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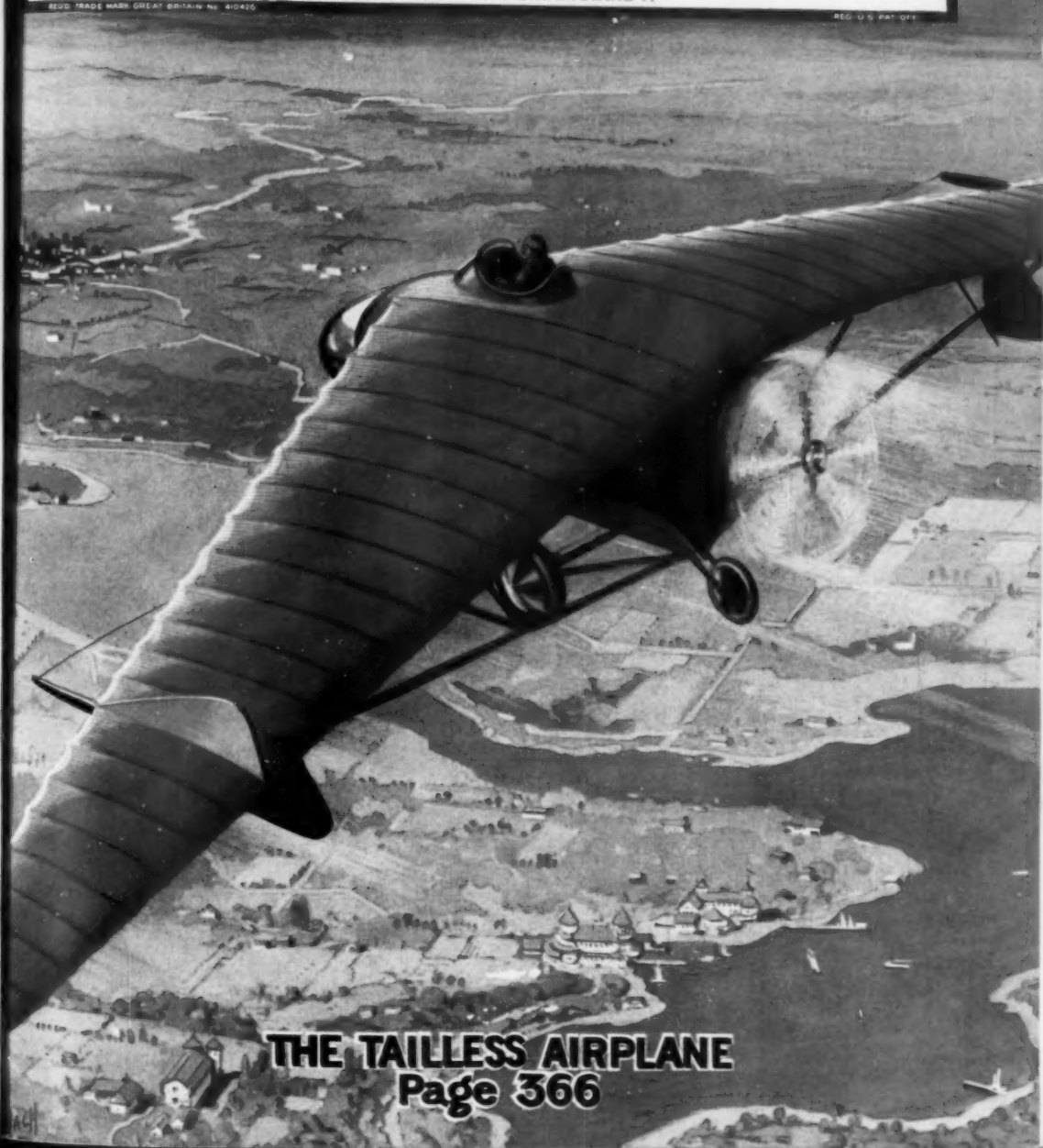
SEPTEMBER Getting Radio Distance—Page 483 25 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. TRADE MARK GREAT BRITAIN NO. 610425

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THE TAILLESS AIRPLANE
Page 366

**USE
ATKINS
SILVER STEEL
SAWS
AND BE HAPPY**

After You Try This Saw—

It will be your favorite always. ATKINS "No. 400" is the aristocrat of the ATKINS line—the finest saw that bears this world-famous name on the blade.

Only ATKINS Saws are made of "Silver Steel" to hold their edge through added years of satisfactory sawing service. "Taper Grinding" makes ATKINS Saws cut faster and easier.

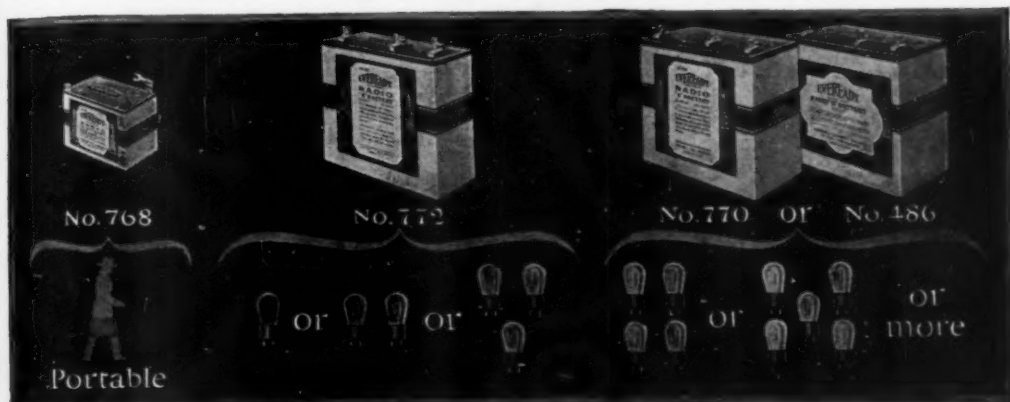
There's an ATKINS Saw to save you time, labor, material and money no matter what material you saw. Ask for our **FREE** folder—"Atkins Saws in the home."

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ATKINS SILVER STEEL SAWS

Perhaps you, too, can cut your
"B" battery costs in half

Just follow the chart. It gives you
the secret of "B" battery economy



THOUSANDS of people have made the discovery that Eveready "B" Batteries, when used in the proper size, and on sets equipped with a "C" battery*, are a most economical, reliable and satisfactory source of radio current.

Here is the secret of "B" battery economy, reliability and satisfaction:

On all but single tube sets—Connect a "C" battery. The length of service given below is based on its use.*

On 1 to 3 tubes—Use Eveready No. 772. Listening in on the average of 2 hours daily, it will last a year or more.

On 4 or more tubes—Use the Heavy-Duty "B" Batteries, either No. 770 or the even longer-lived Eveready Layerbilt No. 486. Used on the average of 2 hours daily, these will last 8 months or longer.

These figures are based on the average use of receivers, which a country-wide survey has shown to be two hours daily throughout the year. If you listen longer, of course, your batteries will have a somewhat shorter life, and if you listen less, they will last longer.

Evereadys give you their remarkable service to the

full only when they are correctly matched in capacity to the demands made upon them by your receiver. It is wasteful to buy batteries that are too small. Follow the chart.

In addition to the batteries illustrated, which fit practically all the receivers in use, we also make a number of other types for special purposes. There is an Eveready Radio Battery for every radio use. To learn more about the entire Eveready line, write for the booklet, "Choosing and Using the Right Radio Batteries," which we will be glad to send you on request. There is an Eveready dealer nearby.

Manufactured and guaranteed by

NATIONAL CARBON COMPANY, INC.
New York San Francisco
Canadian National Carbon Co., Limited, Toronto, Ontario

*NOTE: A "C" battery greatly increases the life of your "B" batteries and gives a quality of reception unobtainable without it. Radio sets may easily be changed by any competent radio service man to permit the use of a "C" battery.

EVEREADY
Radio Batteries
-they last longer

Tuesday night means Eveready Hour—8 P. M., Eastern Standard Time, through the following stations:

WEAF—New York WEAI—Cincinnati
WJAR—Providence WTAM—Cleveland
WEEI—Boston WWJ—Detroit
WTAG—Worcester WGN—Chicago
WFI—Philadelphia WOO—Davenport
WGR—Buffalo WCCO—Minneapolis
WCAE—Pittsburgh WCCO—St. Paul
KSD—St. Louis



"Old Ironsides" in Action, a Replica of the Famous Frigate "Constitution," Built by a Movie Company for Use in a Film Story Involving the Historic Ship—See Page 398

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 46

SEPTEMBER, 1926

No. 3

What is Secret of Mystic Wonders of the Orient?



THE age-old mystery of how members of some of the sects in India are able to thrust knives and pins through their bodies without bleeding, lie at ease on a bed of spikes, permit themselves to be buried alive for hours, and perform other seemingly impossible feats has been brought to America by Rahman Bey, a fakir whose exhibitions have astonished Paris and London scientists, for possible solution.

There is no relation between the English word "faker" and the Indian "fakir"—the latter is simply a member of a cult that has taken a vow of poverty, and may, or may not, be a worker of wonders. Their feats are performed simply as religious rites, and with no particular idea of mystifying the public.

In a private exhibition given before twenty-seven doctors in London, before sailing for the United States, Rahman Bey thrust long pins through his cheeks, and permitted the physicians to insert others wherever they chose. He announced that none of the wounds would bleed, but at the request of one doctor, one wound did bleed and the others did not. When the pins were removed they left no marks.

Rahman Bey's explanation is simple—

by sheer will power, he claims, it is possible to do any of the things he does. One of his feats is to lie down on a bed of sharp spikes, while an assistant places a huge boulder on his chest and then breaks it with a mighty blow of a sledge hammer. Breaking the boulder on a man's chest is not new to Occidental "magicians"—the bigger it is the less the blow will be felt—but performing the stunt while reclining on spikes is something else again. When Rahman Bey got up the spike marks were plainly visible, but in a short time they disappeared.

Tested by the doctors, he demonstrated an ability to vary his pulse at will, one wrist recording increasing heart beats while the other wrist indicated the heart was slowing up. Following that, he applied pressure to nerves in his neck, collapsed, rigid and apparently dead, into the arms of an attendant, and let the doctors search in vain for any sign of life. After that he revived, his pulse started, breathing was noticeable once more, and the fakir got up fully conscious again.

An even weirder stunt was to lie down in a coffinlike box and permit himself to be covered with sand, after telling the audience to have him dug up whenever



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Hadj Ali from Egypt Spurts Kerosene and Then Water on a Torch; a Two-Compartment Stomach Probably Solves the Trick

they got ready. The doctors stood the suspense for five minutes, and then dug up the fakir and he immediately restored himself to life.

Science has never found a reasonable explanation for many of the things done by Oriental magic workers. They seem to defy the accepted belief that certain natural laws must operate and cannot be suspended, and for explanation assert that for thousands of years their forebears have been cultivating self-control until they mastered it to the point that they are able to suspend life itself for an interval and then resume it at will.

The number of fakirs who have demonstrated their ability to do such things is comparatively limited. The majority confine themselves to unusual forms of physical punishment as a species of religious devotion. The late Charles Bertram, an English conjurer and magician who made a trip around the world a quarter of a cen-

tury ago, devoted considerable time to studying the feats of the fakirs and magicians of the Orient. Like Kellar, the famous American magician, he expressed nothing but contempt for the performances of the average Indian magician, classing him as clumsy and his tricks as childish, but when he came to fakirs he had no explanation to offer.

One he visited had been holding one arm up over his head, he claimed, for six years, and explained that at the end of another six he would take it down and raise the other arm. The arm was atrophied and bore evidence that his claim probably was true. Another fakir spent his days sitting on a bed of sharp spikes, while a third had not sat down, it was claimed, for thirty years. Two others had held both hands over

their heads for several years, until the long finger nails curved down and grew back through the flesh of the palms. Their apparent ability to stand acute physical discomfort tends to bear out their claim that, through the teachings of their sect, they have made the will superior to the body. The ability, however, to stick needles through the flesh and lie on beds of spikes without suffering wounds is of another order, and it is in that American scientists will be interested. Whether trickery and illusion enter into their apparent feats has been a question for years.

Many of the stunts performed in the Orient can be duplicated by any first-class Occidental magician. Walking over beds of fire without being burned, one of the stock tricks in some sections of the South Seas, has been duplicated, while such feats as eating fire or molten metal are so well known that they have even been dropped from the circus side show.



Rahman Bey in a Trance, Demonstrating His "Dying" Powers; He Allows Himself to Be Covered Completely with Sand and Remains Apparently Dead for Several Minutes; When Dug Up, He Revives Himself Quickly



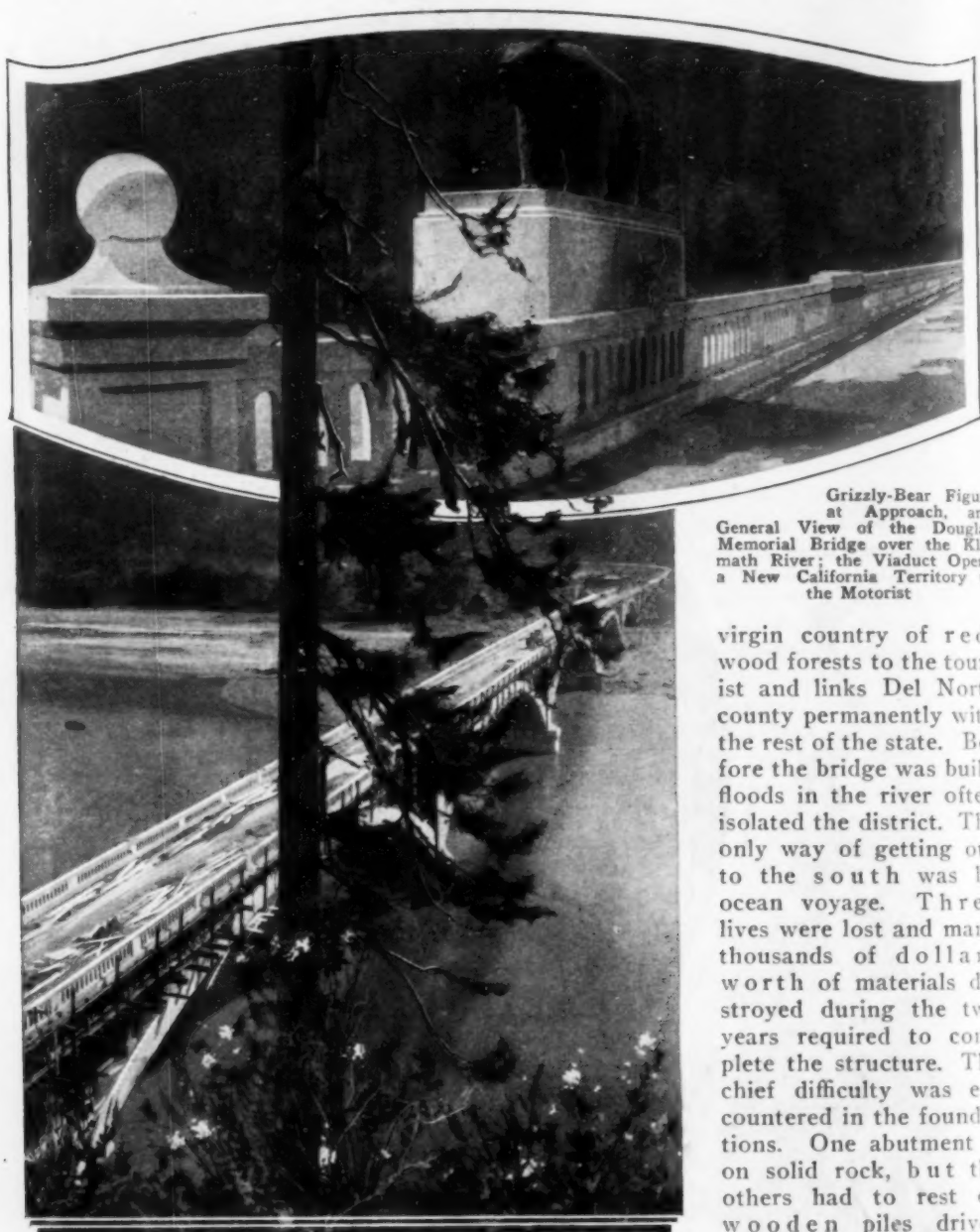
Rahman Bey Asserts That He Can Control His Circulation by Will Power; to Prove It, He Sticks Pins through His Cheeks without Drawing Blood; Right, Indian Dancing on Glass without Cutting Himself



Trick by Which Many East Indian Beggars Make Their Living; Acrobat Climbs Pole Covered with Swords and Balances, Head Downward, on Top



FLOOD-SWEPT RIVER BRIDGED TO LINK TWO STATES



Grizzly-Bear Figure at Approach, and General View of the Douglas Memorial Bridge over the Klamath River; the Viaduct Opens a New California Territory to the Motorist

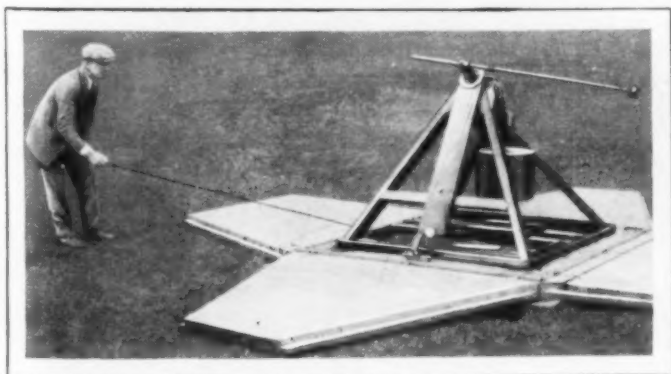
Man again has conquered nature and a triumph engineers consider notable has been recorded in the completion of the Douglas memorial concrete bridge over the Klamath river in northern California. It closes one of the few remaining gaps on the new highway to Oregon, opens a

virgin country of red-wood forests to the tourist and links Del Norte county permanently with the rest of the state. Before the bridge was built, floods in the river often isolated the district. The only way of getting out to the south was by ocean voyage. Three lives were lost and many thousands of dollars worth of materials destroyed during the two years required to complete the structure. The chief difficulty was encountered in the foundations. One abutment is on solid rock, but the others had to rest on wooden piles driven through a sand-and-gravel formation. The bridge is 1,147 feet long, each span being 210 feet, and the roadway is twenty-one feet wide and fifty-one feet above the water. A decorative feature is conspicuous on the pylons of the approaches—huge figures of grizzly bears, typical of the wild and rugged coun-

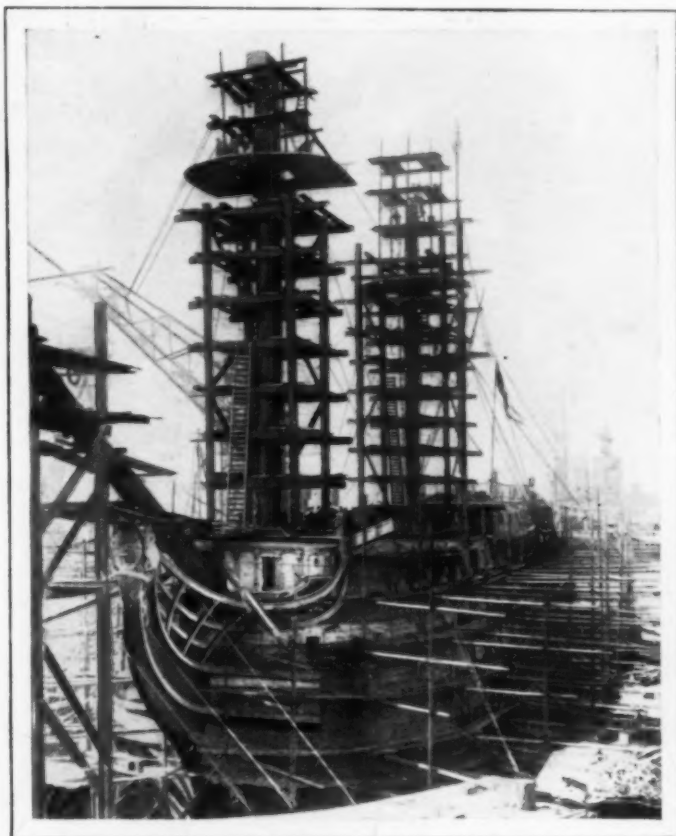
try in which the bridge is located. The nearest railroad station was seventy-five miles, and the closest water point, thirty miles away.

WEIGHTED DRIVER TESTS GOLF BALLS

A club swings, there is a loud crack the golfer describes as "sweet," and the ball, flattened momentarily to about forty per cent of its normal diameter, starts a graceful flight that will not stop for 250 yards or so. Every stroke is equally perfect; there is no slicing. This is not the performance of an expert player, but of a tester which shows if the balls are sufficiently tough, resilient, well-balanced and otherwise suited to the exacting demands of the game. The apparatus consists of a collection of weights attached to a special wooden club which swings in a perfect circle when the weights are released by a trigger and squarely strikes the ball, resting on an adjustable tee. The force of the blow and the distance of the drive can be regulated by changing the weights and the position of the tee.



"Firing" the Golf Ball Tester; When Cord Is Pulled, Weighted Club Swings Round, Striking the Sphere a Lusty Blow



Lord Nelson's Flagship "Victory" during Rebuilding at the Portsmouth Dockyards in England; the Veteran Is More Than 160 Years Old

NELSON'S "VICTORY" IN SPLINTS FOR REBUILDING

More than 160 years old, Lord Nelson's famous flagship, the "Victory," is being rebuilt at the Portsmouth dockyards in England. The vessel is 186 feet long, has a beam of fifty-two feet, and when launched, weighed 2,162 tons and carried 100 guns. It has been used many years as a training ship. Its long life is in notable contrast to the comparatively short term of usefulness of modern vessels, although they are constructed of steel and cost many times as much as the "Victory," which was forty years old when in the battle of Trafalgar.

SHIPS THAT LAND TO LOAD BUILT FOR GYPSUM TRADE

Three vessels under construction in England for an American gypsum manufacturer are unique in that they are being constructed for a service in which the boats load on dry land and then take to the water with full cargoes. The trio will perform this unusual feat at the gypsum-quarry docks in the Bay of Fundy, where one of the

highest tides in all the world flows in each day, and flows out again to leave the steamers stranded on dry land. Tides of more than forty feet are not unusual at the upper end of the bay. To get their loads of gypsum, the ships in the rock-carrying service race up the bay on the peak of the tide, reach the dock and make fast. The water flows out again, to return in approximately thirteen hours. During that period the boats must load, ready to leave on

the next high tide. From charts and past calculations, the captains figure the probable height of the coming tide and the load the ships can safely carry. The peak of the tide lasts only a few moments.



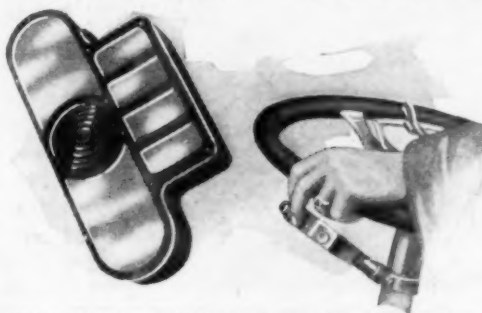
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Just a Detail for the Films, but Ten Men Are Said to Have Spent Three Weeks Carving This Russian Throne Replica

THRONE OF IMPERIAL RUSSIA REPRODUCED FOR FILM

Ten wood carvers are reported to have worked three weeks in reproducing the throne of the deposed Romanoffs of Russia for a motion-picture play. Details of design and ornamentation were faithfully represented, although the piece was to be used but a short time during the action. Producers have found that such elaborate attention to what appear to be minor matters is often worth while and, when errors or omissions in such settings occur, critical audiences are quick to find them.

