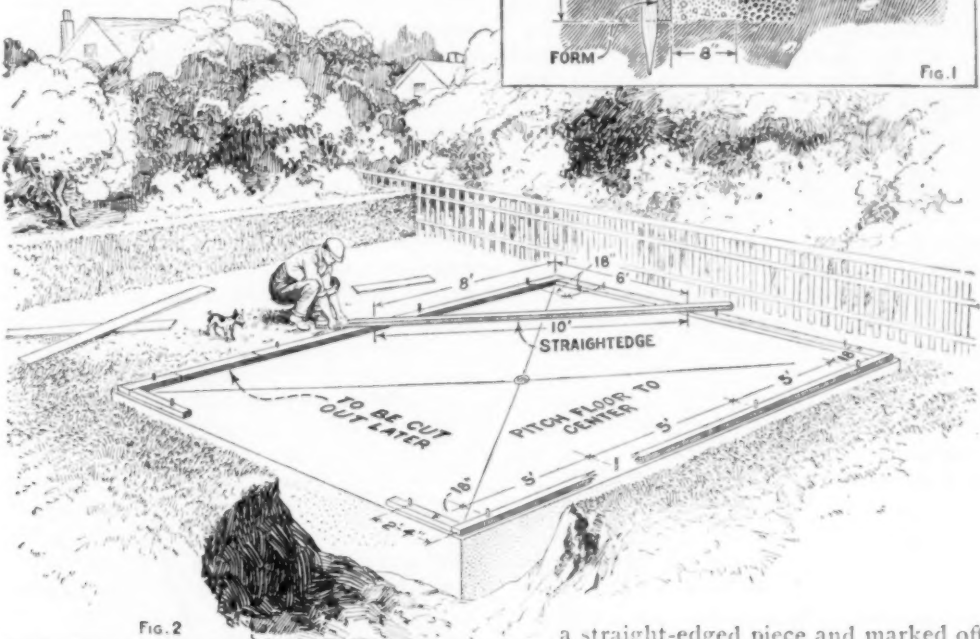
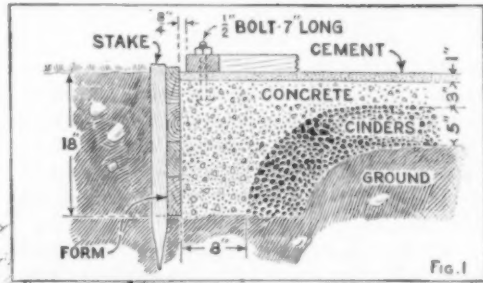


Fig. 2

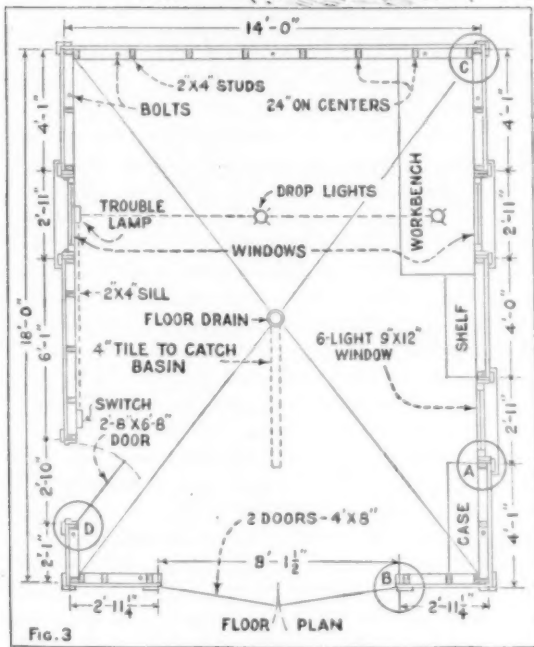


Fig. 3

a straight-edged piece and marked off exactly 10 ft. on it, after which I measured 6 ft. along the end form and 8 ft. along the side form, as shown on Fig. 2. With the straightedge on these two points, the distance between them diagonally should be 10 ft. when the corner is square. Check the adjacent corner also.

The cement pad was made up of a layer of cinders, well tamped and about 5 in. thick, 3 in. of concrete, and 1 in. of cement. Cinders are often omitted on work of this type, but are specified in all first-class jobs and the result, I believe, is better. The wall, of course, was concrete all the way with the exception of the 1 in. of cement at the top. The concrete was mixed in the proportion of 1 part cement, 3 parts sharp sand and 5 parts gravel. For the finishing coat I used 1 part cement to 2 of sand.