FRONT AND REAR AUTO SIGNALS RUN FROM STEERING POST



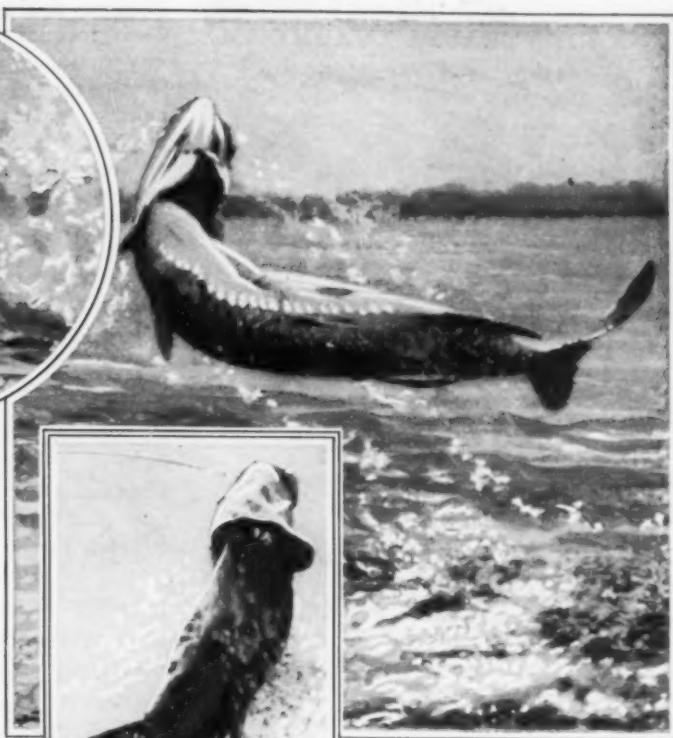
Light Signal and Switches Attached to the Steering Wheel within Easy Reach

Stop signals and those for right or left turn, which are lighted both at the front and the rear of the auto simultaneously, are controlled from switches on the steering-wheel post. The letters are visible at a considerable distance.

LEAPING FISH FIGHTING FOR THEIR LIVES IN SOUTH



Tarpon Battling Like Wild Beasts to Break the Lines; Open Mouths and Distended Gills Indicate Their Anger; the One at the Right Weighed 180 Pounds



Two-Hour Struggles with These Mighty Jumpers Are Not Uncommon on Florida Fishing Grounds. Their Terrific Strength Is Shown Most Impressively in the Height of Their Furious Leaps for Freedom. Center Shows a Giant Tarpon, One of the First Hooked This Spring near Fort Lauderdale and Landed after a Battle That Taxed the Angler's Skill to the Utmost



A 176-Pound Tarpon at Left, Snapped While Fifteen Feet above the Water, and, at Right, a Rare Photograph of Leaping Sailfish, Greyhound of the Sea; They Can Jump across Forty Feet of Water at Almost Unbelievable Speed



Shattering the Waters in Their Frantic spurts to free themselves from the hook, Giant Tarpon and a Sailfish. Photographed off Florida, where the skillful angler, seeking the silver monsters of the sea, may enjoy many of the thrills of big-game hunting

SOFT LEATHER CASE AS PILLOW ADDS TRAVEL LUXURY



Courtesy R. H. Macy & Co.

As a Pillow in a Steamer Chair, the Case Proves Serviceable and Practical on Voyage

With a roomy center pocket for books, purse or other articles, a soft leather pillow is carried like a traveling case. It is a source of comfort on long motor or train trips and in steamer chairs. The inner compartment is closed by means of a sliding tab between interlocking sides.

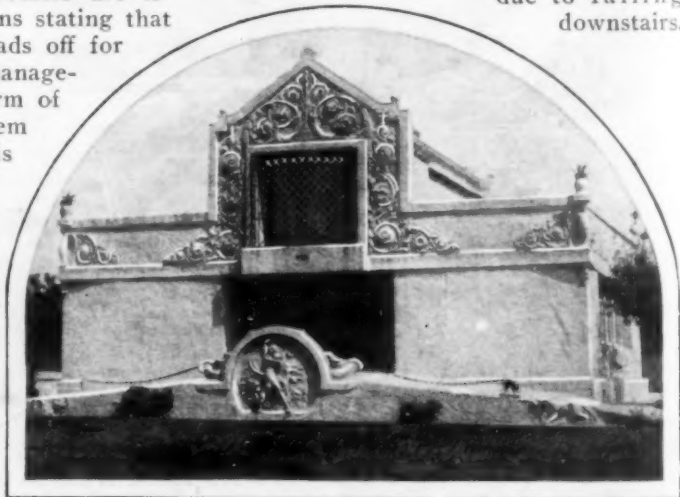
RISK OF TOO MUCH LAUGHTER COVERED BY INSURANCE

Some motion-picture theaters are issuing cards to their patrons stating that they may "laugh their heads off for they are insured." The management has purchased a form of policy which reimburses them in case medical attention is needed for anyone suffering from hysteria as a result of laughing at the film. This is only one of the many queer "risks" now covered by insurance. A father of twin daughters, fearing that they might be kidnaped, obtained a burglary and theft policy on them which remained in effect for several years and was canceled when the twins grew up. In-

surance against the arrival of twins has been frequent, to indemnify parents for any financial setback. A driver of Eskimo dogs secured a policy to protect him against claims that might be set up by persons bitten. Marine companies insure all sorts of articles ranging from wooden cigar-store Indians, race horses and gold to flour and dead bodies. A gambler insured his gold and diamond dental work against holdup and theft and inventors obtained a policy on an ingenious model of the Holy City to reimburse them in case their valued possession was damaged by fire, shipping, or was stolen. A young woman journeying to this country from Europe to officiate as a judge at a conference of perfume manufacturers, had her nose insured against any accidental damage that might be suffered before the contest, impairing her efficiency.

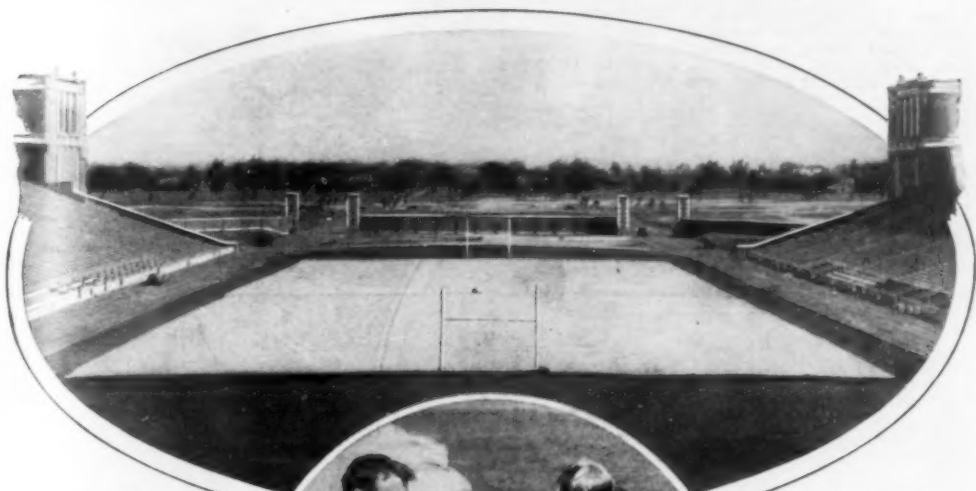
RAMPS INSTEAD OF STAIRWAYS ADD SAFETY TO HOUSE

Steps and stairs have been omitted in a California home for additional safety and convenience, substitutes being provided in the form of ramps and inclines at easy angles. Two sloping approaches lead from either side of the entrance instead of the conventional steps. The plan is considered a wise one where practical, as accident reports show that many of the most serious injuries that occur in homes are due to falling downstairs.



Unusual California Home Where Inclines Are Substituted for Stairways; Sloping Approaches to the Entrance Are Conspicuous

RAINCOAT FOR STADIUM KEEPS GRIDIRON DRY



To keep the football field at the university of Illinois in good condition for games, a huge covering of rubber fabric protects the entire gridiron from rains. It consists of four sections, each 158 by 83 feet, and cost \$10,000. No supports are needed for the shield, as the area is graded in such a way that it slopes from the center, allowing the water to drain off to the sides.



Raincoat Laid over Entire Gridiron, and Coach Zuppke Examining a Corner of the Fabric

which became moist in transit. Carrying a shipment of carbide, the steamer "Mas-cot" caught fire on her way across the North sea. Although the decks became red-hot, the crew managed to jettison the whole of the perilous cargo and made port safely. Fruit of various kinds

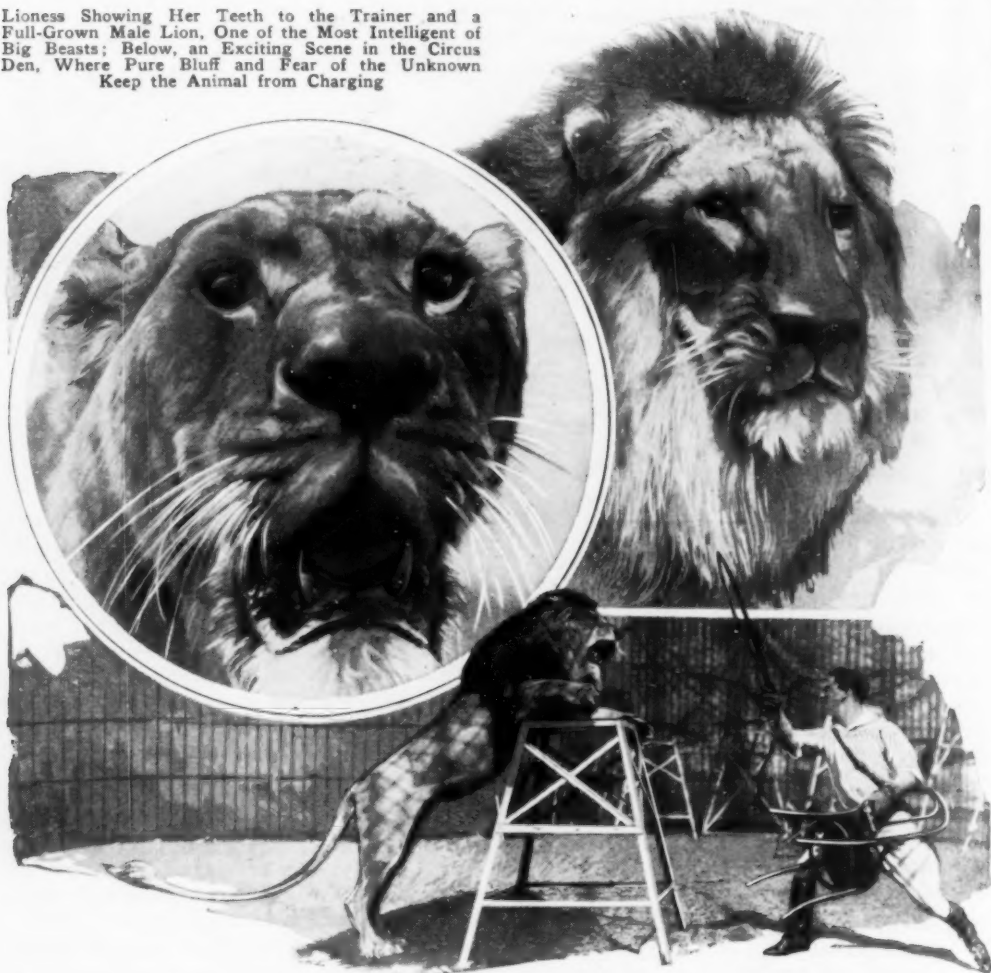
CARGOES THAT KILL DREADED BY SHIPS' CREWS

Cargoes of soft coal are dreaded by seamen for they are liable to spontaneous combustion and the fire is difficult to extinguish. Chemicals of various sorts are even more unwelcome, as they give off unpleasant odors and are dangerous. The steamer "Hardy" was blown to pieces when a cargo of metallic sodium took fire on contact with water. A number of sailors were injured. The crew of the coasting vessel "Sarah Jane" were suffocated by fumes from a load of shell lime

causes trouble. Bananas, for instance, turn black if they become chilled. To prevent this, the bunches are often wrapped in paper, then covered with straw and placed in stout canvas bags. In unloading, they are carried down hooded gangways into closed vans which are sometimes steam-heated. The smell of green coffee is not unpleasant at first, but on long voyages becomes obnoxious, often destroying the appetite, and sugar is unpleasant when it steams. It also attracts beetles and cockroaches which grow to great size and multiply rapidly, developing a sickening smell that taints all food. The odor of turpentine from yellow-pine lumber gets into the drinking water and causes serious sickness.

HOW SHEER BLUFF KEEPS LION TAMERS ALIVE

Lioness Showing Her Teeth to the Trainer and a Full-Grown Male Lion, One of the Most Intelligent of Big Beasts; Below, an Exciting Scene in the Circus Den, Where Pure Bluff and Fear of the Unknown Keep the Animal from Charging



The revolver that roars as the lion tamer drives his charges through their tricks; the whip and the steel-tipped prod are bluff. The revolver is loaded with blanks, the whip is aimed at, but just misses, the lion's nose, and the prod merely waves before his eyes, but doesn't touch him. If it did, there would be another lion tamer missing at next roll call in the circus. The tricks of the trade, according to Christian Schroeder, a circus tamer who learned his business at the world's biggest animal farm in Germany, all center around one thing—bluff. "Keep 'em guessing" is the tamer's motto, and it holds good whether you are handling lions, jungle tigers or the slim and vicious panthers.

"You see," Schroeder says, telling how to do the job safely, "I bluff 'em. If they knew it, they could chew me up in the cage. I couldn't do a thing to stop them. These," handing over the whip, the "fork" and the revolver, "are absolutely harmless, but the lions don't know that. So I win. May be you thought I hit 'em with the whip. I didn't. May be I just touched them real easy once or twice. But I never hit. If I had, they'd been on me. I just cracked it—two or three feet away from the lions. That bluffed 'em.

"They were kind of bad today," the trainer admitted. "That was why I carried the steel fork in the cage instead of my usual wooden stick." The fork is a

long, light rod, tipped with two sharp steel prongs.

"Do you ever jab a lion with it," he was asked. Schroeder laughed.

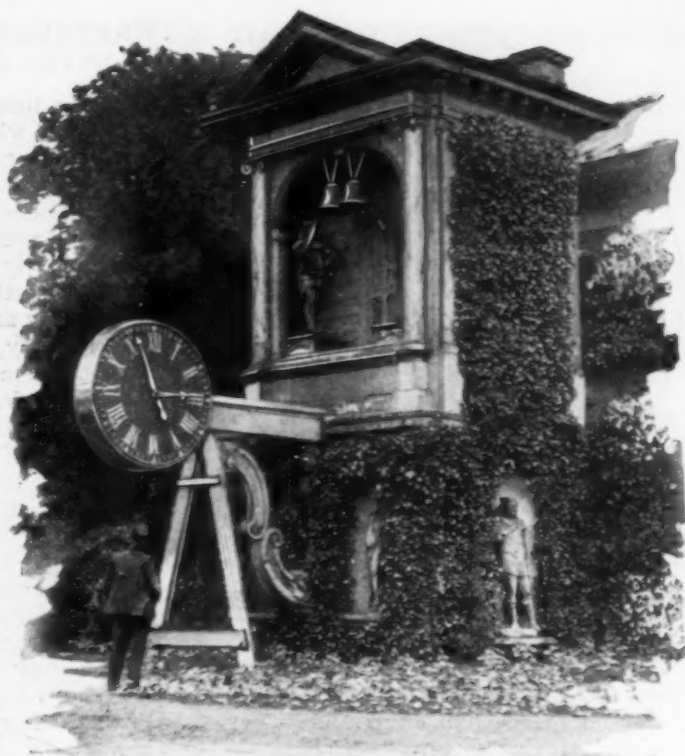
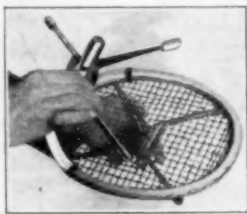
"They'd be at me then, and nothing could stop them. No sir, I just chuck it at 'em. Bluff 'em. They don't know what it is, so they're afraid of it. But jab one of them once with the fork and his fear of it would be gone. Of course, if a lion jumped me, I would use the fork to try and save my life, but holding back a mad lion wouldn't be an easy job, and if one jumps you, the others probably would join in."

He displayed the revolver again. It had been used as a last resort to make the lions mind. Breaking it open, Schroeder withdrew the unfired shells. All were blanks. There hadn't been a bullet in the gun.

"Training a lion isn't a lot different from raising a baby. If you threaten either one too often, they begin to discount your threats. The only way is to save the threats as a last resort and, when you do use them, make them mean something."

TENNIS RACKET KEPT STRAIGHT WITH METAL CLAMPS

Quickly adjusted to the tennis racket to prevent warping, a pair of metal clamps are easy to put on and may be screwed up to different pressures. They are shaped so as not to damage the wood, weigh but little and take so small space that the racket can be carried in its usual case.



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Odd Clock and Bells from St. Dunstan's Church in Garden at Home for Blind British Soldiers, Victims of World War

ST. DUNSTAN'S ANCIENT BELLS TELL TIME FOR BLIND

The original clock and bells of St. Dunstan's church in Fleet street, London, were removed to a private estate when the structure was torn down, and are now in service at a home for blind soldiers of the World war. The projecting dial is a feature of the clock and at the foot of the belfry are some statues that stood in the ancient churchyard.

DRINKING GLASSES MADE OF ICE TO PREVENT DISEASE

Sanitary drinking cups and glasses of ice are formed in a freezing apparatus devised by a Dutch engineer. They are said to last thirty minutes in a warm room and have an outer cover and an inner core for strength and easy handling. Besides keeping the liquid cool, they eliminate the danger of communicating disease, as frequently occurs with a common cup.



Sighting the Camera for Shot from Lofty Position; the Instrument Has Many Features of the Larger Outfits

MOVIE CAMERA FOR AMATEURS USES FULL-SIZE FILM

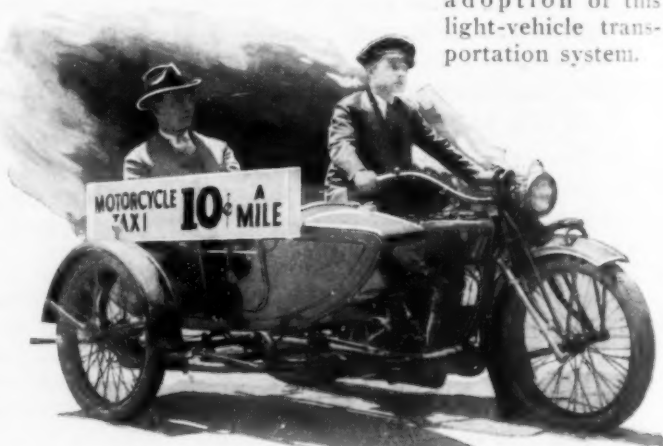
A light portable movie camera for amateurs, recently placed on the market, uses the standard-size film on which all professional moving pictures are made, yet, despite the added weight of its motor drive, is light enough to be operated in the hands, without a tripod. The case is made of steel with a crackled lacquer finish and all gears are machine-cut, with shafts of tool steel, operating in bronze bearings. The lens has a focusing range of from two feet to infinity, and the usual professional iris diaphragm is used. Two view finders enable the camera to be operated from the eye level, or swung at the hip, while a third one allows accurate focusing for titles, close-ups, trick photography and telescopic work. The camera takes 100-foot spools, and the spring motor is large enough to take fifty-five feet at one winding. The motor control can be locked so that the operator can walk around and into his own pictures, while a hand crank is provided for high-speed or slow-motion work.

CHART PLATES BY PANTOGRAPH SAVES ENGINEERS' TIME

To save time in preparing the copper plates from which navigation charts are made, two engineers of the navy department, after three years of experimenting, have devised what is said to be an entirely successful pantograph apparatus. The plates formerly were engraved by hand, a long and costly process. By the new method, they are produced from an original simply by tracing the lines as they appear under a glass, each movement of the tracer being duplicated to the scale desired and with varying depth of lines in the copper. This is accomplished by a diamond point arranged to scratch the metal as the tracer is moved. An additional feature of the system is that figures and other symbols can be quickly drawn on the copper in a uniform style, insuring a neat appearance and clearer legibility in the finished work. Inaccuracies in original drawings can also be properly corrected by making suitable adjustments with the pantograph.

USE MOTORCYCLE AS TAXICAB FOR FAST SERVICE

Sidecar motorcycle taxicabs, popular for some time abroad, have appeared in New York city. A charge of but ten cents a mile and rapid service are inducements to patrons, while reduction of congestion is another point claimed in favor of the adoption of this light-vehicle transportation system.



For Fast Service at Modest Rates, the Motorcycle Taxi; New York Enthusiasts Claim It Will Relieve Congestion

DIVERS RISK THEIR LIVES IN RAISING SUBMARINE



flated, a hazardous task that called for leaping on the tossing floats and opening vents, while divers prepared for the task of rigging air lines and lashings anew. The 240-foot wreck had upended, as navy experts had predicted. But contrary to their plans, the

Why the "S-51" Slipped Back after the First Raising; Pontoons Lashed to the Stern Broke Loose and Leaped to the Surface; Photo Shows One Coming Up

Working among tangled, wave-tossed lines and grinding pontoons that threatened any moment to crush men and boats, divers and engineers fought a thrilling battle during the raising of the submarine "S-51." It was finally lifted and towed back to land, July 5, after an unsuccessful attempt a few days before. The gray, sand-scarred nose of the wreck, borne on the shoulders of four pontoons, suddenly broke the surface of the ocean June 22, the first time it had seen daylight since the sinking, Sept. 25, 1925, when thirty-three men lost their lives. Victory seemed assured. But a chain holding the pontoons at the stern gave way, releasing the floats. That accident cut off 120 tons of lifting power, and air that was being pumped into the stern of the submarine escaped through the check valves. Recognizing failure for the time being, engineers let the submarine settle back to the bottom again and the pontoons were de-

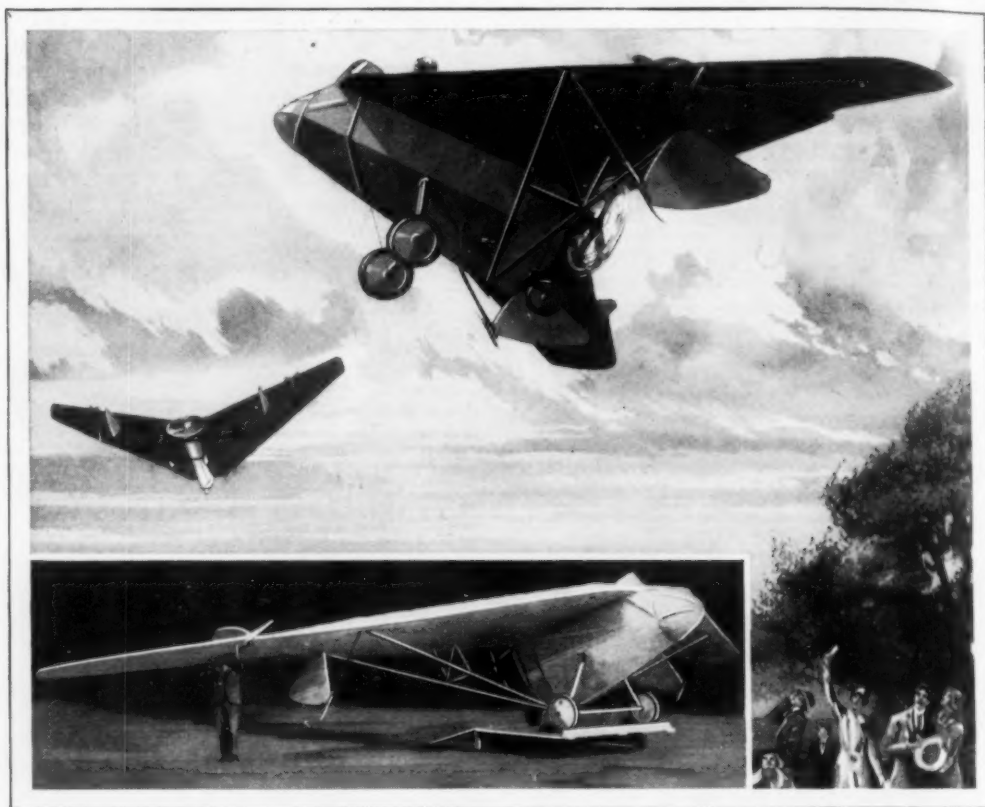
bow, where the "City of Rome" had struck, came up first, and before the workers were quite ready. Several weeks were spent in the salvaging operations.