It is important that the cement be well mixed with the sand and gravel

before adding the water and again after this is done. I mixed the cement in a steel wheelbarrow, which made it much easier on my back and saved an extra handling, as I could wheel the mixture to the part of the floor I was making and simply dump the load. The mixing, of course, I did alongside the pile of sand and gravel.

The drainage of the floor, as mentioned previously, was planned toward the center. I ran a 4-in. tile line from the center of the floor to the catch basin, with a fall of 1 ft. in 25, as the distance was not very great. If the soil is very sandy where you are building your garage, you may be able to use a seepage tank for drainage purposes. This consists of an old oil barrel, well drilled with large holes and buried 1 or 2 ft. under the center of the floor. The concrete over the top of the barrel should be reinforced with some old iron rod or pipe to strengthen the concrete after the barrel rots. The seepage tank will take a reasonable amount of water at a time and is much easier to build and less expensive than the tile. Another way, of course, is to slope the floor toward the large doors so that the water will run out under them.

The concrete was allowed to set several hours before the finishing coat was applied. A plank was laid from one sill to the other to kneel on while finishing the center of the floor with a cement trowel, after it had been scraped to proper slope with a long straight-edged board in the usual way.

After allowing the floor to dry three days, I took out the forms, planned my framing procedure and started this part of the job. One of the greatest problems I had was how I was going to handle the job of framing alone, as none of my neighbors were home during the day. I found, however, that I could cut most of the material in advance and began with the plates, corner studs, etc. The sills were all cut and ready, as they were used to space the bolts in the concrete.

I had the framing material all laid out on the ground when it occurred to me that, by framing the corners as shown in detail F, Fig. 4, I could assemble each wall complete on the floor, then raise it into place and nail all together when done. Starting with a side wall, I securely spiked

the members of the wall together. The spacing of the studs, headers, etc., is shown on the floor plan and also on the side and end elevations, Figs. 3, 5 and 6, respectively.

It is advisable to check all measurements very carefully before cutting any of the material, as I found to my sorrow when I cut the material for both sides the same, neglecting to take into consideration that, while one side has a window and a door, the other side has two windows. The framing should also be squared carefully by using the 6, 8 and 10-ft. rule described previously.

After the side walls are all framed they should be held square with temporary diagonal braces, as shown in Fig. 4. These braces should be nailed on the inside of the frames so that they will not interfere with siding, and may be left on until the garage is finished. Fig. 4 shows one side assembled and ready to be raised. There were two problems to be solved in connection with this operation. First, the sill had to be raised above the level of the anchor bolts, yet in line with them so that the holes would coincide with the bolts and the frame could be dropped into position. It was also necessary to swing the frame to a vertical position. Of course, if you have some one to help you, this does not present such a problem, but I had to do it alone and I found it rather heavier and more unwieldy than I could manage conveniently.

The first part I accomplished by placing short pieces of 2 by 4-in. stuff, on edge, under the sill to raise it above the bolts, as shown at D, Fig. 4. To raise the assembled framing sections, I nailed stay lath on each end, as shown at E, Fig. 3, so that I could raise one end a few inches, brace it, then walk to the other end and treat it similarly. By repeating this operation, raising each end a few inches at a time, I was able to get the whole thing in position without much effort. As soon as it was vertical, I nailed stay lath from the other side as well, which held it into position until the blocks could be removed and the sill dropped over the bolts. After testing the wall with a level to be sure it was plumb, I secured the stay lath with additional nails, placed the washers and nuts on the bolts and tightened them.

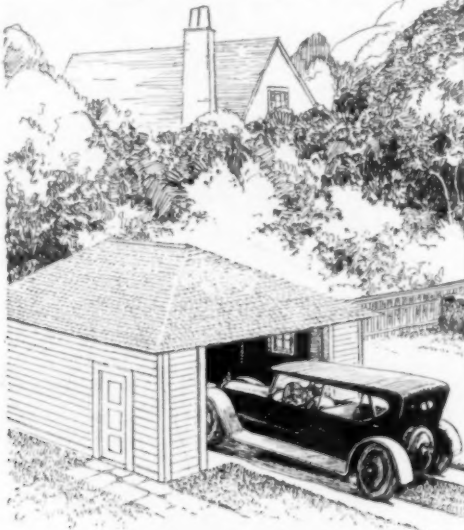
The assembly and raising of the other side was accomplished in the same manner. The back framing being very simple and light, was swung into place easily.

The front framing elevation, Fig. 5, gives full dimensions for making a truss over the doorway so that it will not be necessary to put heavy timbers across the door span, as is the usual practice. Good tight joints are very important in the truss, however, as its strength depends on the bracing of the various members.

Care must be taken before nailing the corner studs into place that the structure is square and plumb. Detail F shows the method of

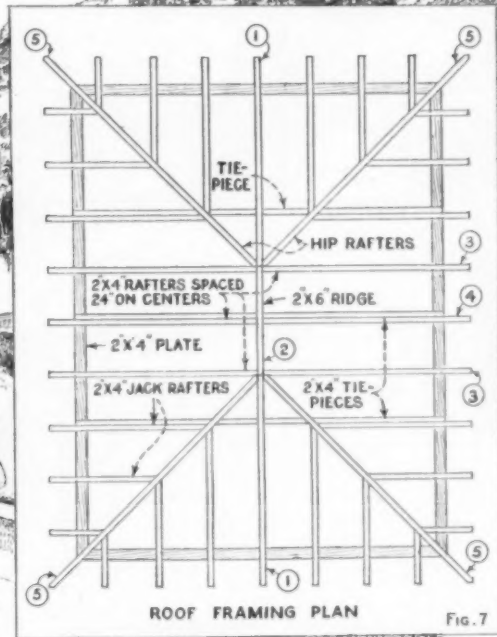
roof of the same size, is about the same, the difference being in the labor involved.

A roof-framing plan, together with a side and front-framing elevation, show



fastening the corners together. The three tie-pieces may be nailed into place at this stage, as shown on the roof-framing plan, Fig. 7. Their purpose, of course, is to keep the side walls from spreading when the roof, and the snow load the roof will carry, are placed on them. They will also be found convenient to support planks for staging, while you are nailing the rafters in place. It is convenient, though not absolutely necessary, to have a scaffold on the outside of the structure also. This should be built at this stage if it is to be of greatest use.

The type of roof I selected, the hip roof, is not the easiest type to frame, but is so much more attractive than the gable roof, that I felt it was worth the extra work. The material required for a hip or gable



the exact size and position of the various members. A skeleton view of the entire building will be given in the second article, so that there will be no doubt about the arrangement of the various rafters.

My first step in framing the roof was to space off, and mark on the plates, the center lines of all of the rafters along the four sides of the structure. All of the rafters were spaced 24 in. from the center of one rafter to the center of the next. I started the spacing from the center of the plates, working each way toward the ends so that

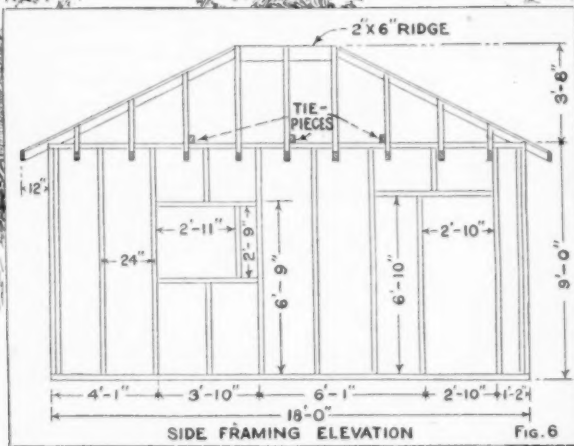


any irregularity in the spacing would come at the corners where it would be less noticeable.

The various members of the roof are numbered, in Fig. 7, in the order in which I found it expedient to set them up. I started with the two end

of the rafters is as follows: A roof 14 ft. wide has a run of 7 ft. and a rise of 3 ft. 6 in., if the roof is quarter pitch, as in this case. This is equivalent to saying that it has a rise of 6 in. to every foot of run. If you place a square on your rafter so that the 6 and 12-in. marks are on an edge as shown in Fig. 9 (Part II), and repeat seven times, the length and cuts of the rafter will be determined. To this, however, must be added the width of the plate and the length of the overhang.

Of course you could figure the length of the rafters arithmetically also by getting the length of the hypotenuse of a triangle whose legs are 7 ft. and 3 ft. 6 in. That is, get



center rafters and ridge which I put together temporarily with cleats, then raised and fastened with stay lath. They must be perfectly plumb, of course, as they are to be used as a guide to measure others.