VAPORIZER IN LIGHT SOCKET RUNS WITHOUT MOTOR

Operated from an electric-light socket, a motorless humidifier flashes on and off to keep cigars moist or it may be used as a vaporizer or deodorizer for rooms. It is constructed like a lamp and has a chamber for the liquid which is absorbed by a wick around the bulb. When the current is on, the heat of the lamp causes the vapor to form, no other attention than occasional renewal of the water supply being needed.



TAILLESS AIRPLANE IS HAILED AS FOOL-PROOF



In Flight and on the Ground; the Hill Plane Has No Tail and the Usual Rudder Controls Are in the Wing Tips, While the Engine Turns a Propeller Pushing from Behind

Designed to eliminate accidents due to errors of judgment on the part of the pilot, a new type of tailless airplane, built by Capt. G. T. R. Hill, of England, is declared to make flying virtually fool-proof. Instead of the usual long fuselage, tipped with rudder and elevators, Capt. Hill's machine has a curiously shortened body, ending in a pusher propeller. The engine is near the rear of the body and the pilot sits in front of it, giving him a clear view ahead. The wing—the ship is a monoplane—sweeps back at a sharp angle, much like those of a bird in flight. On either side, at a distance from the body equal to the length of the fuselage of an ordinary ship of similar wing spread, rudders are fixed. The advantage of the machine is said to be that it is practically stable in any flying attitude, whether on a level course or pitched upward at a climbing angle so steep that an ordinary air-

plane would lose the lifting power of its wings and go into a stall—the cause of a large portion of all air accidents. With the ordinary plane, the normal flying range is limited to a comparatively small angle. Outside of that range, it is only possible to keep even a powerful machine climbing by constant adjustment of the controls. With the Hill plane, it is claimed, the ship will continue to fly in any attitude after the controls are once set, and keep on flying that way until they are changed. In other words, the ship is stable in many positions instead of one, somewhat in the same way that a watch is adjusted to operate properly whether held upright, face down, or leaning to one side or the other. Instead of the trailing skid under the tail, which furnishes the third point for the landing of an ordinary plane, the tailless ship has a third wheel under the short body.

PICTURE LABELS ON PACKAGES TO REDUCE BREAKAGE

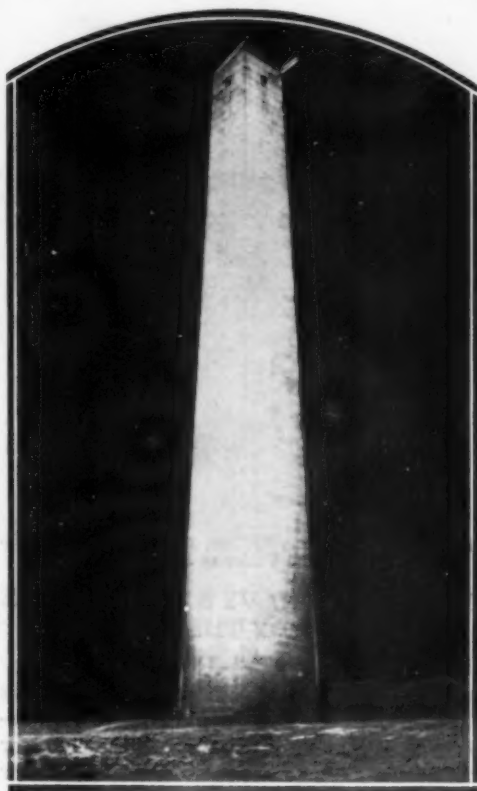
One of the difficulties in international trade is that few of the men handling the shipments can read the different languages in which signs on the boxes are written. Breakage through ignorance of the contents is often the result. To eliminate this, the international union of railways has adopted a series of picture labels, a sort of commercial Esperanto in tags, so that everyone concerned will know the nature of the contents of the boxes. For instance, parcels of perishable goods have a label in blue and white with a design showing a fish, a flower and a bunch of grapes. Live-stock crates carry a tag in the same colors with pictures of a dog, a cow's head and a hen. Articles of a fragile nature are marked with red and white stickers showing a wine glass.

TYPEWRITER WITH MANY KEYS HAS FORTY ALPHABETS

Taking rapid dictation directly on the typewriter, without the use of shorthand, is said to be possible with an instrument on which the inventor, a former court reporter, asserts he has attained a speed of 283 words a minute. It differs considerably from the usual typewriter, the board, for instance, having 1,160 keys which cover no less than forty alphabets. The machine is the result of twenty-five years of study.



Attorney Fred A. Dolph at Model of Keyboard of His Typewriter, Which Contains Forty Alphabets



Courtesy General Electric Co.

Bunker Hill Monument under the Glow of Six Big Floodlights Is Visible Twelve Miles at Night

LIGHT BUNKER HILL MONUMENT WITH SIX BIG LAMPS

Six big 1,000-watt searchlights with a total of 15,000,000 candlepower have been placed near Bunker Hill monument in such a way that they flood the entire shaft with radiance, making it visible from a distance of twelve miles by night. Each set of three lights on separate poles, one 190 feet and the other 250 feet away, illuminates two sides of the monument.

TEST PINE SHAVINGS AS "SNOW" FOR MOTION PICTURES

Pine shavings bid fair to play an important part in the silent drama if experiments with them as substitutes for snow prove successful. In filming "frozen-north" pictures, it is said that ten or fifteen carloads of imitation snow are often required. Bleached cornflakes have been used, but the shavings are cheaper.



Secretary of the Navy Wilbur, Center, at the Unveiling of the Memorial Tablet to First U. S. Warship

HONOR OF NAVY'S BIRTHPLACE CLAIMED BY THREE PORTS

The time and place of the beginning of the American navy was a disputed point between three Massachusetts towns recently. Marblehead claimed the honor from the fact that, in 1775, the schooner "Hannah" was chartered there as the first warship authorized by the colonies. On October 13 of that year, congress had passed an act establishing a marine committee consisting of John Adams, John Langdon and Silas Deane. Salem asserted its right to recognition as the navy's birthplace because the "Man-O'-War Ketch," which sailed out of the port in 1676, was the real nucleus of America's sea power; and Kingston, the third claimant, insisted that since three of its ships were taken into the naval service in 1775 and still another was built there the following year, it should be considered as the scene of the navy's beginning. Officials of the Massachusetts military and naval historical society upheld the claims of Marblehead.

BEE FARMS ON CITY ROOF TOPS PAY PROFIT IN BERLIN

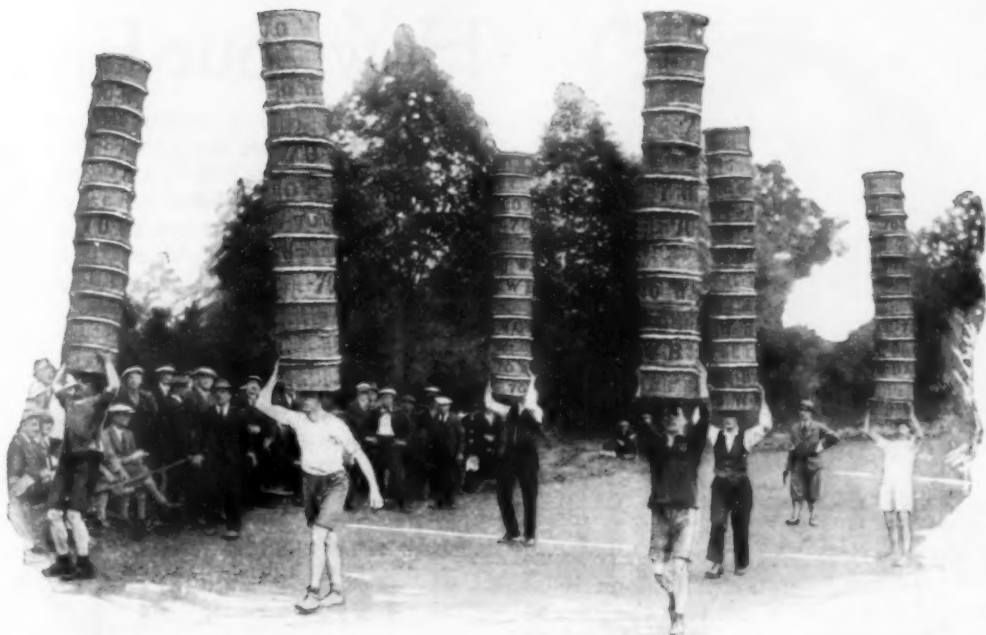
Several citizens of Berlin have found that bee keeping is a paying proposition even in a city of 4,000,000 inhabitants. It is estimated that there are at least 200 fanciers there who keep the hives on the flat roofs of the buildings. The structure occupied by the Prussian diet has twelve and there are twenty on the roof of the academy of music. In all, more than 3,000 swarms are kept within the city, making a bee population estimated at upward of 150,000,000 or so.

METAL TAPE FOR PHOTO FLASH GIVES BRILLIANT LIGHT

Magnesium in thin tape form, and carried in a small igniter that fits in the vest pocket, has been prepared for photo flashlight purposes by a German chemist. A small portion of it is said to burn with brilliance equal to that of a 1,000-candle-power half-watt electric lamp, and since the small box in which it is contained may be moved about while the picture is being taken, shadows can be lighted up and thus better effects obtained in the photograph than are possible when powder is used. Snapshots can also be taken under the intense light and its use eliminates the bother of powder and excessive smoke. Added safety is another feature of the magnesium flash.



Taking Studio Flashlight with Magnesium Tape and Close View of Igniter Opened, to Show Material Coiled in Position for Use



Where Steady Nerves, a Cool Head and a Sense of Balance Counted as Much as Speed; Race between Expert Basket Carriers at an English Athletic Meet

RACING WITH BASKETS ON HEAD ADDS THRILL TO MEET

One of the most spectacular races at the athletic meet of the Spitalfields market sports club at High Beach, England, was between a number of runners carrying high piles of baskets on their heads. The men become proficient in this task during their daily work and further demonstrated their skill at the contest. Dropping a basket disqualified an entrant.

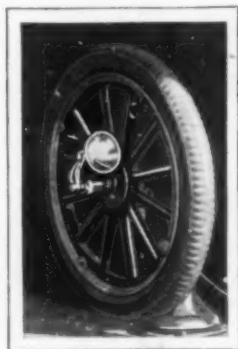
MINNOWS SENT BY BATTLESHIP TO FIGHT MALARIA

A unique force of fighters departed recently aboard the Argentinian battleship "Moreno" from the United States for Buenos Aires. They were 2,000 minnows hatched at the bureau of fisheries and sent to the South American republic to aid in the war on malaria by devouring the larvae of carrier mosquitoes. These larvae live only in stagnant water and, being air breathers, stay almost entirely on or near the surface, the favorite feeding grounds of the minnows. Many pools in this country, too large to be coated over entirely with a smothering film of oil, have been

successfully rid of the embryo mosquitoes by the minnow treatment. The first shipment was ordered by the international board of health for breeding purposes and for distribution throughout the fever-ravaged regions in Argentina.

LIGHT FOR FRONT HUB OF AUTO HELPS DRIVER STEER

Directing a bright light on the curb, a lamp attached to the front hub of the automobile, illuminates the side of the road so that there is less danger of running into ditches or other obstructions when turning or driving. It is fastened by a nut with a shank that protrudes through a hole cut in the hub and by a bracket. Grease is retained in the hub by felt and steel washers. Tests have shown that the light is of great aid when driving with headlamps dimmed or in the face of glare.

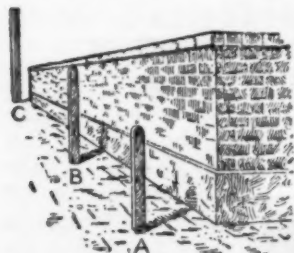




An Illusion of Looking through a Hole in Your Hand,
Due to the "Sympathy" of One Eye for the Other

EVERYONE knows that the sky seems blue and that the full moon looks much larger when it just tops the horizon than an hour or more later, riding high in the sky. As a matter of fact, however, space is colorless and the moon is not larger at one time than at another. Both are optical illusions, as untrue as that transmitted by your eye when it tries to tell you that every distant object is partly obscured by a purple haze.

The moon probably looks larger at the horizon because the eye associates it with other objects.



Perspective Produces Illusions
Such as This; the Post C Is
Really the Shortest and A the
Longest

If you see a tree at that distance you readily imagine it being thirty feet high, because you are accustomed to thirty-foot trees; and when you see

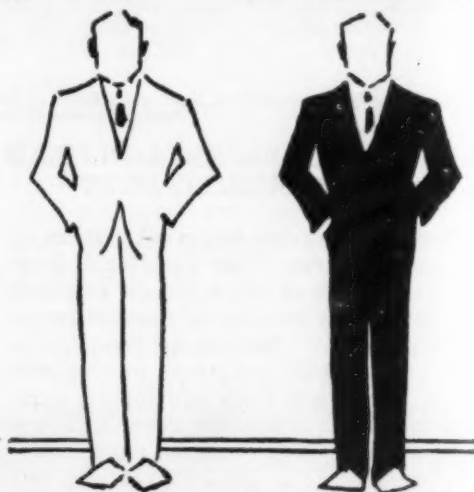
the same tree in silhouette against the rising moon your eye naturally decides the moon is much larger. But an hour later, high in the sky, with nothing to compare it with, the moon has shrunk to the size of a barrel head, and the eye remarks to the brain, "how small it has grown!"

The two eyes do not actually see things as they are, but through long habit and training adjust themselves to a set of sup-

How Your Eyes

posed truths. Then, when something comes along to upset the adjustment, the eye promptly decides that "I am right and what I see is wrong." Some of the queerest pranks played on the eye are by combinations of lines, straight and curved. If you draw a thick horizontal line and rising from its center a thin vertical line, making them of equal length, your eye will try to tell you that the vertical line is much longer than the other.

Series of vertical and horizontal lines, spaced a short distance apart, and in each case filling a perfect square, give an equally strange illusion. The squares lose their squareness; the one with the vertical lines appears taller than its breadth and the



Two Figures of Identical Size, but the Light Clothes
Make Their Wearer Look Larger

one with the horizontal lines becomes apparently, broader than it is tall.

As an illusion, that is interesting, but in its practical application toward fooling other people's eyes it accomplishes no end of good. A short, rather rotund person, for example, can wear clothes with a predominating vertical stripe or pronounced vertical lines, and thus appear much taller and thinner than he actually is. On the other hand a person who is too tall and thin can wear horizontal stripes, or, in the case of women, ruffles and laces in horizontal designs, giving an appearance of less height and greater width.

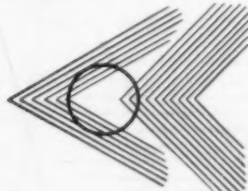
Deceive You

The same rule applies in decorating rooms. A room with a low ceiling appears squat and small if the walls are paneled in broad horizontal spaces, or if the wallpaper has a pronounced horizontal motif in its design. On the other hand, a room with a too high ceiling would appear even loftier and colder if the wall decorations ran to tall and narrow effects. So the one is made to seem bigger than it is by running the panels and paper designs vertically and the other is given a homy atmosphere by cutting off the high ceiling with a molding and using horizontal panels.

There is no end of the results that can be obtained by studying the effects produced by drawing combinations of horizontal and vertical lines. A girl who is too short should wear a close-fitting hat because a wide-brimmed one only accents her shortness. Similarly a girl who is too tall can offset that by wearing the big-brimmed hat.

Lines which are parallel can be bent or made to converge by crossing them with others; lines of the same length can be made to appear unequal by judicious use of other lines to create angles; circles of equal size can be made to look larger or smaller, or distorted, and a dozen and one other tricks played on the eye—and in real life every trick has its application.

Architects employ many of them, and their use was known even as far back as the ancient Greeks. The Parthenon at Athens still holds the record as one of the largest collections of optical illusions ever assembled in one building. For example, its majestic pillars, thirty-four feet high, bulge out three-quarters of an inch in the

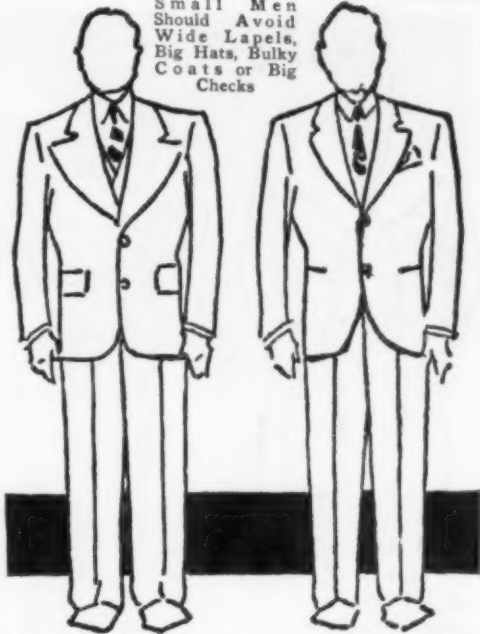


Lines Properly Placed Convince the Eye This Circle Is Distorted



Another Illusion, That Cross Hatching Has Bent These Two Parallel Lines Out of Shape

Small Men
Should Avoid
Wide Lapels,
Big Hats, Bulky
Coats or Big
Checks



middle, because the Greek architects had discovered that a pillar with straight sides appeared too thin in its center section. The three-quarter of an inch excess there just nicely corrected the optical illusion by furnishing another—making the eye tell the brain that the pillar is straight. The long lines of the beams which surmount the columns appeared quite straight to the eye. Actually it had a curvature of several inches, otherwise it would have seemed to sag.

The same problems that faced the Parthenon builders are being met every day in modern public buildings and lofty sky-



Three Identical Faces, But the Horizontal Lines of the Bows Make the One on the Right Appear Broader; Even the Ribbon, in the Center, Helps

scrapers, and in addition the latter require visual tricks of their own. One of the worst faults is the checkerboard appearance given a lofty office building by its



Long Overcoats Make Tall Men Short and Short Men Shorter, While Square Toes and Straight Lines in Shoes Make the Feet Look Bigger

rows upon rows of windows, all alike in size and shape. Architects have several ways of correcting this defect. One is to group double or triple windows together, separated by only a narrow surface, and on either side of the groupings leave wider spaces. The result of the combination of narrow and wider surfaces gives a tall column effect to the walls.

Another, and even more novel, method was employed recently in a tall Gothic-type tower built by a Chicago newspaper. The building, some thirty-five stories high, included an ornate tower for the upper dozen or so of floors. It was necessary to get straight, sweeping lines below so they would carry the eye upward to the highest peak. To accomplish this, the



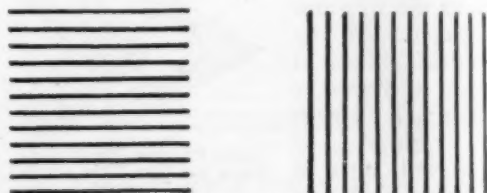
A Pair of Parallel Lines That Seem Destined to Meet if Continued, Merely Because Series of Angular Lines Crossing Them, Convince the Eye of an Untruth

space beside the windows was filled in with stone, but that above and below them was covered with pressed sheets of dull-gray

metal, which, being recessed behind the stone front, did not attract the eye but left an impression of immensely tall stone columns.

A circular white spot on a black background and a similar spot, of exactly the same size, but colored black and placed on a white ground, form another interesting illusion. Laid side by side, the eye is convinced the white spot is the larger of the two. That is why dark polka dots on a white dress look smaller than white or light dots of the same size on a dark dress. Similar contrasts in brightness are applied in many ways in interior decorating, and in the arts and architecture. A dark line or spot always appears darker against a light background and a white spot always appears brighter against a dark background. Architects have found that columns, such as those of the Parthenon or of public buildings in this country, always appear smaller when viewed against the bright sky than they do when the observer stands outside and sees them against the deep shadows of the portico.