It is rather difficult for an amateur to cut all of the roof members in advance; however, if all of the rafters are cut "on the ground" and put into place, they will serve as a framework to which the hip and jack rafters can be fitted readily in the order suggested. Rafters 1, 3 and 4 are all the same length. Also the slope of the sides and ends of the roof are the same.

The method of determining the length

of the rafters is as follows: A roof 14 ft. wide has a run of 7 ft. and a rise of 3 ft. 6 in., if the roof is quarter pitch, as in this case. This is equivalent to saying that it has a rise of 6 in. to every foot of run. If you place a square on your rafter so that the 6 and 12-in. marks are on an edge as shown in Fig. 9 (Part II), and repeat seven times, the length and cuts of the rafter will be determined. To this, however, must be added the width of the plate and the length of the overhang.

Of course you could figure the length of the rafters arithmetically also by getting the length of the hypotenuse of a triangle whose legs are 7 ft. and 3 ft. 6 in. That is, get



difficulties and do not believe that you will have any trouble with this part of the job.

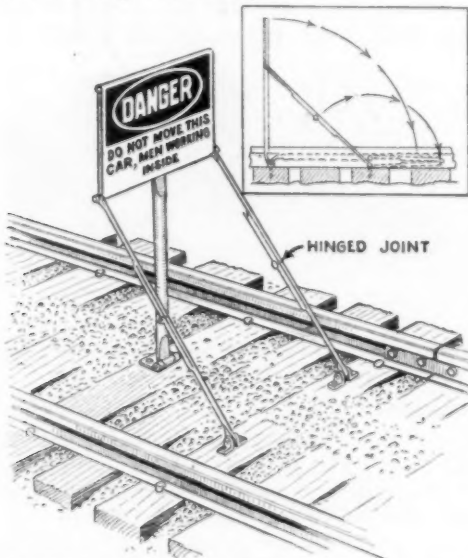
(To Be Continued Next Month)

### Preventing Tractor from Rising

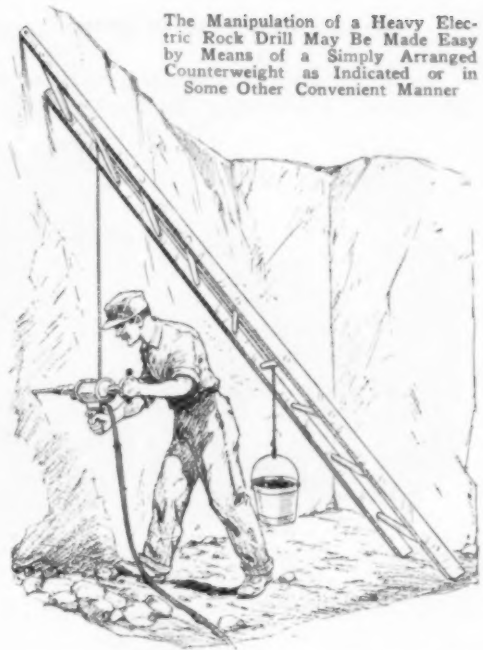
To prevent his tractor from rising unexpectedly at the front end while disking, a Mississippi farmer fastened one end of a strong chain to the front axle and the other end to the disk harrow. This helped greatly in holding the front end down, as it could not rise until the chain was slackened. When arranged in this way, the tractor is held down by the weight of the implement it is pulling as long as the chain remains taut.—Bunyan Kennedy, McCool, Mississippi.

### Permanent Stop Sign on Railroad Tracks

Sometimes the blue flag on railroad sidings, rip tracks or yards is forgotten, or is not placed at the proper location. This can be corrected by using a permanent sign, as shown in the drawing. It is made of sheet steel, a hinged joint being provided so that the sign can be dropped on the ground between the tracks when desired. It should be flat enough so that workmen will not trip on it accidentally. As such a sign is in view at all times and therefore is a constant reminder, it will not be forgotten easily.



Collapsible Stop Sign on Railroad Sidings Is Always Ready for Use



The Manipulation of a Heavy Electric Rock Drill May Be Made Easy by Means of a Simply Arranged Counterweight as Indicated or in Some Other Convenient Manner

### Counterweight for Electric Rock Drill

When preparing a site for a power house, considerable rock drilling was necessary. To make the work easier, the heavy electric drills were counterbalanced, as shown in the drawing, with the result that much labor and time were saved. A ladder was set in the position indicated and a length of sash rope, one end of which was tied to the drill and the other end to a pail, was slipped over a few rungs of the ladder. Enough sand was put into the pail to balance the drill. The same method can, of course, be applied equally well to other heavy tools and machines, which must be lifted by the operator while using them.—I. R. Hicks, Centralia, Mo.

### How to Clean White Tile

Tile walls in bathrooms are usually washed with soap and water when they become dirty, but it has been found that, so treated, they soon show a series of tiny cracks which in time become larger. The water causes the trouble, not the soap. To prevent cracking, rub the wall with a soft cloth soaked in turpentine. Kerosene may also be used for this purpose.—L. H. Georger, Buffalo, N. Y.

### Making Brake Bands Round

An important but often neglected part of relining auto brake bands is to true



Cast-Iron Rings Used as Forms on Which Auto Brake Bands Can Be Hammered True

the bands so that they are perfectly round before putting them back on the drums. We had considerable trouble in this respect, so we had a number of cast-iron rings made at a local foundry, to accommodate all the regular sizes of brakes. The rings were chucked in a lathe and those intended for rounding internal expanding bands were bored out, while those intended to be used for the contracting type of band were turned to the same diameter as the drums. The method of using the rings is plainly shown in the photos. The contracting band, after being relined, is placed around a ring of the right size, drawn tight and gone over lightly with a hammer until it is properly shaped. For the expanding type, the relined band is slipped down inside the right-size ring, expanded and then hammered to shape.—Avery E. Granville, LaGrange, Ill.

### Cleaning Nozzle of Blowtorch

The nozzle of a gasoline blowtorch often becomes clogged with dirt. As the opening is too small to permit the insertion of a wire to clean it, and the nozzle is at the back end of the burner opening, it cannot be reached for blowing the dirt out. A good method of cleaning is to remove the needle valve and the pack nut, and pour out enough gasoline to eliminate the pressure. Then get a short piece of copper

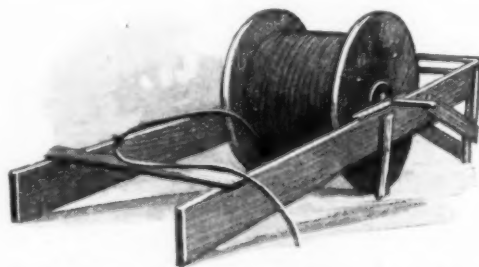
tubing that will enter the burner end and fit squarely against the end of the nozzle. The dirt in the opening can then be removed by compressed air or by blowing through the tube. As the needle has been taken out, the dirt will be forced back through the opening and out of the torch.—E. T. Gunderson, Jr., Humboldt, Iowa.

### Valve-Grinding Kink

When grinding valves, the compound used works away from the grinding surfaces and more has to be supplied, especially if the valve is badly pitted. This is necessary, because the compound will not flow back when the pressure forcing it from between the grinding surfaces is removed. A good mixture to use for this purpose consists of ordinary grease and abrasive compound. First heat the head of the valve with a torch, until you can barely stand to touch it with the hand. When the mixture is applied, it will melt and run together when the valve is lifted. This keeps the abrasive on the grinding surface.

### Cable Stand for Linemen

Cable reels are heavy and hard to raise without special equipment. The task can be made much easier by the use of an



Wooden Frame Serves as an Emergency Cable Stand for the Lineman

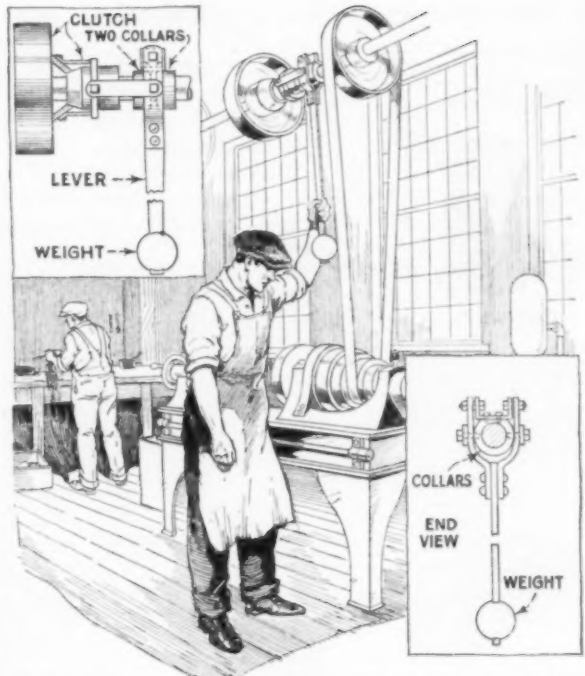
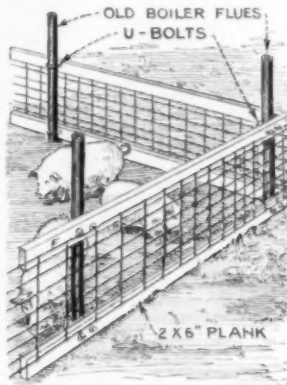
emergency stand as shown in the photo. It consists of a 2 by 12-in. frame, set in the position indicated. After putting a length of heavy pipe through the core, the reel can be rolled high enough on the frame to clear the ground. A block of wood should be nailed on to hold the pipe in place.—Carlton Groat, Portland, Oreg.