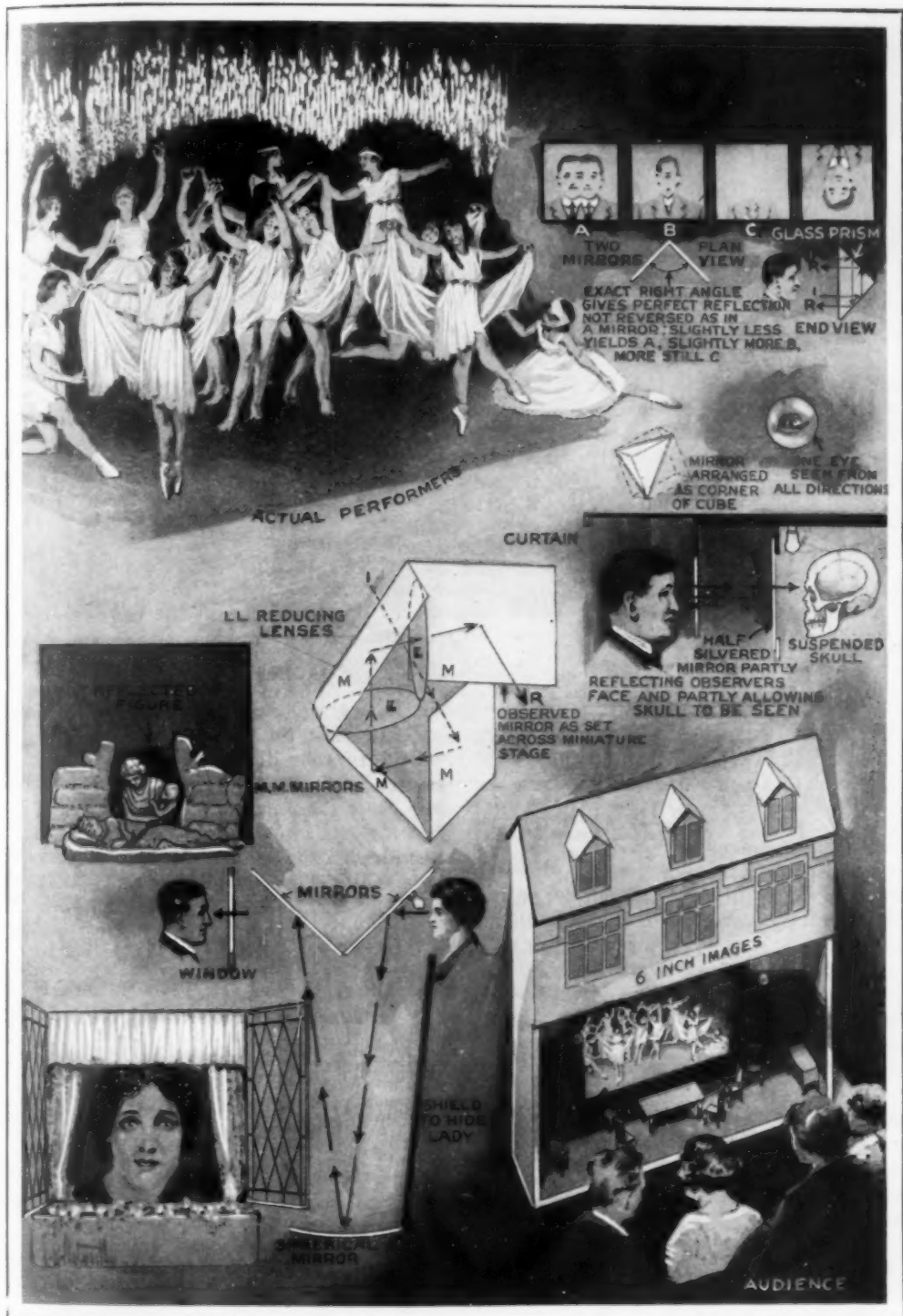
Besides the illusions with which the eye tricks itself in looking at everyday things, it is possible to fool the vision in many other ways. One of the easiest is a variation of the principle used in the familiar stereopticon, where two pictures, slight-



Two Perfect Squares, But They Appear Distorted Because of the Arrangement of the Lines

ly different, are viewed, one by each eye, and their images blended to give the illusion of depth. The same blending can be accomplished without the aid of a stereopticon. Draw two similar figures, circles or squares, of the same size, and a couple of inches apart on a sheet of paper. Hold them at arm's length and focus the eyes on a spot some distance beyond them—in other words "look through" the paper. After a trial or two in focusing the eyes, you will find the two figures blend together as one.

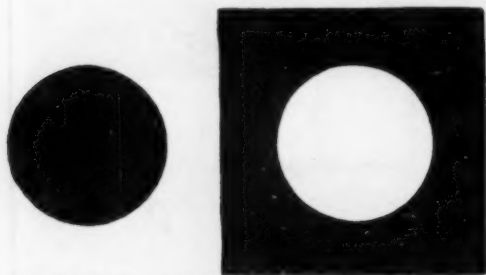
A similar illusion can be effected with



© S. W. Clatworthy

Six-Inch Dancing Figures, the Face at the Window and Some of the Other Startling Optical Illusions Recently Exhibited in London, with Sketch Drawings Showing How They Were Produced

a sheet of paper, rolled into a cylinder an inch or so in diameter. Hold it before one

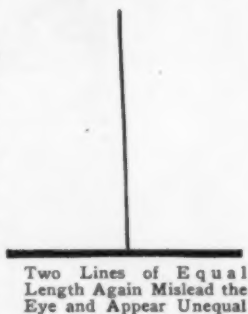


Why Light Suits Make a Man Look Bigger Is Revealed by a Study of These Two Spots

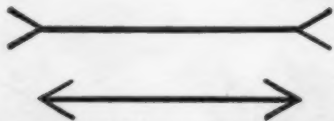
eye, look at some object, using both eyes, and then place the other hand over the end of the paper tube. You apparently continue to see the object with both eyes, looking through what seems to be a hole in your hand.

One of the greatest collections of optical illusions ever presented was shown at a recent meeting of the Optical Society in London. The skilled workers who are members of the society showed a miniature stage on which human figures, only six inches high, danced and presented plays; a window through which a woman looked, though, when the observer approached, no one was there, and many others equally mystifying.

The pygmy dancers were really reflections, through a series of reducing lenses and mirrors, of actual people who danced and acted on a hidden stage. The stage the observer saw was a reflection in a mirror. The illusion of a woman at the window was even simpler, employing two



Two Lines of Equal Length Again Mislead the Eye and Appear Unequal



One of the Most Striking of All Illusions; It Takes Actual Measurement to Convince Many the Lines Are Equal in Length

plane mirrors, set at a forty-five-degree angle, and a third concave mirror. The woman stood behind the scenes and

looked into one mirror, which reflected her image down to the concave mirror, and from there up to the other plane glass. Looking through the window, behind which this last mirror was placed, the observer saw, apparently, the real person, only to find as he approached that she was not there.

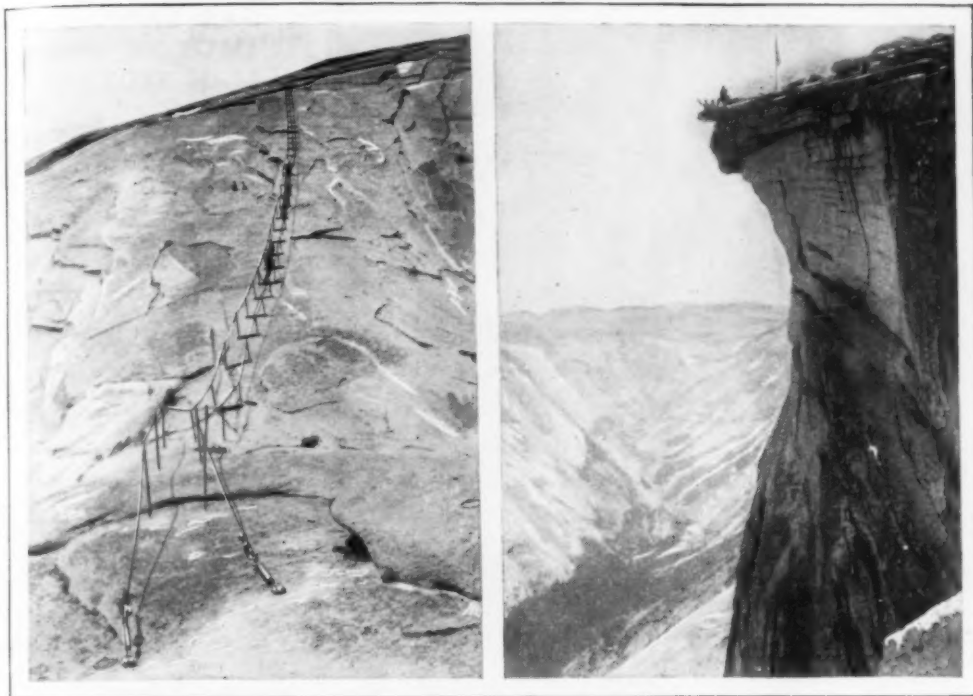
Another illusion, worked in the same way, represented a soldier's dream of home. A plaster figure of a soldier asleep in a trench was visible to the visitors, while above his head appeared his wife and child, reflected from a plaster statue hidden behind the scenes. As the light illuminating the statue of the woman and baby was turned on and off the vision appeared and disappeared.

Pairs of mirrors adjusted at various angles gave series of queer figures, ranging from a double reproduction of the person looking in them, through thinner figures to one which was headless; while another mirror effect showed only one eye of the observer, yet the eye remained open regardless of whether he closed the left or right one. The effect was produced by an arrangement which superimposed the images of both eyes, so that shutting of either left the other still open.

Still another illusion combined a skull, suspended in a cabinet, with the body of any person looking in. The skull was hidden by a half-silvered mirror, which partly reflected the outlines of the observer's face, while allowing the image of the skull to show through, giving a weird sort of X-ray combination.

AIRPLANE WITH TEN MOTORS PLANNED IN GERMANY

One hundred and thirty passengers will be able to fly at one time from Hamburg to New York in thirty-six hours if plans for a giant airplane now under consideration in Germany are realized. The ship will have ten motors of 1,000 horsepower each, will weigh 230,000 pounds and have an average speed of 170 miles an hour. Besides the passengers, a crew of thirty will be carried, and the craft will be fitted with six pontoons for landing on the water. Duraluminum is the proposed material for the plane which will have a span of about 300 feet.



Left View Shows the Cable Way up the Steep Slope of Half Dome and the Other, the Summit and a Group on the Rim of the Ledge; a Radio Set Was Carried to This Point to Test Reception

GUIDES RISK LIVES ON CLIFFS BUILDING CABLE LADDER

Clambering to the summit of the Half Dome, that rises a mile or so from the floor of Yosemite valley, and fastening a cable ladder to the steeply sloping rock so that tourists may ascend with ease, is the annual hazardous task of two western guides. They make their way inch by inch to the summit, sinking steel pegs at intervals for foot and rope holds. Lines are laid behind them to which are attached the cables, and these are finally pulled up and fastened in place when the ascent is completed. The ladder is taken down each fall so that avalanches will not sweep it away. On

the last construction of the cable way, the guides carried a radio set to the peak of the dome and tuned in on distant stations to prove that reception was satisfactory at that point. A Los Angeles studio broadcast a special program for the guides.

WHEELED BRACES MAKE CHILD'S CYCLE SAFE



Braced by Small Wheels on Each Side of the Rear, This Bicycle Is Easy for Children to Ride

Designed especially for small children, a bicycle introduced in Paris has small wheeled braces on either side of the rear wheel in order to keep the machine from tipping. After the youngster has learned to ride, the extra wheels may be removed.

☐The nap on silk hats is sometimes made from the fiber of the milkweed.



When Auto Is Driven into Deep Water, Paddles on Front Wheels Propel the Car like a Boat

FOLDING-PADDLE-WHEEL AUTO RUNS ON WATER

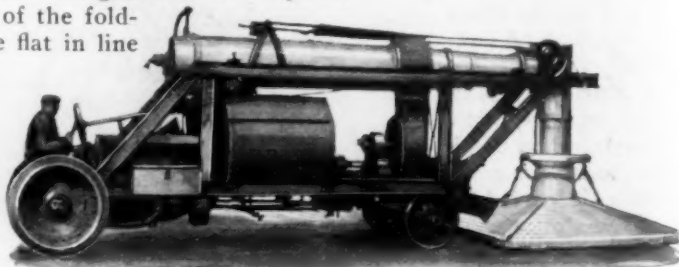
With a water-tight body and a collapsible set of paddles on the front wheels, a lightweight auto can be run from the beach into lake or river for navigation as a boat. An advantage of the folding paddles is that they lie flat in line with the direction of travel when the auto is on land to decrease interference from the wind. The rudder is underneath the body, the steering gear, which is operated by the wheel, being inclosed in a water-tight keel-like casing.

GAS BAGS SAVE MOTOR FUEL IN STORAGE

Regarded by experts as an important development in the oil-refining industry, large balloon bags have been adapted for catching the gasoline vapors that escape from storage tanks. They are each of 18,000-cubic-foot capacity, large enough for two or more tanks, and make possible a saving of \$1,500 a month on a standard-size tank, oil men assert. The vapors expelled through the vent pipe are retained until lowering temperatures condense them and the gasoline flows back into the tank, which is prevented from drawing in fresh air every night.

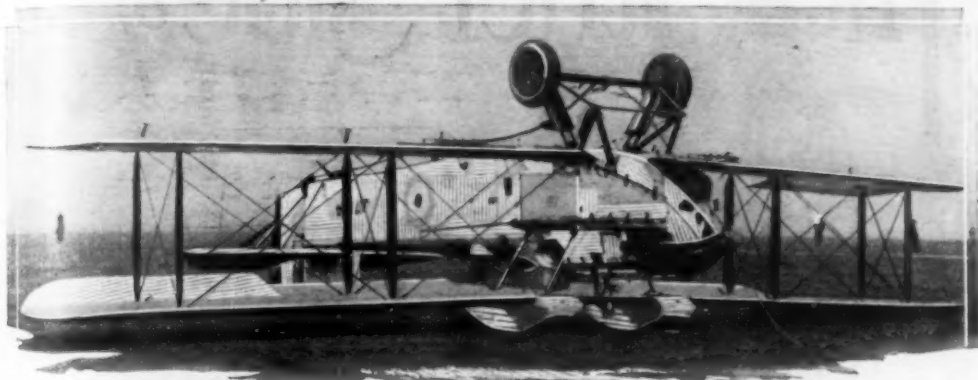
ASPHALT HEATER LOWERS STREET MENDING COST

Expense of fixing streets in an eastern city has been lowered from more than \$2 per square yard to about thirty-five cents with the aid of an oil-burning heater. It directs a blast of hot air upon the pavement without permitting the flame to strike the surface, and can be used to soften asphalt for removal, or for heating hard paving materials before coating them with asphalt.



At Work on Asphalt Pavement with the Oil-Burning Heater

BOMBING PLANE TURNS TURTLE IN TAKING OFF



On Its Back; Huge Bombing Plane That Capsized While Taking Off from an English Flying Field; the Accident Was Caused by the Plane's Striking an Obstruction Just before Rising

An unusual accident occurred recently on an English flying field when a huge bombing plane struck a projection while taking off, and was turned upside down. The pilot was uninjured and about the only damage done was to the propeller, which was smashed.

FLOOR OF TILE WEARS LONGEST, RUBBING TESTS SHOW

Experiments with flooring materials at the Mellon Institute of industrial research in Pittsburgh, have shown that vitreous tile has the greatest resistance to wear. Marble, maplewood, rubber, linoleum, two kinds of cement, an asphaltic composition and cork tile were tested. Actual wearing conditions were nearly duplicated by means of a leather-shod wheel rubbing and pressing on samples of the materials. Sand was fed between the substances and the leather to produce the effects caused by dirt on an ordinary floor. After a test period of the same duration in each case, the pieces were weighed to determine the percentage of loss due to abrasion. It was found that the vitreous tile showed an average of only four and one-half per cent loss, marble and maple were about equal, with slightly more than twenty-three per cent, and more than four-fifths of the asphaltic composition had worn away. Nearly half of the cork tile had disappeared. While the results were held to indicate the relative endurance of the materials, the tests

were not considered wholly representative of actual performance, since no coverings such as varnish were used on the samples.

FURNITURE IS STEAM-CLEANED FROM GAS-FIRED BOILER

Water and fold marks are easily removed from upholstered furniture and the appearance of garments is brightened by using a gas-burning steam boiler with a spray nozzle and hose. The vapor is quickly generated and a superheater insures dry, hot steam. The apparatus is intended for stores and upholsterers.



Steam Cleaning an Upholstered Chair with Handy Boiler Outfit; Control Nozzle Regulates Blast

The Other Side of the



rays of the sun, is lined with rows of neat little medicine and supply cabinets, watering and washing tubs, all painted in the stable colors, and neatly coiled bandage rolls.

Stall doors are opened and the morning cleaning begins. Currycombs and brushes ply, fresh straw remakes the trampled night beds, soft flannel

cloths wash the night's dust from slim, fleet legs.

Breakfast time, for the horses, not the men, and the morning's ration of oats is distributed. Each stable hand has from one to three or four horses to care for, depending on the size of the stable and the wealth of the owner. Horses, like people, differ greatly, some requiring the almost undivided attention of a personal valet, and others getting along with a third or fourth the care.

With the morning meal out of the way, the day's limbering up begins. Stable boys and jockeys turn out and lend a hand. Carefully blanketed, the racers are led round and round the well-trodden dirt path beneath the overhanging porch roof, stretching and easing muscles cramped by the night. For a quarter or a half an hour, as long as the trainer thinks necessary, the exercise walk continues, then the animals go back to their stalls, and decks are cleared for the serious business of the day.

It is now half past five or six o'clock, and light enough to take to the track. The horses that are entered for the afternoon's races come first, usually for a brief exercise gallop, since their schooling is complete and only a workout is necessary. It is important that it be finished soon, to give as long a rest as possible.

IT'S four a.m. and the first streaks of dawn are beginning to lighten the sky.

The place may be Churchill Downs or Latonia; Aqueduct or Hawthorne; Kenilworth or Derbyshire—anyone of the tracks where fast horses gather for the "Sport of Kings." No matter what the track, the scene is the same.

On one side the vast, deserted grandstands, silent save when an occasional sleepy watchman makes his rounds. On the other, the long row of low white-painted stables, just awakening for the day's business.

The day starts at dawn on the "other side" of the track, the side where the stables are, and it ends with the evening twilight, for horses keep sun-time hours, and the trainers and jockeys, and stable hands who care for them must, perforce, keep the same.

Four a.m. and the first stable hands roll out of their cots in the tack rooms, stalls fitted up for light, very light, housekeeping. They live with their horses by day and sleep beside them at night.

Down the side of the long stables thoroughbred heads are poked out over the tops of the half doors, and a chorus of stamping and neighing greets the arrival of the first attendants. The stable side, sheltered by a wide overhanging porch roof, to keep out the rain and the direct



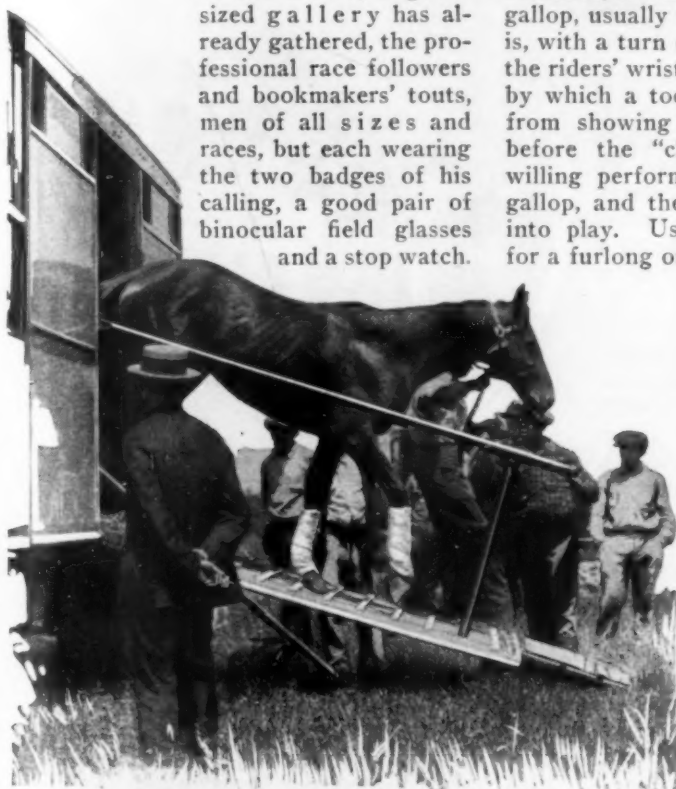
The Moment for Which Weeks of Effort
Back of the Track Has Been Shaped

Despite the earliness of the hour, a good-sized gallery has already gathered, the professional race followers and bookmakers' touts, men of all sizes and races, but each wearing the two badges of his calling, a good pair of binocular field glasses and a stop watch.

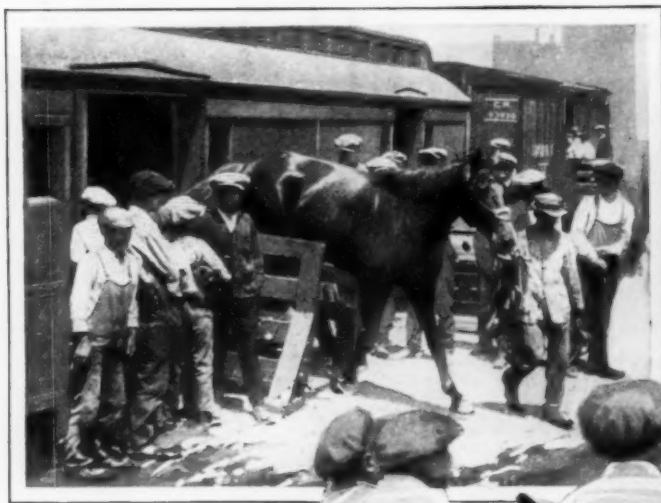
Before this critical and professional audience, the afternoon's racers take their gallop, usually ridden "under wraps," that is, with a turn or two of the reins around the riders' wrist to give a good strong pull by which a too-eager horse can be kept from showing off more than necessary before the "clockers." Occasionally a willing performer is put through a stiff gallop, and then the stop watches come into play. Usually an occasional spurt for a furlong or so, coupled with the general behavior of the horse, is all the watchers have to go by.

As quickly as possible the afternoon's entries are led off the track, blanketed and walked up and down the side lines to cool them out slowly, then given a good rub-down and wash and returned to their stalls.

Next come the horses being groomed for future races. The trainer, mounted on his pony, a scrub of indeterminate breeding, watches critically, orders walks and gallops, and keeps a close eye on the work.



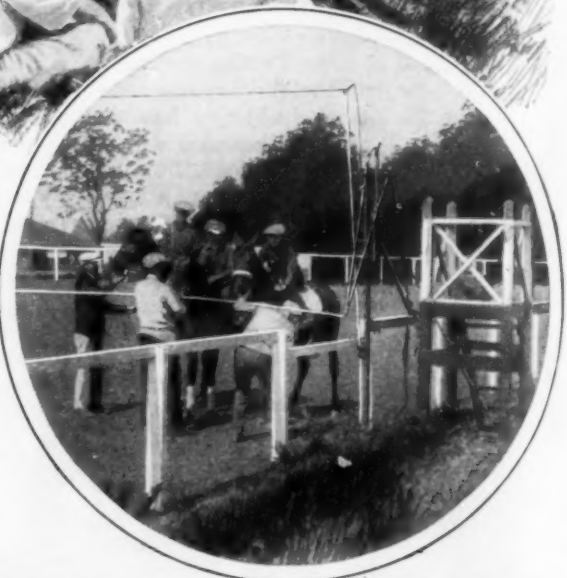
Unloading a Thoroughbred from a Special Motor Truck, the Newest Method
of Transporting Horses over Medium Distances



The "rail birds" are still on the job, getting an eye on future possibilities.

Finally only the youngsters are left in the stable, and then school starts for the day. The youngsters include all those who have yet to start in a race. They must be trained to respond to the jockeys' desires, to race with other horses and try to win, to get away to a flying start when the barrier is sprung, to keep their feet in the thick of a galloping tangle, and to take no fright whatever may happen. Skittish and full of fire, their workout usually starts with a walk around the mile of track, interspersed with a few short gallops. If they are very young and inexperienced, or easily frightened, the trainer on his pony or another jockey on a well-broken horse may ride alongside, possibly with a leading strap to teach obedience.

Finally nine o'clock comes. Barrier school has been called by the starter for nine, and must be over before ten to clear the track for the teams with scrapers and drags, who will level and work the dirt ready for the last ounce of speed in the afternoon meet. At the head of the back stretch lies the "chute," a short, straight



Unloading the Horse Pullmans, Top; a Stable Swipe Demonstrating Southern Airs to an Admiring Audience, and the Morning School Class at the Barrier

stretch leading into the track just where the turn straightens out. Through the chute the horses are led onto the track, and at the end of it, a barrier has been erected for the youngsters' school, with a crew of assistant starters in charge.

The first task is to convince the students that the inch-wide cloth webbing which forms the barrier is harmless. With an assistant starter at its head, each horse is led up in turn, allowed to inspect and sniff

the cloth, and finally it is rubbed over its muzzle and brushed up past its eyes to convince it that, when it is lifted, it means no harm.

Next the youngsters must be taught to line up before the web and keep their places. Trainers, stable hands and assistant starters lend a hand, soothe the frightened and urge the balky until they have been taught to take their places and hold them without too much fidgeting.

The last, and hardest, step is to spring the barrier and teach the horses to make a dashing getaway. A button on the starter's stand releases the electric catch and powerful springs jerk the tape out and away from the horses, swinging it up over their heads in the arc of half a circle. At the click of the springs and the swish of the rising webbing, the more frightened will back and bolt. Time and again they have to be led up to place, introduced to the look and smell of the tape, and made to stand while it is sprung.

With school over and the



track cleared, the stables settle down to finish the day's cleaning, repair "tack"—the track name for all harness and gear—and look after the needs of the horses.

The cleaning is a job in itself. Despite the rough boards of the walls and the dirt floor, a stable is always neatly white-washed and scrupulously cleaned. The exercise path beneath the porch roof is worn deep by the daily sweepings of

The Jockey at Home in His Decorated Box Stall, Top; a Trainer Coaching an Apprentice Boy on a Young Horse, and Fixing of the Racing Bandages; Fine Horses Require Constant Attention



years. It must be kept free from dust if the horses are not to suffer. In the tack rooms, each incoming crew lays a wooden floor, papers the walls with building paper, hangs each oiled and polished saddle and bridle in its place, and finally decorates the whole with gay strips of bunting, pictures of famous racers and personal ornaments to make the living quarters homelike. Housekeeping on the back side of

any race track would do credit to a New England housewife.

By two o'clock the jockeys are arrayed in their racing silks and ready for the

noon the back side of the track is as busy a place as the public paddock before the grandstand. Three or four hours of bustling activity, then the evening feeding



The Morning Parade That Starts Soon after Dawn, When Ghostly Lines of Sheeted Horses Tramp Round and Round under the Overhanging Stable Roof, Limbering Up for the Day

afternoon's events. Stable hands are busy with the day's entries, the owner, usually with his guests and anyone else who can find an excuse for getting past the gate-men, are crowding around. For the after-

and grooming, the final cleaning of the day, and with the last ray of twilight, the stables are asleep. Only an occasional jockey, with no ride booked for the next day, is seen abroad after dark.

NON-SHRINKING PAPER BARREL IS STRONGER THAN WOOD

Lighter, stronger and costing a third less than wood, a paper barrel for ship-

ping, packing and many other purposes, is said to be non-shrinking and, hence, proof against leaks. Steel or wooden hoops are not necessary, so that the outside surface is smooth and free from obstructions likely to damage other containers. The barrel is made by a special process involving the winding of heavy pressed paper.



© Kade' & Herbert
Illustrating the
Lightness of
Smooth, Hoopless
Paper Barrel

ping, packing and many other purposes, is said to be non-shrinking and, hence, proof against leaks. Steel or

GENERATOR CONTROL ON AUTO SAVES BATTERIES

Eliminating the need of troublesome changes in the auto-generator third brush to increase or reduce the charging rate, a control placed on the cowl board is said to afford charging current from zero up to twenty amperes. It consists chiefly of a rheostat, with a dial like those of a radio set, which is so wired to the generator that the current through the field circuit must flow through the rheostat as well as being controlled by the third brush. With this attachment, overcharging batteries can be avoided without having to keep the headlights burning in the daytime.

FOODS GOOD FOR ONE PERSON ACT AS POISON TO OTHERS

Practically every kind of food is a "poison" to some person or other, according to Dr. W. Soltan Fenwick, an English diet expert. The unpleasant feeling suffered after partaking of a heavy meal is often due to substances which act as poison to that individual rather than to the quantity or unwholesomeness of the food, he declares. Eating a small portion of the white of an egg, gives some persons intense pains. Oatmeal, strawberries, milk, meat and other nutritious foods are likewise apparently injurious to many. The difficulty, according to the doctor, is not in the food itself but in the individual. The person's system, likely, is hypersensitive to a particular article, often one protein or another. Doctors are now able to desensitize a patient in many cases so that he may eat foods, that formerly caused trouble, without ill effects. Poor digestion and not stupidity, Dr. Fenwick points out, is many times the cause of a child's failure to make satisfactory progress in school.

BIG DIESEL RAILROAD ENGINE PULLS HEAVY TRAIN

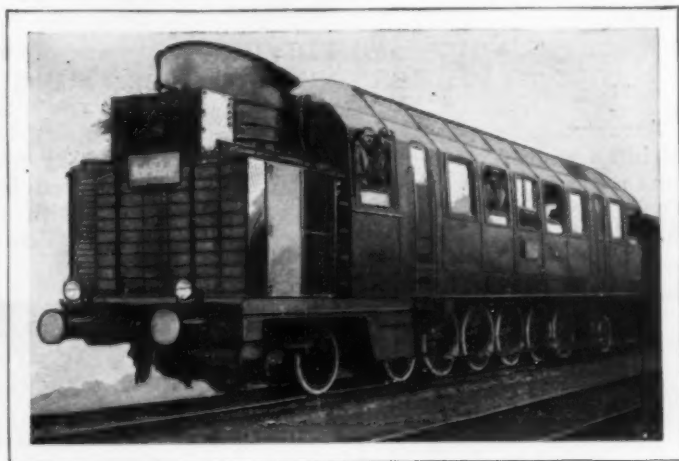
That the Diesel locomotive is adapted to heavy train service was indicated by tests in Germany with an engine of this type having a magnetically coupled toothed gear system. It is reported to have registered an efficiency of twenty-nine per cent as compared with the twenty-seven and one-half per cent shown by the Diesel-electric engine, or the eight and seven-tenths per cent by the steam locomotive. A maximum of 1,200 horsepower was developed. The locomotive weighs over 280,000 pounds and is so arranged that it can be placed on different sets of wheels for operating on narrow as well as broad-gauge tracks.



Golf Bag in Carrying Position, and Open, to Show How Clubs and Balls Are Attached

GOLF BAG OPENED LIKE BOOK PREVENTS THEFT OF CLUBS

Theft or loss of clubs is prevented in a patented golf bag which opens and closes like a book and has special storage spaces for balls. The clubs are automatically locked in when the holder is shut, and are all exposed to view when it is opened, so that the player can readily select the one he wants. The bag is conveniently carried by a shoulder strap and each section is braced by a skeleton of metal.



Big Diesel Locomotive for Heavy Train Service in Germany; It Is Said to Have Great Efficiency and Power



Wheel in Action; the Rider Slips Easily into the Water in a Safe Diving Position as the Wheel Turns

BIG WATER WHEEL FOR DIVING ADDS TO SUMMER SPORT

Amusement and instruction are afforded in an eight-foot wooden water wheel for the swimming beach, to aid the diver. The person sits or lies prone on top of the wheel, which is eighteen inches wide, and, as it turns, slips into the water. A ratchet underneath prevents the wheel from going backward. A ladder and a platform are included in the apparatus which occupies not more than 120 square feet of ground. It is so constructed that fingers and toes cannot get caught.

Large snakes are among the prey of the secretary bird, a species found in Africa.

COTTONSEED AND WHEAT MAKE GOOD BREAD

Edible flour that is said to produce good results when mixed with an equal amount of wheat is now being manufactured under a patented process at a southern mill. It contains about forty per cent protein and is extracted from the material left after oil is taken from the seed. Heretofore, most of this has been used for making stock feed or fertilizer. The flour process promises a new and important subsidiary industry to cotton production. Cottonseed oil in later years has commanded but low prices and many mills throughout the south have been closed. If the flour proves a success, a stimulating effect is anticipated.

SHORT UMBRELLA FOR AUTOISTS FITS IN BOX

Carried in a small box attached to the rear or front seat of the automobile, between the floor and the cushion, a short-handled umbrella of a specially treated fabric, has been devised for the tourist. It can be folded away while wet as the material is not affected by moisture and may be cleaned with soap, water or gasoline. Venti-



Placing Umbrella in Box That Can Be Attached to the Auto Seat for Emergency Service on Tours

lation is afforded through small holes in each end of the metal carrier box.

TRAPDOOR SPIDERS' SKILL RIVALS MAN'S



Trapdoor Nests Closed; the Spiders on the Photographer's Hand. Proving That They Are Not Ferocious, and the Doors Open; Matches Show Relative Size of the Holes

Trapdoor spiders long have been the subjects of study by nature lovers, architects and engineers by reason of the ingenious homes they build for themselves in the ground. A California naturalist recently found 227 trapdoor nests on a barren plot of soil, about twenty-two feet square, near San Fernando, and after diligent search discovered five of the borings so close together that they could be photographed on one plate. To keep the holes open for taking the picture, the lids were propped up with small sticks, but an assistant was required to keep the spiders in their holes to prevent them from knocking down the supports and closing the traps. There are several varieties of trapdoor spiders, some of which grow to large size. Most of them line their holes with soft web and the lid is fashioned of alternate layers of web and earth. It fits so tightly that the den is almost completely concealed.

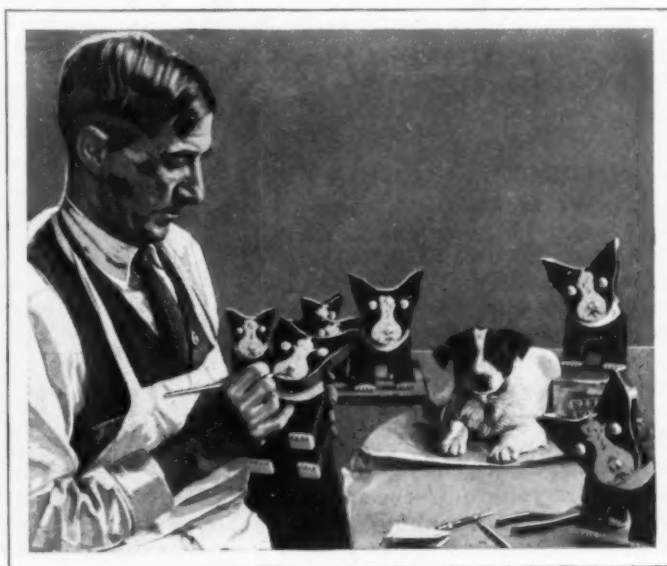
READING BY SOUND

By means of different sounds for different letters, a Russian oculist has devised a system for teaching the blind to read. An apparatus produces the various tones, some of which represent objects as well as characters. Experiments with

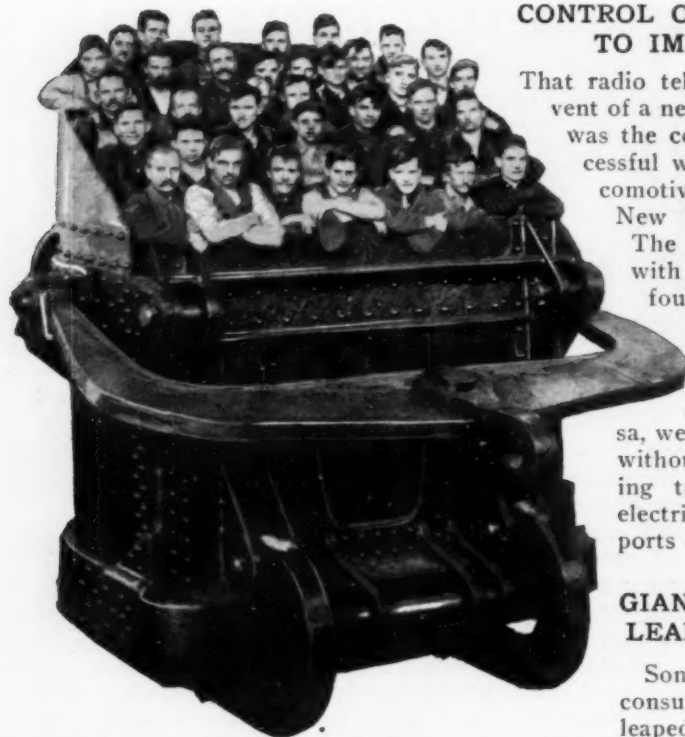
children showed that they were quickly able to identify objects in a room.

CRIPPLED WAR VETERAN'S DOG SERVES AS TOY MODEL

In spite of the handicap of serious wounds, Allen Johnson, of Sawtelle, Calif., a veteran of the Spanish-American and World wars is earning a livelihood modeling wooden toys. His success is partly due to his pet dog, "Kelly." The animal's comical face gave Johnson inspiration for making toy dogs with movable heads. "Kelly" was used as a model. Parts of the toys are shaped with a jigsaw.



Johnson Finishing a Wooden Dog, While "Kelly" Holds a Steady Pose to Help His Master Catch the Right Expression



Capacity of Huge Steam-Shovel Bucket Illustrated by Men; Thirty-Four Stand Comfortably in It at Once

DIPPER OF HUGE STEAM SHOVEL HOLDS THIRTY-FOUR MEN

Fifteen cubic yards is the capacity of the dipper of a huge steam shovel manufactured by a western firm. Its size was illustrated when thirty-four men stood in it at one time.

IRON SMOOTHS CLOTHING WHILE WORN

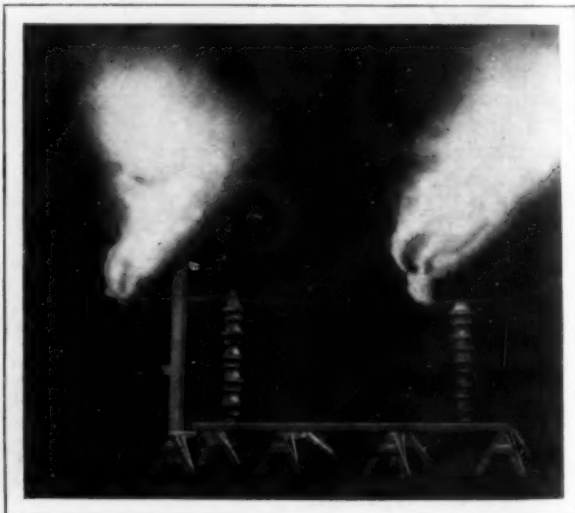
Clothing is said to be smoothed and the nap and texture "rejuvenated," even while the garments are being worn, with the aid of an electric steaming outfit. It consists of a small boiler heated by electricity and a perforated sadiron to which vapor is passed through a flexible tubing. The steam is played through the small openings in the iron, inside a heavy canvas bottom. The outfit does not require experienced operators.

CONTROL OF TRAINS BY RADIO TO IMPROVE SERVICE

That radio telephony indicates the "advent of a new era in freight operation," was the conclusion drawn from successful wireless tests between a locomotive and a caboose on the New York Central railroad. The demonstration was made with three-tube transmitters and four-tube receivers on a 115-meter wavelength. Conversations between persons in the caboose and the engine, and vice versa, were carried on for five hours without interference from passing trains, power lines or an electrical storm, according to reports on the tests.

GIANT ELECTRIC FLAMES LEAP TWENTY-FIVE FEET

Some 3,000 horsepower were consumed in an electric flash that leaped from a grounded 220,000-volt line, during a recent test. The flames were more than twenty-five feet high and the experiment enabled engineers to gather data on long-distance high-power transmission that they could not obtain in laboratory tests with artificial high-voltage discharges.



During Test of High-Voltage Line; Twenty-Five-Foot Electric Flames Leaping from Grounded Wires



By J. EARLE MILLER

COUNT out two piles of playing cards on the table, tell one of your audience that you are going to hypnotize him and force him to pick up one of the piles, the description of which you will write on a slip of paper and intrust to a third person for safekeeping—do that and you will catch the attention of any crowd.

The trick itself is simple, one of many easy card tricks anybody can perform, with no more equipment than a pack of cards. The secret lies in not caring which pile is picked up, as both, though containing different numbers of cards, answer the description written on the paper. Take a deck which you have privately prepared by placing the four tens on top. Deal the four off on one pile, and then deal off ten cards, one by one, on the other, without revealing the exact number in the pile, but making it plain as you lay them down one by one that one pile has more cards than the other.

Select the person to be "hypnotized," look him searchingly in the eyes for a moment or two, then tell him you have willed him to make a certain choice, which you will now write on the slip of paper. You write down, "You will choose the ten pile," and hand the paper to another in the audi-

ence. Your prediction is bound to come true no matter which pile he picks. If he chooses the four tens ask him to look at them; and if he picks the ten cards ask him to count them, and in either case to compare the result with the prediction you wrote in advance. While that is being done, carelessly shuffle the other pile into the deck to prevent comparison of the two.

The card-trick entertainer needs at least two decks of cards, of different colors, to keep them separated. With a pair of decks it is possible to prearrange one, as for the trick above, while the audience has its attention centered on the other. The arrangement can be carried out under the guise of idly shuffling, to avert suspicion of a fixed deck.

A few false shuffles and cuts will prove a big help in satisfying the curious. One of the most baffling three-way cuts, which returns the deck to its original state, is easy to do. Grasp the deck in the left hand, holding it between the thumb and fingers, near the left end. Bring the right hand around the right end in the same way, catching the bottom third of the deck between the joint of the thumb and the second joints of the fingers, and



Ten Cards, from Ace to Ten, Placed on Top of the Deck, Are the Secret of One of the Best of Amateur Card Tricks

lift it out from beneath the top two thirds, which are still held in the left hand. Now bring the right hand over the deck and catch the top third between the tip of the thumb and the tips of the fingers. You now have the middle section in the left hand, the bottom between the joints of the right fingers, and the top between the right finger tips.

Next relax the pressure of the joints on the bottom section, which is uppermost in the right hand, and flip it out, face down, on the table. This is done by jerking the hand sharply backward at the same instant you relax the pressure. Next place the middle section, which is in the left hand, on the lower section, lying on the table, and complete the deck by laying the top third, still held between the right finger tips, on the others. The deck is now reassembled in exactly the same way as before the cut, but after practicing a half dozen times you can carry out the operation so rapidly that it will fool the eye of anyone but an expert.

The false cut and false shuffles can be worked in before or during any number of tricks in order to more completely baffle the audience. If you want to shuffle, and yet keep the bottom cards in their original position, hold the pack rather loosely in the left hand, with their backs toward the audience, and shuffle apparently as usual. But be careful, when rais-

ing part of the cards in the right hand, to leave the bottom cards with those retained in the left hand. The others can then be shuffled back in front of the bottom cards as much as you choose.

If you have prearranged cards on top, which you do not wish to disturb, take a number from the bottom and shuffle them in front of the top cards, taking care that their ends project slightly past those of the cards you wish to preserve. When the shuffle is over, give the deck a simple cut at this dividing line, bringing the former top cards back into place.

Another method, used in many tricks, is to have the card you wish to keep track of placed on top of the deck, holding it out in such a way during the process that you can note the bottom card. Then give them a simple cut, which brings the bottom card, that you know, next to the unknown card placed on top of the deck. Now shuffle by taking cards from the bottom and mixing them in the loosely held cards near the top; then cards from the top and shuffling them into the bottom, but taking care not to disturb the relation of the known and unknown cards, one above the other. You needn't care where you shuffle them into the deck, so long as they remain together. The unknown card can always be found by running through the deck and picking out the next one below your known card.

If you shuffle by riffling the cards on the table you can easily keep track of either a top or bottom card, or several cards. If they are on the bottom, let the bottom cards of that half pack fall to the table first. If they are on top, make sure that you let them fall last. If you note the bottom card of the deck you can have the cards selected for the trick placed on the table, drop the deck over them, riffle the deck several times, letting the bottom cards fall first, call for a simple cut, and then find the selected cards directly under the one you first noted.

It adds much to the effectiveness of a trick if the chosen card is disclosed in some dramatic manner. One of the best ways is to throw the deck, face down, on the table and have the unknown card appear mysteriously, lying face up on top. The method is simple. Bring the card you want to the top of the deck, hold the

cards in the left hand, with the thumb on top and the fingers beneath, pass them to the right hand, catching hold at the ends, and under cover of the maneuver use the thumb to push the top card a third of its breadth past the edge of the pack, the overhanging portion being concealed by the right palm. Now throw the deck on the table, releasing all of the cards together. The rush of air will catch the overhanging card and spin it over, so that it falls, face up, on top of the pack.

For variety the "sticky fingers" disclosure is equally dramatic. Get the card to be disclosed on top of the pack, moisten the first and middle fingers of the right hand, grasp the deck with the fingers on top and the thumb beneath, shove the hand holding the deck forward a few inches, and then jerk it back, at the same time removing the thumb pressure. The top card will stick to

your fingers while the others drop to the table in a heap. The trick is done so quickly that the audience is unable to see how you got the card out of the deck, or how you could throw fifty-one cards down and hold the fifty-second in your hand.



Arrangement for Dealing Three Kings Over and Over. Above, a Trick in Hypnotism, Center, and, Below, a Close View of the Thumb Drawing Off One Card at a Time, While Apparently Shuffling the Deck



One of the most mystifying tricks which any amateur can perform after one trial, has another form of dramatic disclosure. Count off three cards, laying them

face up and side by side, and then continue to add a card below each until you have three rows of seven cards each. Lay the rest of the deck aside and ask someone in the audience to mentally select one card in any one pile, and then tell you which of the three piles it is in. Pick up one of the other piles, then the one containing the chosen card, and finally the other odd pile, thus getting the seven containing the chosen card between the other two. Now count them off again in three piles, adding one card at a time to each pile, and again ask which pile the chosen card is in. Pick them up again with the pile containing this card between



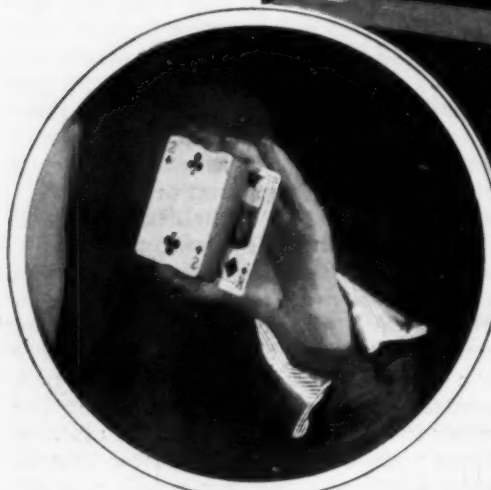
the other two, and count them off a third time, and again pick them up. On this third time the chosen card, no matter where it may have been in the beginning, will be the middle card of the middle pile; in other words, fourth from the top of the center seven.