### Casting Box for Printers

Printers often receive paper matrices for making stereotypes. Those not possessing a regular casting box have to send the work to some other printer. A practical box can be improvised without any trouble. Take a chase, lay the matrix, face up, in the center, and place four brass rules around the matrix, and lock it up in the usual manner. See that the corners of the rules butt against each other so that the melted metal will not leak through when poured. Melt some lino-type metal and pour it over the matrix to the top of the brass rules. Then let it cool until hard, which can be determined by touching it with a screwdriver. When cool, the stereotype is unlocked and trimmed to the required size. To make the stereo type-high, place a 36-pt. slug against the trimmer knife on the saw and bring the gauge against it, which will give an accurate measurement for height. If no saw trimmer is available, use a piece of coarse emery cloth or sandpaper on a flat block of wood.—Samuel Rubin, Holyoke, Mass.

### Old Boiler Flues Used as Fence Posts

In a western irrigation district old worn boiler flues were used as posts when building several miles of hog fence. The flues were cut to equal lengths and were set about 8 ft. apart. The top and bottom wires were stapled to 2 by 6-in. boards, which were fastened to the flues by means of threaded U-bolts and nuts, as shown.—Ivan E. Houk, Denver, Colo.



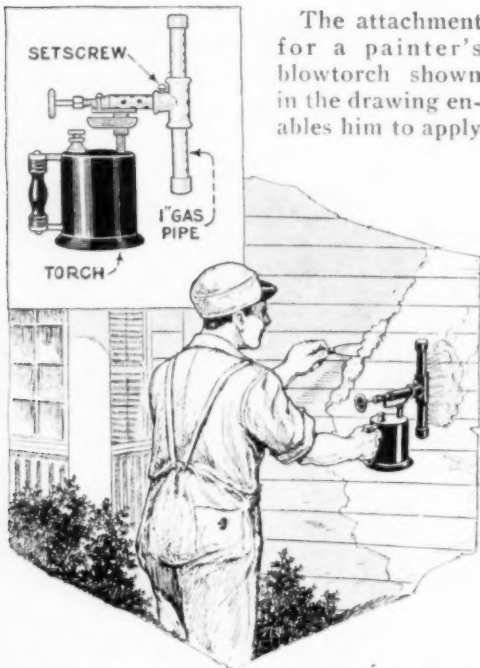
Belt and Pulley Shifters Installed Directly on the Lineshaft without Extra Support

### Belt Shifter Installed on Lineshaft

Some time ago I installed a hundred automatic machines. This was not such a difficult task but each row had to be driven individually with a clutch arrangement. Just how to arrange the shifters was a problem, as there was no ceiling, wall or any solid support near the lineshaft. However, the novel type of shifter illustrated, installed directly on and supported entirely by the lineshaft, was found a satisfactory solution. While the exact dimensions depend, of course, on the size of the shaft, etc., the drawing shows the construction of the shifter. In this case three standard  $1\frac{1}{4}$ -in. collars were used. One was flattened for the handle or pivot bracket and was made a running fit between the two others, which were securely set on the shaft.—F. W. Schrader, Woodstock, Can.

Ⓢ A large spring cotter may be converted into a serviceable pair of tweezers by grinding the open end to a point; before grinding, wrap the cotter with a string, near the eye, to close the open end.

### Paint-Removing Fitting for Blowtorch



The attachment for a painter's blowtorch shown in the drawing enables him to apply

Pipe Attachment on the Painter's Blowtorch Applies the Flame Uniformly

the flame more uniformly over the painted surface, previous to scraping, and this feature is of special advantage on windy days. It is made of 1-in. pipe and fittings, drilled with  $\frac{1}{4}$ -in. holes, to permit the escape of the flame, and provided with a set-screw so that it can be securely attached to the nozzle of the torch.—G. E. Hendrickson, Argyle, Wis.

### A Simple Magnetic Chuck

A machinist friend of mine recently had occasion to put into shape some of the plates of a meat grinder. General machine shops are often called upon to re-surface these, so that the little device used by him for holding them on a lathe face-plate will be of interest. It consists of an old U-shaped magnet, the kind that is used in magnetos, and is fitted with a block of soft wood between its sides, the wood being fastened with a couple of screws. Through the center of the block a hole is drilled, large enough to take the tip of the plate. A small screw was driven into the block to engage the plate

and afford a positive drive, and the device was ready for use. In order to prevent the magnet from losing its strength, an iron bar is kept across the two ends.—E. P. Shockey, Bowling Green, Ohio.

### Keep Your Watch Clean

Some years ago, I met a man who said that he could wear his watch several years without having it cleaned. He turned his watch pocket inside out, and showed his trick. He had provided a buttonhole in the bottom of the pocket, which allowed the dirt to sift through, and the watch was always in a clean pocket. Many workmen cannot help getting dirt and sand in their pockets, and if they let it remain there, the watch will get dirty and cease running very soon.—A. L. Neuenchwander, Miami, Fla.

### Focusing Cloth for Windy Days

Photographers who engage in outdoor photography are frequently inconvenienced by the difficulty of keeping the focusing cloth in place, especially on a windy day. The cloth is also likely to be blown away when left on the camera. To avoid such annoyances, one photographer sewed a length of small chain to the hem of the cloth. This weighted the cloth sufficiently to hold it in place.



Small Chain Sewed to the Edge of a Focusing Cloth Makes It Easier to Handle



## Gluings Ivories on Piano Keys

By F. R. RODGERS

**A**LTHOUGH usually a troublesome job, re-gluing of the ivory tops on piano keys, when they have come off for some reason or other, can be done effectively by the following method: First, the front of the keyboard should be removed.

It may be necessary also to take out the screws holding the pivots, which should be done so the complete keys can be lifted from the action. When several of the ivories have come off, or are loosened, care should be taken to keep the right ivory for its particular key, for in some cases they will not interchange. Scrape all the old glue from both key and ivory with a knife.

When one simply tries to lay a block on top of the ivory and clamp with a thumbscrew in order to glue the ivory in place, it will almost invariably slip, causing part of the ivory to extend outside of the key while exposing the raw wood on the other side. To avoid this, make special blocks as follows: Rip a piece of board and plane square to the exact width of the key; the thickness is immaterial. Saw off blocks just as long as the wide part of the key, since it is usually the wide part that comes off. Cut off some pieces of thin wood as long as the blocks, and fasten, with brads or small-head nails, one on each side of the block. These side-pieces will form a groove into which the key will fit. The same result can be obtained by plowing a groove the width of the key in a suitable length of wood and then cutting it into pieces as long as the keys, although the first method is easier and just as good.

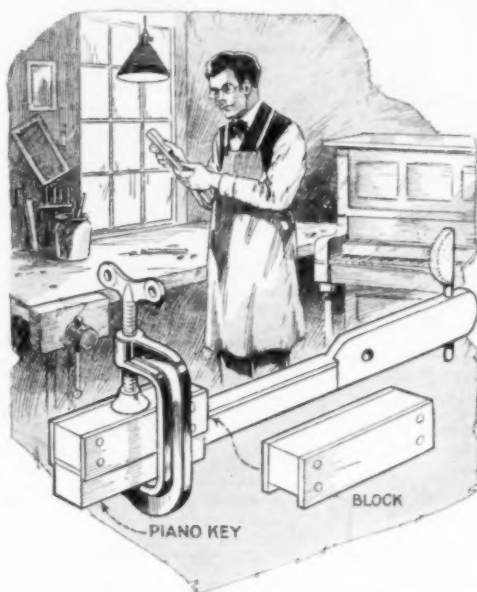
Use hot glue and warm the blocks,

which will prevent the glue from chilling and setting too quickly. Spread an even coat of glue on the key, lay the ivory on it and cover with a strip of thin paper, allowing the paper to come over the sides of the key; then push the block down over the

sides of the key and clamp, with just enough pressure to hold firmly. The ivory cannot slip sideways, and it is an easy matter to hold it forward, as the pressure is applied with the clamp. The paper keeps the glue that will be squeezed out of the joint from sticking the block fast. When dry, most of the paper can be torn off, and the remainder will yield to a little sponging with warm water. Scrape off what little glue is left on the edges of the key and re-