As you pick this pile up between the other two, the chosen card is the eleventh from either end of the twenty-one cards in your hand. Hold the deck, face down, and lay the cards out in sets of four, as shown in one of the photographs, remembering that the third card laid on the third pile will be the chosen one—in other words the eleventh card laid down. You will have one card left over, and this is discarded. Now ask someone to designate any pile. If it is one of the four which do not contain the chosen card, throw it aside, and continue asking for other piles to be pointed out until only the one with the chosen card is left. Should the one containing that card be chosen you simply pick up another pile, and the audience, thinking that has some-

thing to do with the trick, will rarely remark on the fact. After you get down to one pile, ask the audience to point out two cards, and throw them away if they are two you don't want, or throw the others away if the chosen one is one of the pair picked. Then have one of the last two pointed out, and follow the same course. If it is the odd card, throw it away and have the audience turn up the chosen one, or if it is the chosen one, throw away the other and have the audience turn up the one left. This trick will work with any odd number of cards which is a multiple of three—nine, fifteen, twenty-one, etc.

A good trick which catches the attention, particularly of poker players, enables you to keep dealing a good hand over and

over to the same person, while apparently redistributing them on each deal. Prepare a deck by placing three aces, next some other card, and then the fourth ace on top. Tell your poker-playing friend you are going to show him a useful way of dealing and deal off two hands of three cards each, one to



The Royal-Court Trick, Which Rearranges the Cut Cards into Suits. Top; a Close View of the Surprise Disclosure, Left, and, at Right, a Good Closing Trick, Tearing the Deck in Half



Using a Card with Turned-Up Corner in a "Hypnotic" Trick, Top, Left; the Court-and-Ace Puzzle, Right; and Below, the Final Step in the Surprise Disclosure of One of the Most Interesting Stunts of All

him and one to yourself. Naturally he will get the first ace, you the second, he the third, you the odd card, and he the fourth ace. Have him display his hand, and while he is doing that add a third card to your hand, and pick it up, but do this by holding the third card and shoving it under the other two, in the same way that many good dealers pick up cards. By doing this you get the one ace in your hand between two odd cards, and when you place them on the deck, an odd card is on top of the ace. Have your friend place his three aces on the deck, and repeat the deal. You can do it over and over without detection—the more times the greater the mystery. After several times, give the deck a false cut or a false shuffle, and still keep on dealing three aces. Finally lay your third card on top of the other two, pick up the three, place on the deck, let your friend place his on top, and hand him the deck to try it. He will deal you two aces and an odd card and find two aces and an odd card in his hand.

A trick that always puzzles is one of the simplest done with a prepared deck.



Place a jack on top, then two odd cards, and next the other three jacks. Pick up the six cards, display them fanwise, with the two odd cards concealed behind the next jack, so that the audience sees only the four similar face cards. Lay them back on top of

the deck, hold it up in your hand and explain you will now distribute the jacks through it. Lift off the top jack and place it on the bottom of the deck; next lift off the next two cards, which are the odd ones, placing them one at a time at separate places in the deck. The audience now believes you have one jack left on top, one at the bottom, and the other two spread through the deck. Invite someone to give the deck a simple cut, then hand it to him and explain that he will find the four jacks all together again. As one was on the bottom and the other three on top the simple cut brought all four back together.

A more complicated trick that is still more amazing enables you not only to tell how many cards a person has drawn from the deck, but to dramatically disclose a single card having the same number of spots as there were cards drawn. Arrange ten cards, from the ace to a ten spot, on

top of the deck, so that the ten is on top and the others follow beneath it in order, nine, eight, seven, six, five, four, three, two and ace. Now extend the deck, spread fanwise, and invite someone to withdraw any number of cards up to ten. In extending the spread deck, keep the previously arranged top cards well under your thumb, so that the choice will be forced into some other part of the deck.

Turn your back while the cards withdrawn are being counted, then have them placed on top of the deck. Explain that you do not wish to use the same cards in the trick, so give it a false cut. Then hold the deck in your right hand, with thumb at one end and fingers at the other, and apparently shuffle it, but each time let the thumb of the left hand draw one card off the front of the deck, and return it to the bottom of the deck. Count to yourself and continue until you have taken off ten cards. The next card on top of the deck will have as many spots as there were cards withdrawn and placed on top. Try the trick once for yourself and you will see why this never fails, provided not more than ten cards were withdrawn. After you have finished the apparent shuffle, the top card can be disclosed by either of the dramatic ways already described.

Another trick, which employs only the face cards, always excites wonder. Lay the

twelve royal cards out in three rows, getting one of each suit in each row, and starting the second row with a card of the same suit as the last in the first row, and the third row with the same suit as the last card in the second row, following in each case with the same suits as the first, second and third card in the row immediately above.

Glance over your layout, explain you are trying to get the cards well mixed, and if you have more than two of any one face value in a row, shift one of them for a card of the same suit in one of the other rows. This is not really necessary to the trick, but helps cover up what you are going to do. Then pick up the cards, one by one, starting with the last card in the bottom row, followed by the last card in the second and third rows, then the third card in the bottom row, and the similar ones above, and so on, until you have all twelve.

Offer the twelve cards to anybody, or to several persons, for cutting. They may be cut any number of times so long as only a simple cut is used. Then hold the deck, face down, and count off the cards into four piles, placing one in turn on each pile. Next turn the piles over one by one and each one will contain the king, queen and jack of the same suit.

Tricks supposedly using hypnotic force are always good. Look your sub-



Above Is the "Sticky Fingers" Disclosure Just Before the Thumb Releases the Deck, and Below, the Details of the False Cut; the Parts of the Deck, Reading Down, Are Bottom, Top and Middle

ject straight in the eye and direct him to count off any number of cards he wishes, piling them on the table, and then to look at the next card on top of the pack, return it to place, and put the pile on the table over it. As you give the directions demonstrate by counting off two cards on the table and then hold up the third, face toward your subject, to drive home the point that he is to look at the card at which he finally stops. As you hold the card up on a level with his eyes, with your thumb and forefinger grasping it at the upper corner, you bend the corner slightly with the finger, then place this card on the deck, and the two you counted out on the table on top of it. Hand him the deck, get him started, and then turn your back so you will not know how far he goes.

He looks at his card, places it back on the deck, and puts the pile from the table on top. As the card with the bent corner was the third from the bottom of this pile, the card he chose is now the third card past the one you marked. Count off the cards in a row on the table, keeping on until you are a dozen or so past the card with the bent corner. Now take the subject's hand in yours, have him extend his forefinger, and move his hand slowly back and forth above the pile, gradually narrowing the movement to the cards around the third one past the card with the bent corner. Finally place his forefinger on this third card and when he withdraws it he will find his chosen card. If you accompany the search with a running patter about hypnotic, psychic and magnetic forces you can make the subject believe that his finger was drawn down to the card, instead of your pushing it down.

A good way to end an evening of parlor tricks is to take one of the decks and tear it in two. It requires some strength, but

isn't hard when you know the secret. Square up the deck and take hold with one hand around each end, so that the two top joints of the fingers of the right hand touch the left wrist, and the two top joints of the fingers of the left hand touch the right wrist. Then start to twist the entire deck in opposite directions, bracing the left against the body or the table top. You will be surprised how easily the feat can be performed.



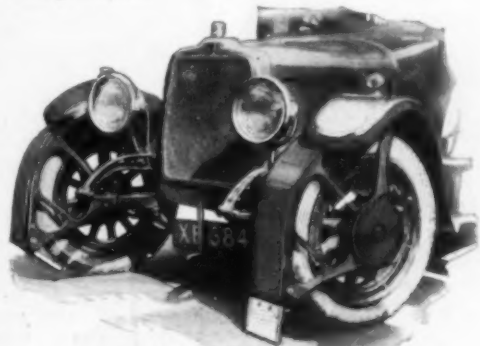
"Topsy" Ukulele with Special Keyboard to Help in Fingering; the Mouth Is the Opening in the Sounding Box, Which Is Round like That of a Banjo

SINGING "TOPSY" ON UKULELE

Painted in eight bright colors, the face of "Topsy" appears on a novel ukulele. The opening in the sounding box forms the mouth, so that "Topsy" seems to be singing when the instrument is played. A special fingering device is provided to aid the beginner.

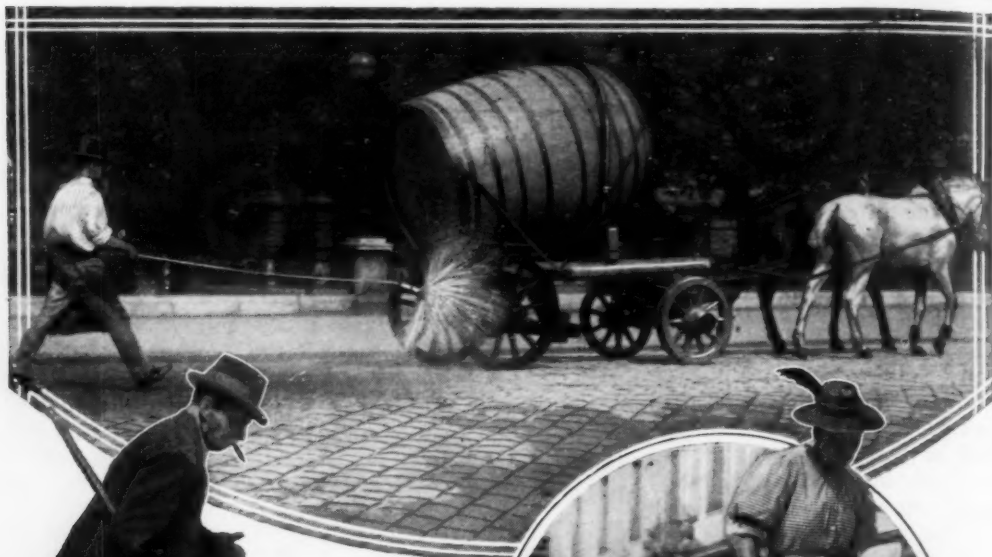
DROP GUARD ON AUTO WHEELS TO REDUCE ACCIDENTS

Guards for the front wheels of automobiles in England are being fitted so that a rubber tab at the bottom automatically drops down and prevents the wheel from passing over a person the car may happen to strike. Besides this feature, the metal shields over the tires protect the rubber in case of a collision with some hard or sharp object.



Front-Wheel Guards on Auto; One at Left Bent Back, Showing How It Protects Tire

HOW HIGHWAYS OF THE WORLD ARE KEPT CLEAN



Type of Sprinkler
Commonly Used in
Vienna and Other
Large Cities in Aus-
tria and Germany,
and, at Right, Wo-
man Worker in Mun-
ich, Skilled in
Handling the
Dustpan



Above, a Street
Sweeper in Vienna;
Below, a Greek White
Wing Wield-
ing a Coarse
Broom to
Clean the
Highways of
Modern
Athens



About Fifty Women Are Included in the Munich Street-
Cleaning Force; Most of Them Are Widows of Work-
men, and Receive the Same Pay as the Males; They Are
Accustomed to Hard, Unpleasant Work and Long Hours

LUMBER SEASONED BY COLD AIR IS BETTER

Moisture is removed from lumber by cold air instead of by heat under a patented process said to produce a lighter and stronger material without shrinkage or checking. The seasoning houses are kept almost air-tight and at a temperature between fifty and seventy-five degrees Fahrenheit, and the lumber must remain under treatment thirty days for each inch of thickness. The boards are stacked on edge, in such a way that the largest possible surface is exposed to the cold air, which circulates naturally without the aid of mechanical means, partly due to the arrangement of open spaces between the walls of lumber. It is estimated that some 5,000 barrels of liquid, including pitch and turpentine, are removed from the 2,500,000 feet of lumber in three-inch planks that can be stored in a western seasoning house during the curing process. Oregon fir, seasoned by this method, is said to be 500 pounds lighter to the 1,000-feet than when treated by other systems. The reduced weight favors shippers, while the fibers are said to be softer yet stronger.

CRANK-OPERATED METAL SHEARS CUT CURVES

Curved or irregular cuts are easily made in sheet metal with crank shears now on the market. The piece is held and guided with one hand and the shears operated with the other. The cutting is done by two circular blades and a clean, smooth edge is obtained.



Metal Cutter in Operation: Curved or Irregular Pieces Are Easily Sheared Out



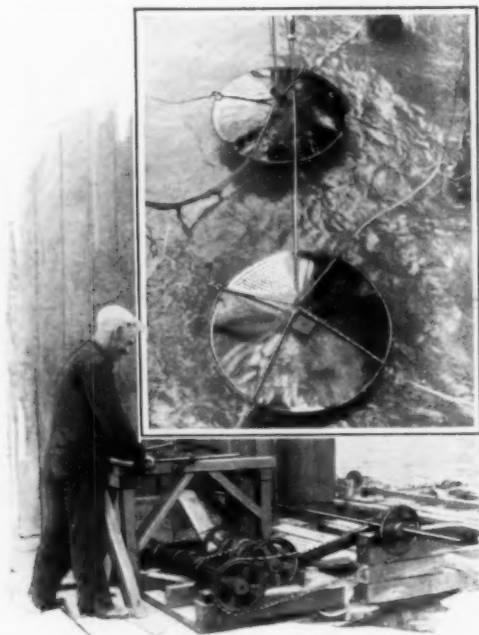
Patrolling the Beaches from the Skies; Guard Ready to Toss Life Preserver from Plane to Distressed Swimmer Below

LIFE-SAVER AIRPLANE PATROL GUARDS OCEAN BEACH

The bronzed life guards may be seen in an airplane flying over a California beach, ready to throw down a life preserver to any swimmer in distress. The pilot of the plane is specially skilled in guiding his craft close to the water. The plan enables two men to patrol a wide area and give speedy assistance.

CUT RAILROAD COSTS

Low operating costs and the ability to make long runs are features credited to the oil-electric type of locomotive. The Baltimore and Ohio railroad ran one engine, without a load, 733 miles at a fuel and oil cost of less than two cents a mile. On the Central railroad of New Jersey, a locomotive of this type pulled 44,346 tons at a cost of \$1.37 a thousand tons, whereas the expense of fuel with a coal-burning engine doing the same task was \$7.78 per thousand tons. A freight train ran 537 miles at five cents a mile.



Insert Gives Close View of the Wave Floats; Below, Part of Gears to Springs

WAVES HARNESSSED BY FLOATS TO PRODUCE ELECTRICITY

Electric power is said to be produced successfully from the action of the sea waves by means of an apparatus which a Los Angeles inventor has devised. It consists essentially of a number of floats which are placed on the water and made to tighten a series of springs by their movements up and down. The inventor declares that the apparatus, working for four to six hours, will store up a considerable quantity of electrical energy, and says that the device can be used by ships while they are at anchor, for danger signals and for lighthouses.

GARAGE DOORS OPEN BY LIGHT FROM AUTO HEADLAMPS

Operating on the principle used in making radio photographs, an apparatus has been devised for opening garage doors simply by directing the rays of the automobile headlamps on the mechanism. The light actuates a sensitive unit in such a way that the doors roll wide, sparing the garage attendant the trouble of responding and the autoist the bother of sounding his horn for attention.

POWER LOSS IN BROADCASTING LIMITS RADIO'S USE

Theories that unlimited power can be transmitted by radio are not upheld by Prof. Benjamin Bailey, of the university of Michigan. He points out that a broadcasting station may use electricity equivalent to five horsepower but power picked up by a receiving set will be equal to only an infinitesimal part of the energy sent out, less, he says, than that exerted by a fly in lifting its foot.

MOTOR-DRIVEN WOODWORKER IS WHOLE SET OF TOOLS

Several tools are combined in one portable motor-driven unit a western inventor has designed to save the cost of purchasing separate pieces and to aid the woodworker. Interchangeable parts are furnished to afford the services of a saw, a screwdriver, drill and jointer, while a planing attachment is one of the principal features. This has four cutters which revolve at high speed in a drum turning in the same direction at a lower rate of speed so that a cut as deep as one-fourth of an inch can be smoothly made at one time. Vertical action of the cutters is



Motor-Driven Saw in Foreground Is Considered Nearly Equal to All of Tools in Cabinet Behind

said to reduce the amount of power required. Sanding, shaping, jig-sawing, mortising and grinding are some of the other jobs to which the tool can be applied.



© Henry Miller

Ulric S. J. Dunbar with Realistic Landscape Model He Has Fashioned to Illustrate Special Features of Automobile Highways and Other Lanes of Travel for Sesquicentennial Exposition

MODEL OF HIGHWAY SYSTEM SHOWS ROAD PROGRESS

Modern types of auto-road construction are graphically presented in a realistic highway model on exhibit at the Sesquicentennial exposition. It was prepared by a well-known sculptor and shows bridges, culverts, pavements and other details in accurate scale. A scenic background in perspective increases the natural aspect.

BIG AIRSHIP BUILDING IN GERMANY

To be twice as big as the "Los Angeles," a huge airship now under construction in Germany will have five motors of 420 horsepower each. With word of this enterprise, it was also announced that chemists of the Zepelin works have

discovered a fuel which is expected to replace gasoline. It is said to minimize the danger of explosions.

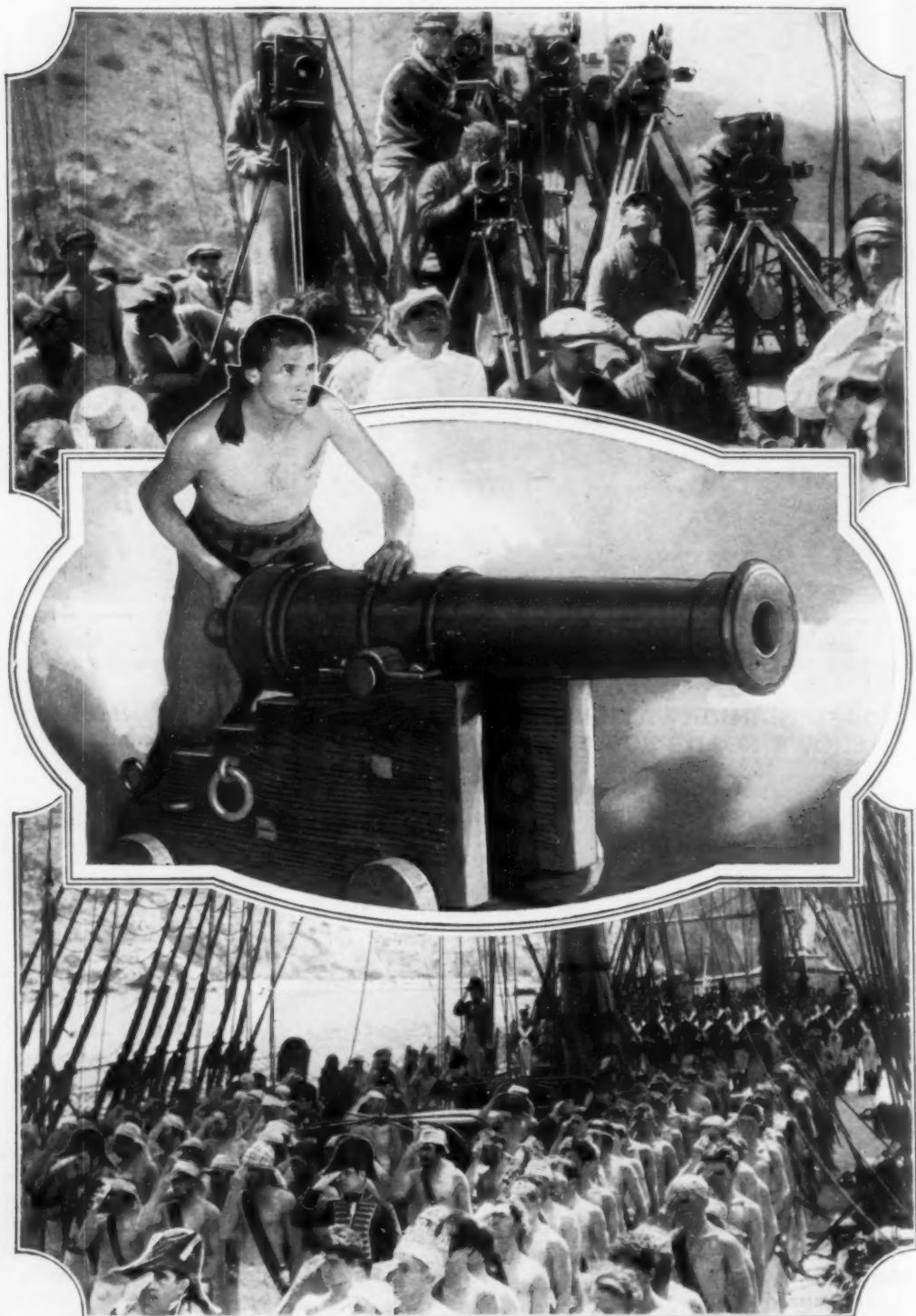
GAS STATION LIKE MUSHROOM AFFORDS WIDE VIEW

Besides its distinctive appearance, which attracts the attention of patrons, a gasoline-filling station in a western city is so constructed that it admits light from all directions and persons inside can command a view of the highways on all sides. The roof is shaped like a mushroom, a thatched effect being secured by an irregular arrangement of the shingles which are stained a suitable color. The sides are of stucco.



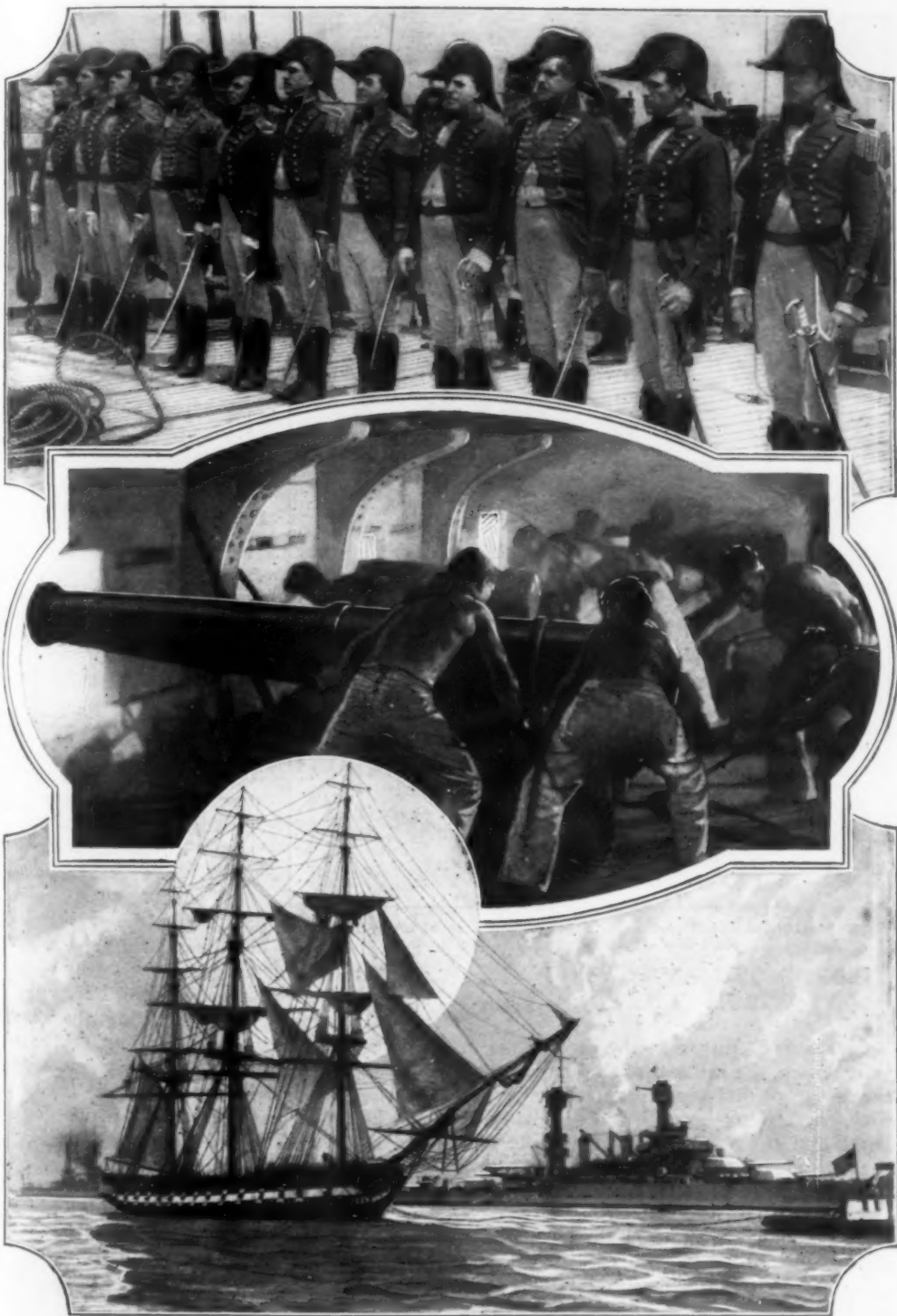
Stucco Gasoline-Filling Station with Mushroom-Shaped Roof; the Shingles Are Arranged like Thatch

HOW EARLY AMERICAN HISTORY WAS REMADE TO

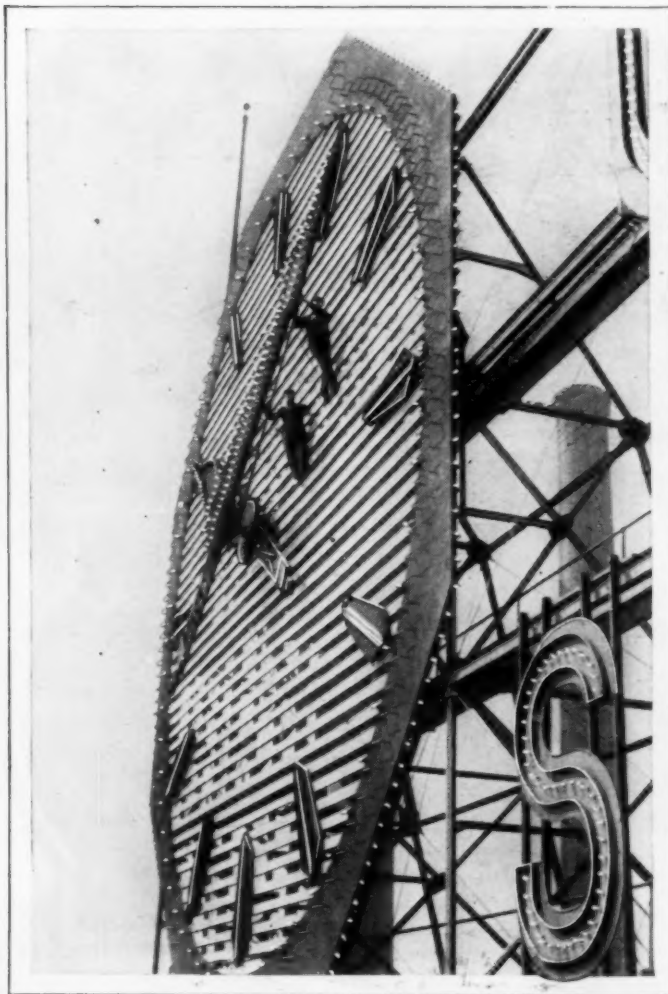


Cameras in Batteries Filming the Action as Hundreds of Movie Players Re-Stage the Battles That Made the Name of "Old Ironsides" One of the Most Famous in the American Navy's History

FILM THE THRILLING STORY OF "OLD IRONSIDES"



The Replica of a Great Frigate Fires a Seven-Gun Salute for the "West Virginia," the Latest Type of Battleship; Above, a Gun Crew at Work and Marine Officers Who Drilled the Movie Crew



Workers on Clock Dial Illustrate Enormous Size of Hands, and Figures Are Mere Markers to Represent the Hours

HANDS OF MAMMOTH CLOCK WEIGH TWO TONS

As nicely balanced as the tiny hands in your watch, the indicators that travel over the fifty-foot dial of a huge clock in Jersey City, together weigh two tons. The hour hand tips the scale at 1,800 pounds and the minute hand at 2,200. Heavy counterweights help control the movements, a slight slip ahead every three seconds. In many large clocks of this type, the minute hand makes a jump of a full minute,

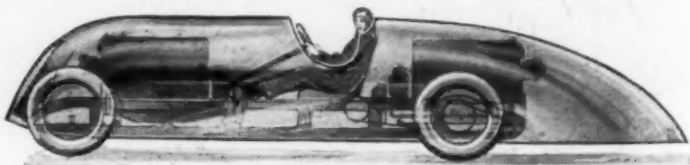
but the hands in this instrument were so large that it was considered unwise to allow such action.

MACHINE WRITES AND DECODES CIPHERS

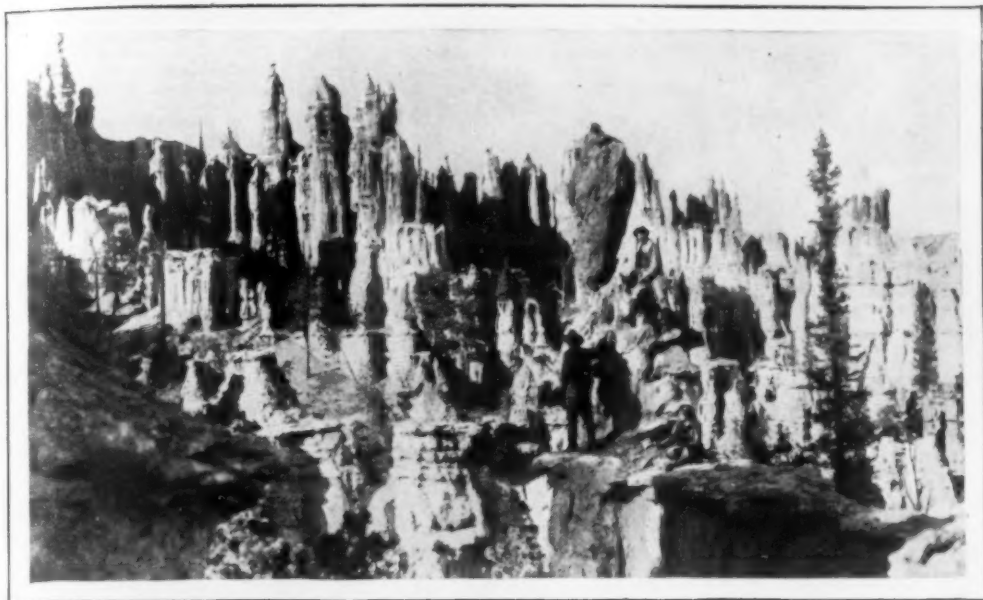
To simplify the use of ciphers in communication by telegraph or radio, a Danish inventor has devised two electrically connected typewriters. Typing on one of the instruments, automatically reproduces the message in code on the other. When this cryptogram is received, it is easily translated simply by reversing the sending procedure, the code yielding the original message as it was first typed.

TWO-MOTOR RACER FOR NEW SPEED RECORDS

By coupling two twelve-cylinder aero engines together to form a single drive to the rear wheels, an English motor expert hopes to achieve a car which will lower existing speed records on short distances. According to the specifications, the racer will be slightly more than twenty-two feet long, the wheel base nearly twelve and one-half feet, and, running at full speed, the two engines will develop nearly 1,000 horsepower. The car will be a single-seater and will weigh between two and one-half and three tons.



Sketch of Two-Engine Racer Planned by Englishman; Motors Are to Be Coupled to Form Single Drive



Nature's Weird Gallery of Rock Columns in Bryce Canyon, Where Wind, Rain and Frost Have Carved Fantastic Shapes in Hard and Soft Strata; Brilliant Coloring Enhances the Scene's Beauty

NATURE'S SKILL AT SCULPTURE REVEALED IN CANYON

Wind, rain and frost are master sculptors in a magic studio of rainbow-colored rock. So many travelers speak of Bryce canyon, a picture spot of the west, near Zion national park in Utah. Here weird statues of fantastic design and mammoth proportions have been carved from strata painted in practically every color, shade and tint of the spectrum. Hard layers, overlying softer one, have protected the material below, producing tall columns like totem poles, capped with flat blocks, the edges of which form odd profiles against colorful backgrounds.

SAHARA DESERT ONCE A FOREST

Dense forests once grew on the Sahara desert and a race of people who lived by hunting and tilling the soil inhabited the region, according to Prof. James H. Breasted, of the university of Chicago. A clue to this "lost chapter of history" has been obtained, he declares, by deciphering inscriptions and markings on a large rock in the desert. This monument has been called the "Lost Temple," but is not a structure made by man, simply a rock

shaped to resemble a temple by the winds and sands. Judging from small statues and other objects found in ancient graves during recent excavations, the early Egyptians and other peoples apparently thought of the life beyond as a realm where joy and merrymaking abound, he said.

ELECTRIC FAN IN SAFETY STAND GIVES EVEN CIRCULATION

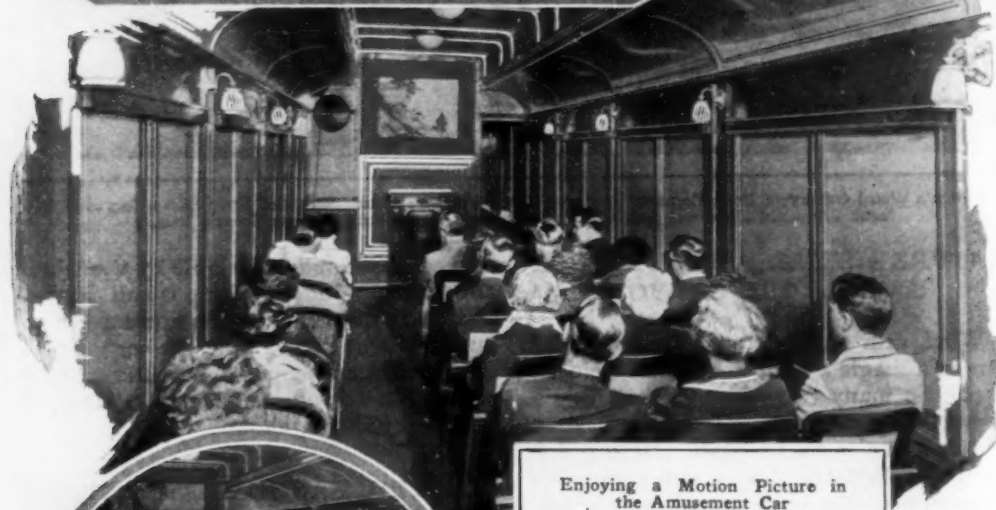


Safety and absence of unhealthful draft are two of the features claimed for an electric fan that may be placed upon the desk or table like a lamp and send the air in all directions. The revolving unit is entirely shielded by a globe-shaped grating and is said to run with practically no noise. It will not disturb loose papers and is recommended for winter use as well, to assure proper circulation of air in residences and offices.

DANCE HALL, THEATER AND GYM ON WHEELS



Conveniences Such as Real Beds, Dressers and Armchairs Are Features of Sleeping Quarters in Special Cars Constructed for Long Railroad Tours through Scenic Parts of the United States and Canada; the Land "Liners" Have Other Steamerlike Accommodations



Enjoying a Motion Picture in the Amusement Car



When the Chairs Are Removed, the Theater, Thirty-Eight Feet Long, Becomes a Roomy Dance Hall with Music from Phonograph or Radio; at Right, a View in the Gymnasium



WOMAN AS BUTTERFLY HUNTER COLLECTS RARE SPECIMENS

Gathering collections of butterflies and other insects is a common pastime, but a Florida woman makes it her business and has established one of the country's largest laboratories for preparing the specimens. Scientific institutions, colleges, other collectors and jewelers are her customers. During her first season, she is reported to have sold \$400 worth of one variety of blue butterfly common in Florida but rare in other sections. She recently received another order for 10,000 grasshoppers at three cents each.



Blowing Up the Rubber Neckpiece, Which Is Part of the Bathing Cap and Serves as Buoy

PRIZES FOR SAFER AIRPLANES TO AID AVIATION

Prizes totaling between \$150,000 and \$200,000 have been offered from the Daniel Guggenheim fund for the promotion of aeronautics, for inventions that will increase the safety of flying. It has been found that lack of public confidence in the stability of aircraft is the greatest handicap in the development of aviation. For that reason, the awards have been posted to encourage an international competition among manufacturers and designers toward solving some of the problems interfering with airplane safety. Included in the drawbacks to complete security in the craft as now constructed, are too high a landing speed, too great a run after landing, too flat a gliding angle, making approach to a given spot difficult, and the length of the run before taking off is too great. "Stalling" is one of the most common causes of accidents and means to prevent it are to be sought. Special investigation has been authorized into the development of radio and other aids to aerial navigation.

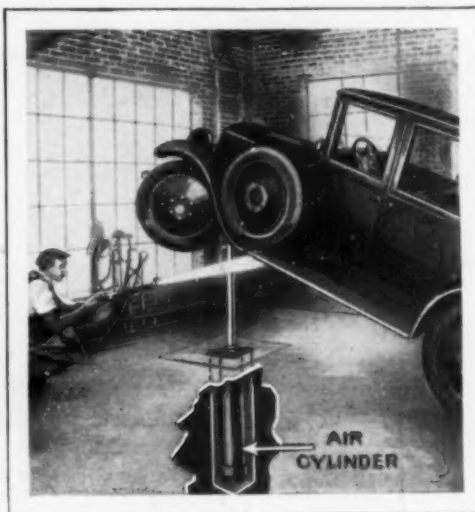
INFLATED BATHING-CAP COLLAR SERVES AS BUOY

For the timid bather, a swimming cap has a neckpiece that may be inflated to help keep the head up and the nose and mouth out of the water. It has enough buoyancy to partly support the wearer.

GARAGE AIR JACK LIFTS CARS FOR WASHING UNDERSIDE

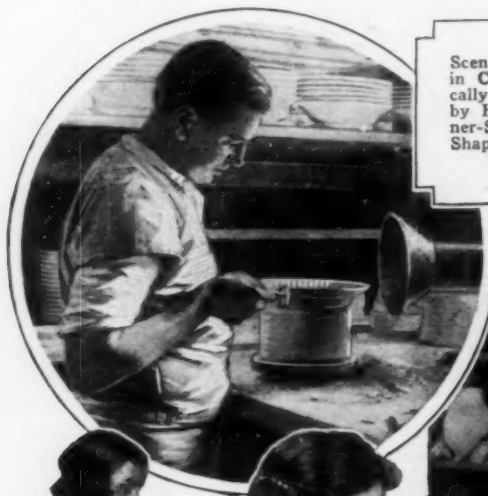
Time required to wash the automobile is reduced with the aid of a compressed-

air lifting jack that raises the car at the front end to a height at which the underside can be thoroughly cleaned. The lift consists simply of a cylinder and piston; the piston is equipped with a saddle at the top to engage the front axle of the car, and is operated by air from the auto-washing system. When lowered, the lift rests flush with the floor so that it is not in the way.



Car Raised for Washing or Repairing; Position of Air Cylinder Indicated Below

WHERE IT TAKES THREE MONTHS TO MAKE A CUP



Scenes from Porcelain Factory in Copenhagen, Where Practically All Processes Are Done by Hand; at the Left, a Dinner-Service Plate Is Being Shaped with a Safety-Razor Blade before Burning



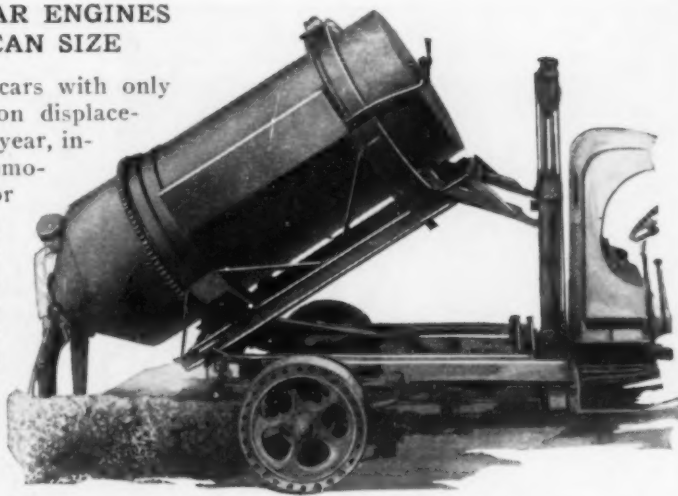
Huge Vase Valued at Several Hundred Dollars and Woman Artist Painting a Design; Many of the Workers Are Members of Distinguished Danish Families



Painting a Plate for Sesquicentennial Exposition and Putting Handle on Cup

EUROPEAN SMALL-CAR ENGINES QUARTER AMERICAN SIZE

Introduction of racing cars with only 91½ cubic inches of piston displacement, at Indianapolis this year, indicates that American automobiles within the next two or three years will be using smaller and higher-speed engines. They will still have a long way to go, however, to reach the limits of smallness already in everyday use in Europe, where cars with engines less than half the size of the Indianapolis racers are quite common. That our cars ever will be as small as the Peugeot, for example, with a piston displacement of only 40.2 inches, is doubtful, for the small car abroad has been developed primarily to meet high taxes based on rated horsepower—a problem that has never faced American motorists. In England the British light Austin and the Italian Fiat, the one with 45 inches displacement and the other with 60, are rated at seven horsepower, and are taxed about \$40 a year, whereas taxes on imported American cars of average size run as high as \$150 or more. To get satisfactory operation out of such a small motor it is necessary to speed up the revolutions considerably, and make greater use of the lower transmission gears. The driver is required to do considerably more gear shifting than with the heavy, high-powered American cars. Anything over 2,200 revolutions per minute may be classed as high speed with American cars, while the small foreign machines usually operate at 3,500.



Truck Body Raised to Dump Contents of Mixer, Which Is Turned by Power from the Motor

TRUCK-BODY CONCRETE MIXER REDUCES BUILDING COST

Auto truck body and cement mixer have been combined in one to reduce hauling and construction costs on all sorts of concrete jobs. While operated as a mixer, the drum-shaped body is turned by power from the truck motor. When the batch is done, the cylinder is tipped and the contents pour out of a rear opening. It takes about five minutes to prepare one batch. The combination effects economy in hauling time and labor cost.



Seat Attached to Ordinary Chair; It Is Folded Up When Not in Use

HIGH CHAIR FOR BABY FOLDS UP

Easily attached to any ordinary chair in a few moments, a baby's high chair can be folded into a small package for carrying or storing. It provides a safe and comfortable rest for the child and is especially handy when traveling.



Sky Writing with Kites; Letters Attached to a Group of Box Kites Are Visible at Great Distances

LETTERS FLOWN FROM KITES FOR SKY ADVERTISING

Sky writing with signs attached to kite strings has been employed for advertising purposes in a western city. The letters are of silk sewn on a backing of thin netting. From three to six kites are needed, depending upon the size of the display. A wooden slat at the bottom of each character keeps it straight.

ASPHALT CUT FROM HOT LAKE OF UNKNOWN DEPTH

One of nature's most perplexing mysteries is the hot lake of asphalt on the island of Trinidad, a 100-acre kettle that apparently keeps filling up as fast as the contents is taken out. Annually, for more than a quarter of a century, almost 125,000 tons of asphalt have been removed from the deposit, but there seems to be as much in the big caldron today as when excavations were first started. Subterranean fires keep the mass warm. It is of unknown depth, borings having been made

175 feet down without striking bottom. The only difference in the asphalt at that level is its soft, almost fluid, consistency. That exposed to air on the surface is firm and more nearly solid. The mining is done with hand mattocks, for the yielding surface of the lake prevents employing heavy units of machinery. The asphalt is cut out in large blocks, broken up and transported in small cars to the sea coast for shipment. The lake lies 125 feet above sea level.

INCLINED RACK FOR AUTO LEVEL UNDER LOAD

Requiring less space and accommodating cars of longer wheel base than can be cared for on many such devices, a tilting rack, for the garage or filling-station yard, has wide tracks and assumes a horizontal position under the weight of the car. It is twenty-two feet long, the groove width for the wheels is sixteen inches and the flooring is constructed to prevent slipping and the accumulation of snow, ice or dirt. An additional feature is a flight of steps at the side and a strong bumper that prevents the car from rolling off the front of the rack.



Car in Level Position on Tilting Rack, and About to Ascend; Note Wide Runways for Wheels

FABRIC BOAT CARRIED IN BAG ALSO SERVES AS BED



Lieut. Comm. Byrd with Boat in Bag: Blowing It Up by Sections for Use: Two with Outboard Motors, and in Service as a Bed; When Used for Latter Purpose, Canvas on Bottom Keeps Out Cold

Inflated with bellows, a waterproof-fabric boat, which can be packed into a small bag when collapsed, makes a comfortable bed for two persons when turned upside down. When wanted for water use, it may be propelled by oars or by an outboard motor and has cross strips for seats. As a mattress, it is said to be as conducive to rest as a feather bed. Cold or dampness is easily excluded by placing canvas or other substantial material between the bed and the ground. One of these combination outfits was carried by Lieut. Comm. Byrd on his flight over the

pole. Inflated in sections, it will remain afloat even if one part is punctured.

RADIO ON BARBED WIRE FENCE RELAYED TWO MILES

Neighbors of a Kansas farmer, who own radio receivers, can enjoy distant concerts with him by connecting their loud speakers to a wire fence along which the programs are relayed. The plan is said to have worked successfully over distances up to two miles. The dry cedar posts form effective insulation.



Visibly Affected by Period of Forced Wakefulness, Student Subjects Used in Experimental Tests at the End of Their Second Night without Slumber; Some Nearly Asleep Standing Up

How Loss of Sleep Affects You

Tests Show Ways to Conquer Insomnia and Obtain Greater Benefits from Hours Devoted to Slumber

A DEFINITE step in solving the mystery of sleep, which has baffled science from the earliest time, has been made by experiments in several American universities. The difference between sound and unsound sleep has been measured in electrical terms by Dr. Curt P. Richter, of Johns Hopkins, with an apparatus showing the amount of electrical current passed through the body of subjects in different states of wakefulness.

Another investigator has discovered that the average sleeper turns over as many as thirty times during a night's rest, and tests by Dr. F. A. Moss, of George Washington university, have caused him to conclude that sleep is caused by a chemical change produced in the waking hours, resulting in a state akin to intoxication. Sound sleep removes the poison.

Although Napoleon went through strenuous campaigns with only four

hours' sleep each night, Edison finds about the same amount sufficient, and others have managed to prolong their working hours by reducing the time spent in sleep, many authorities agree that at least eight hours of slumber out of the twenty-four is not too much for the average man.

Dr. Edmund Jacobson, of the university of Chicago, holds that cultivating sounder sleep, thereby achieving greater relaxation and refreshment, rather than attempting to reduce the number of hours spent in sleep is the wiser course. After some seventeen years of experimenting and study, he has originated a method of attaining more beneficial slumber and for relieving cases of insomnia and attendant nervousness.