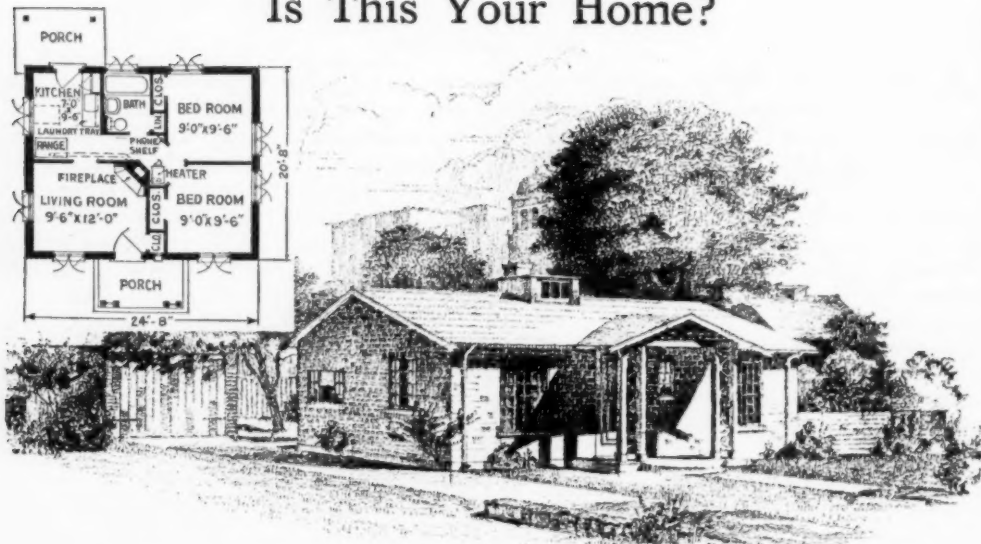
place it in the piano. The result will prove very satisfactory.

A word as to the glue may not be amiss. No doubt any glue will do, but the old-fashioned hot glue is best and the white kind is better than the dark, since with the white glue there is no danger of discoloring the ivory. Cook it in a regular double gluepot and do not have it too thick, as all the surplus glue must be squeezed from the joint. The glue should flow freely when hot, with about the same body as varnish. The white glue usually will not set as quickly as the general run of dark glue, although having the clamping blocks good and hot will prevent the glue from setting before the ivory can be properly fastened in them. If hot glue seems too troublesome to use, or no gluepot is available, select any good prepared glue that is rather light in color, and warm it by placing in a pan of hot water.



A Simple Jig for Re-Gluing Piano Ivories That Will Insure a Good Job

## Is This Your Home?



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Plan No. 4A39

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**E**SSENTIALLY this is a four-room house with an entrance porch, and, if desired, a porch off the garden. There is no basement nor attic. In other words, all you see here is useful house. But the parts have been proportioned so that the appearance is fine. Anyone seeing this house set among trees and in a garden, even of the most simple sort, will be struck with its pleasantness and the good taste and trimness of its lines.

As to the plan, there is a living room with a big fireplace, with a metal hood that acts as a reflector to throw the heat from the fire back into the room.

Then there are two bedrooms. They are of medium size, but large enough to take the furniture. The kitchen is modern and fully equipped. The sink and the laundry tray form one unit. A cover goes over the tray when not in use, forming to all practical purposes, a standard drainboard. One fixture is made to serve the purposes of two. The house heater goes behind the chimney stack under an arch of masonry.

Each bedroom has a corner location with two windows and cross ventilation, so they possess all that any bedroom can really afford.

As to the construction, there is no ceiling to this house. The roof does double duty, just as other parts of the building do. Up at the top there is a dormer. In summertime this house will be cool. The dormer will let out the heated air. Closed in winter with the heavy insulation of the roof, all the heat will be trapped in. This method of using the roof for a ceiling not only effects a saving in the cost of construction but adds appreciably to interesting appearances. Besides, it gives the rooms themselves more cubic content. They are more airy, less stuffy.

The floor is of concrete laid over the ground and finished with linoleum. In order that the ground may be well drained and no dampness come through the floor, there is a course ten inches thick of loose rock with gravel above, and the concrete is laid over the gravel.