While making tests at Harvard university in 1908, he found that, when their muscles were tense, the subjects jumped

more at loud noises than they did when their muscles were relaxed. In other words, there seemed to be a direct connection between muscular contraction and the capacity of being disturbed. From this observation, he developed what he has called a system of "progressive relaxation" to induce slumber.

His subjects lie on their backs in a quiet room. Later on, they are shown how to relax in any position. They are instructed how to achieve such perfect relaxation, that sound, refreshing sleep will come easily. A first step is to demonstrate the presence of contraction in the muscles. This is done, for instance, by having the subject bend his arm against resistance offered by the physician. Having felt the sensation produced by tenseness, it is usually easier for the subject to let his muscles become limp.

"Many persons complain that they cannot go to sleep



Steps in the Relaxation Method to Induce Slumber; Top, Learning to Recognize Limpness in Arm Muscles by Resisting Force Offered by Physician; Center, Stretching and Then Relaxing Forehead and Eye Muscles, and Bottom, a Good Sleeping Position



because tunes keep running through their heads," said Dr. Jacobson. "What probably is happening is that they are whistling or singing the songs to themselves and making minute movements of the muscles of the lips and tongue. When these muscles are absolutely relaxed, the tunes are likely to cease. Repeated tests have shown that there is a direct connection between tenseness of the muscles and mental activity. When you think hard, you naturally scowl. By letting all of the muscles go, just doing absolutely nothing, you approach a way to shut off all the activity of the mind and sleep is the normal result."

In many cases, it takes months of practice to achieve this perfect muscular relaxation, Dr. Jacobson declared, and he advises persons who



Sleep Subjects Trying to Catch Water Soiled from Swinging Pendulum, an Exercise Testing Eye and Hand Co-Ordination

suffer from insomnia to consult a reliable physician for an examination, so that any diseased condition may be discovered and given proper treatment, for relaxation is hindered if there is pain from some internal organ or if disease is present.

One of the interesting features of this relaxation system is that it can be practiced in a modified degree when you are at work. While sitting at a desk, for instance, you can relax any of the muscles not needed to maintain your posture. This rests and refreshes the whole body. Undue strain on the eyes can be avoided by relaxing the small muscles of the region even while working.

"There are several kinds and degrees of sleep," Dr. Jacobson continued, "but none is as refreshing as that which follows complete relaxation. Even if it is not necessary for a person to become perfectly relaxed, there are several important matters which will help to gain more rest and benefit from slumber. Insomnia often results from too much activity, mental, muscular or both, during the day. The skillful person is the one who learns to do things successfully with the least general tension. Avoid emotional excitement, arguments, all games that are too absorbing and too close reading just before going to bed. Never read or talk in bed.

"Don't count sheep while attempting to fall to sleep. This apology for a method most often fails, but when it succeeds, it does not lead to restful sleep, which should be invited not by mental activity like counting, but by the cessation of all mental activity. Do not partake of huge meals or exciting drinks like tea, coffee or liquors before going to bed. Some persons say that they cannot get along without their coffee. Well, perhaps they cannot, but they pay the price for their indulgence in less sound sleep. May be it helps the digestion and encourages good spirits, but it interferes somewhat with a really beneficial sleep, especially for those who do not drink it regularly.

"Everyone knows the importance of exercise, but if it is taken past the point of fatigue, it is likely to result in insomnia. It is best to intersperse your exercise with short rests so as to avoid becoming tired. One of the common mistakes made by parents who have small children is to 'show them off' to company before the youngsters' bedtime. This excites the children and often results in serious damage to the young nervous system.

"The proper occupation for adults before going to bed is not reading or animated discussion, but it is a good plan to devote an hour or so to doing little odd jobs in an idle way. This gives the mind and muscles time to calm down from the activities of the day.

"One of the frequent causes of insomnia is the drug habit. In the long run, even mild medicines given for sleep add to the sum total of sleeplessness. Drugs which produce sleep do so by poisoning a part of the nervous system, thereby leading to drowsiness. Sedative drugs are better avoided."

The kind of sleep and not the time devoted to it, is the important thing, Dr. Jacobson holds. It is possible, from six hours of sound slumber, to obtain the same benefits as might be derived from eight hours of sleep not so complete, but both Dr. Jacobson and Dr. Nathaniel

Kleitman, of the university of Chicago, believe that it would be unwise for everyone arbitrarily to attempt to cut off two hours or so from his allowance for slumber. Their advice is "sleep all you can afford." Obviously, this does not mean prolonged napping, since hardly anyone can afford the time, and too much slumber produces lethargy. But if you are now devoting eight hours to sleep, your schedule is well balanced.

"One of the reasons why we have dreams is that the higher centers of the brain are not completely at rest, leading to confusing interpretations of communications that arise from the lower centers," says Dr. Kleitman. "For instance, the bite of an insect may be felt as the cut of a sword or discomfort arising from eating pickles and ice cream may be interpreted as a weight on the sleeper's abdomen."

MAIL DELIVERED BY TRICYCLE TO SAVE FACTORY TIME

Delivery of mail in large manufacturing plants is often an important and costly problem, but an eastern concern has simplified the task and reduced the expense by means of three-wheeled carriers operated like a tricycle. Girls can easily propel them, they are not difficult to steer and hold considerable mail in large packages or letters. It is estimated that each of the young women riders pedals the carrier some 3,500 miles a year.



Efficient Delivery Tricycle Used in Large Manufacturing Plant; It Saves Time and Mail Is Kept Sorted



Laying Canvas Strips as Traffic Markers Instead of Painted Lines; Adhesive Holds Them to Pavement

FABRIC-STRIP TRAFFIC MARKER SAVES PAINTING LINES

Durable strips of white canvas with adhesive material on one side for attaching to the pavement are being used as a substitute for painted lines to indicate passenger lanes at street intersections. They are laid in a few minutes and with less trouble than is involved in painting.

OIL-PIPE MILEAGE IN U. S. SIXTY-FIVE THOUSAND

Serving to bring the crude product from the oil fields in Texas and Oklahoma to the refineries in Pennsylvania, New York, New Jersey, and other states, an elaborate pipeline system has a total length of some 65,000 miles. It is one of the busiest lanes of transportation in the world, the oil being kept steadily flowing from the wells to the city plants by means of pumping stations along the way. For the same purpose storage tanks are also scattered along the line to hold reserve supplies. The pipes are usually from four to eight inches in diameter.



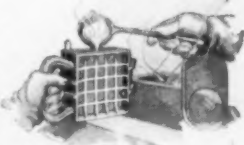
As Fruit Is Cut Off, It Slides down the Pipe into the Picker's Bag

FRUIT PICKER SAVES THE TREES AND WORKER'S TIME

Cherries, plums, crabapples and other small fruits are gathered without using a ladder or climbing the trees by a picker that clips the stems and allows the fruit to fall down a chute directly into a large pocket worn by the worker. It is therefore not necessary for the human hand to touch the crop and, besides protecting the trees from broken limbs and damaged bark, the picker is said to nearly double the amount one man can gather in a day.

CASTER PREPARES SMALL CUTS DIRECT FROM LINOTYPE

Cuts up to four and one-half by five inches are made with the melted lead from the linotype machine, without heating a larger stereotyper, in a small caster now on the market. The mat is inserted, the platens clamped and metal dipped from the melting pot of the linotype. The unit is light and easy



to handle, casts type-high and has movable gauges. It is of particular service for preparing advertisements quickly.

RECORD DANCE-STEP SOUNDS ON SPECIAL PHONOGRAPH

As an aid to dancing, a special phonograph introduced in London records the sounds of the footsteps made by the instructor so that pupils can have a permanent and accurate guide to follow. Previously, similar records were made with the aid of Chinese drums, but were not considered absolutely reliable. An English dancer recently used the apparatus and a plate-glass platform as a stage.

HANDS OF FAN-SHAPED WATCH RUN BACK AND FORTH

A watch owned by an eastern collector is distinguished by its shape and the movement of the hands. They run from side to side of the dial instead of around, snapping back automatically and starting again when the number twelve is reached. The watch is said to be about seventy-five years old and is the last of three made for German royalty.



HOW TAXIS ARE KEPT FREE FROM ENGINE TROUBLE

Motorists who are accustomed to engine trouble after the car has made 15,000 to 20,000 miles are amazed at the performance of taxicabs, which regularly make 75,000 to 100,000, or even more, before the motor is torn down for reboring and a general overhaul. One of the largest taxicab companies in the world, operating 2,900 cars in Chicago, regularly gets an average of 75,000 miles out of its engines, and in exceptional cases has run them as far as 114,000 miles before new pistons and piston rings were needed. The explanation of such remarkable performance lies in the fact that cabs, kept on the street

around twenty hours a day, with engines running practically every minute, are operating constantly at the best engine temperature, instead of having the frequent cold starts customary for a private car. Each time a motor is started cold, it takes a short time to get the oil circulating freely, and in the meantime metal parts are being subjected to hard wear. Equally surprising is the oil record, at least to motorists who regularly drain the crankcase every 500 miles. The taxicabs run a month, which means between 4,500 and 5,000 miles, before the oil is changed. Each day, if necessary, fresh oil is added to bring the level up to the mark, but at the end of the month more than five-percent dilution is rare. Every two weeks the chassis is lubricated, and every thirty days the chassis and body are gone over, loose bolts tightened, and similar minor adjustments made. At each 5,000 miles, or about once a month, the carbon is burned out. At 25,000 miles, the valves are reground and at 50,000 miles connecting rods are taken up and the main bearings overhauled.

RECORD DAIRY-CATTLE GROWTH WITH SCREEN AND CAMERA

Accurate records of the growth of dairy cattle on the department of agriculture's farm at Beltsville, Md., are kept with the aid of a camera and a specially ruled screen. The animal is led onto a level platform in front of the scaled background, which is marked into six-inch squares and is exactly the same distance from the camera each time a picture is taken, from the calf's birth to maturity, a post in the ground serving as a tripod. Comparison of the photographs shows the cow's development in terms of the increased area covered by its body.

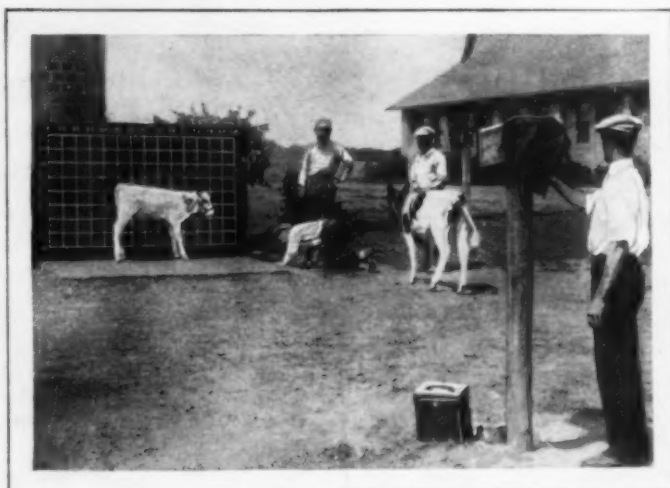
☐ For treating slow-healing wounds, insulin has been found beneficial.



An Innovation in Doughnuts, the Square Pattern and the Cutter Used to Shape Them

SQUARE-SHAPED DOUGHNUTS LATEST COOKING NOVELTY

As in other realms, the cooking art has its changing styles. A recent one is the square doughnut to replace those of the time-honored round shape. A special cutter has been devised, and cooks declare that they can stamp out more square doughnuts than round ones from a single rolling. Triangular crullers, easily cut in large quantities, have also appeared.

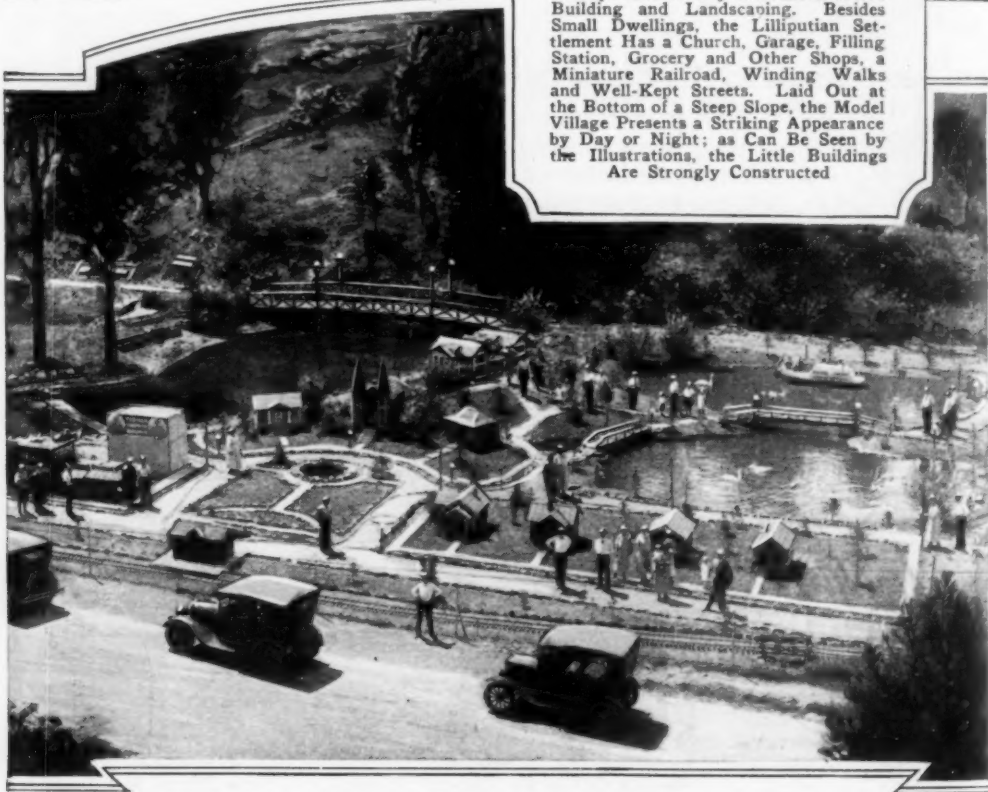


Posing a Calf for Its "Growth" Photograph; a Later Picture Will Show the Animal Hiding More Squares

TINY TOWN IS MECCA OF THOUSANDS OF TOURISTS



Electrically Lighted and with Miniature Parks, Ponds, Bridges and Other Decorative Features Closely Modeled after Those of a Real City, This Tiny Town in the Mountains of Colorado Has Given an Architect Opportunity to Express a Variety of Ideas in Home Building and Landscaping. Besides Small Dwellings, the Lilliputian Settlement Has a Church, Garage, Filling Station, Grocery and Other Shops, a Miniature Railroad, Winding Walks and Well-Kept Streets. Laid Out at the Bottom of a Steep Slope, the Model Village Presents a Striking Appearance by Day or Night; as Can Be Seen by the Illustrations, the Little Buildings Are Strongly Constructed



NATURAL OIL IN U.S. HARD TO REPLACE

Coal and shale are frequently considered as reliable and abundant sources of oil, but, according to one authority, great difficulties would be encountered should consumers have to turn to these materials if the supply of natural ground oil were exhausted. He declares that all the bituminous coal now mined and suitable for such treatment would not yield enough oil to care for the present annual increase in the consumption of motor fuel. With regard to shale, he says that it would take 1,000 tons of it to furnish sufficient oil to drive a single modern battleship at full speed for one hour. According to this estimate, the mining and processing of nearly 1,500,000 tons of shale would be required to provide fuel enough to send a battle fleet across the Atlantic ocean. This expert believes that it will take ten or twenty years to develop the shale-oil industry to such magnitude that it will count as a factor in solving the oil-supply problem.

CLOCK IN STRAW HAT LONDON FAD

Straw hats with a clock mechanism in the crown and the top used as a dial, have appeared in London. The time-piece is said to run satisfactorily, saves the bother of consulting a watch and also serves others than the wearer.

☛ Squirrels make use of their bushy tails to keep warm at night.



The Columns on Each Side of This Restaurant Interior Are Trunks of Living Trees Spared for Their Shade

BUILD HOTEL AROUND TREES TO PRESERVE OASIS

Rather than destroy highly prized trees in a desert town east of Los Angeles, a hotel was constructed around them. The trunks served as columns in the dining room, artificial leaves being used to increase the outdoor effect. The real branches were allowed to grow above the roof of the hotel.

LIGHTHOUSES MARKED TO GUIDE AVIATORS

Thirteen lighthouses in the lower Potomac river and Chesapeake bay have been marked so as to be guides for airmen. The roofs are painted with large arrows, pointing due north, and a number in figures, eight feet high, corresponding with those on the navigation charts. The system marks the seaplane route between Washington and Norfolk.



Clock-Dial Straw Hats Were Seen This Year in London; the Mechanism Is Concealed in the Crown



False Paper Eyes Transform the Face Almost as Much as an Entire Mask

PAPER EYES WORN AS MASK TRANSFORM FACE

Amusing changes in facial expression are produced with a pair of compressed-paper eyes easily fitted in place and less troublesome to adjust than a regular mask. They afford an effective disguise without hiding the rest of the face.

POCKET SCALE TELLS RANGES, HEIGHTS AND ANGLES

Several instruments are combined in a celluloid rule that fits the pocket. It can be used for determining ranges or distances and heights of objects far or near. A plumb line with bob is attached for aid in measuring angles. In computing the size or distance of an object, the rule is



Using the Plumb-Line Attachment and Measuring Range of Distant Object with Gauge

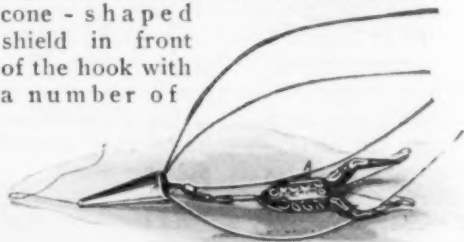
held the full length of the line, twenty inches, from the eye. Results are obtained from a scale on the rule.

ENGINES THAT RUN RED-HOT SEEN IN NEW STEEL

What engineers regard as an important aid to industry is a new steel alloy that resists extremely high temperatures. According to reports, it will work without injury at red heat so that the shaft of a turbine, for instance, could be run at the rate of as much as 1,000 revolutions a second, with a temperature of 900 degrees Centigrade. In the opinion of one authority, the material will help solve many industrial problems in the application of high-temperature gases.

FISHHOOK KEPT FROM WEEDS WITH BAIT PROTECTOR

To keep the fishhook from becoming entangled in weeds and tearing the bait, a guard intended especially for use in trolling, has been devised in the form of a cone-shaped shield in front of the hook with a number of



Trolling Bait with Its Protecting Wire Guards That Keep the Hook from Catching Weeds

spreading wires to brush away material likely to foul the tackle. It can be used with minnows, wobblers, frogs and practically every kind of bait.

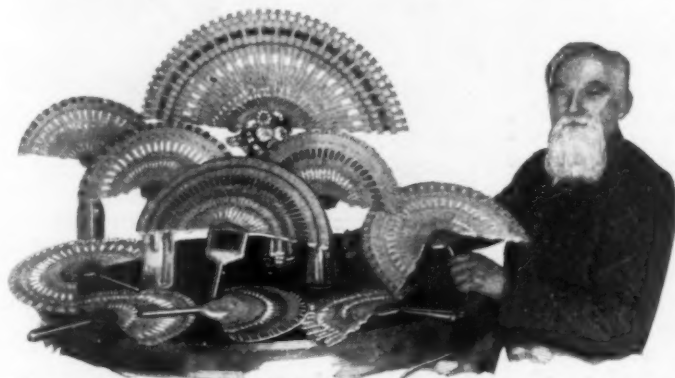
TEST RADIO UNDER MOUNTAIN SIX HUNDRED FEET HIGH

Definite measurements as to the transmission of radio signals through masses of rock have been made under Mount Royal in a tunnel of the Canadian national railways. The shaft is three and one-half miles long and, at the center, the mountain is between 500 and 600 feet high and composed of rock and limestone. Messages were received from Ottawa on a

1,400-meter wavelength and from an American army short-wave station, broadcasting on forty meters. It was found that the short-wave signals were rapidly reduced in intensity as the receiver was carried to the interior of the tunnel. They were clear at the entrance, but were inaudible on penetrating only a few hundred yards into the passage. The long-wave signals decreased to five per cent of their volume at the center. Measurements were made with an audibility meter. The tests seemed to support the theory that short-wave signals pass to the upper atmosphere and are then reflected or bent by the so-called "heavyside" layer, arriving at their destination by that lofty path and not by that of the longer waves, which travel closer to the surface of the earth.

WHITTTLING FANS FROM WOOD A VETERAN'S PASTIME

Assisted by his wife, an old war veteran in Washington occupies part of his spare time by fashioning fans from straight-grained fir and cedar. An ordinary pocket-knife is about the only implement used, and when the ribs have been shaped, they are steamed, spread to the position desired and interlaced with ribbons.



Mr. Ward and Some of the Decorative Fans Whittled from Fir and Cedar with an Ordinary Pocketknife



Where Vice President Henry Wilson Learned to Make Shoes; Cobbler's Shop at Natick, Mass., Preserved as Memorial

OLD COBBLER SHOP PRESERVED IN VICE PRESIDENT'S HONOR

Many government officials pass into obscurity soon after their years of service are over, but the memory of Henry Wilson, who was vice president of the United States during Grant's second term, is preserved in a modest little building at Natick, Mass. It is the shop in which he learned to make shoes and recalls the fact that he was known as the "Natick Cobbler." He died in 1875.

STEEL HEATED IN NITROGEN GAS TO LAST LONGER

Steel articles, heated in an atmosphere of nitrogen gas at a temperature about six times that of the boiling point of water, become exceedingly hard on the surface, according to discoveries at the Krupp works in Essen, Germany. It was found that grinding tools treated in this way, in some cases, lasted five times as long as those casehardened in the usual manner. The nitrogen is created in the vessel in which the steel undergoes the heat treatment.

METER HELPS DANCERS KEEP TIME TO MUSIC



Dancing to the Rhythm Indicator, Which Shows Correct Tempo of Different Selections

As a ballroom novelty and an aid to both dancers and musicians, a rhythm meter has been introduced. A pendulum visually registers the beats, and a dial indicator shows the tempo of the selections.

MYSTERY ZONES OF SILENCE ADD TO SEA'S PERILS

Besides the ordinary dangers of the sea, such as storms, fogs, rocks, and collisions with derelicts and icebergs, there are other perils, little known to the average person and some of them baffling to scientists. Possibly they may explain the sudden disappearance of craft that have been lost at sea and never found, and may be the basis for many of the early superstitions about the oceans. Not long ago, the "Manchester Brigade," while in mid-Atlantic, stopped suddenly and quivered so violently that the captain believed the boat

had struck a derelict. In a few moments, the ship trembled and shook from bow to stern. It developed that it was in the path of a submarine earthquake but the cushion of water, nearly two miles thick, prevented serious damage. The steamer "Nina" narrowly missed destruction when a submarine volcano exploded close by. An immense tongue of flame leaped upward out of the sea, terrifying the crew and giving rise to the belief that another vessel had blown up, but as no trace of wreckage could be found, this theory was abandoned. Falling meteors have contributed to the perils of navigation. In 1908, the Dutch steamer "Ocean" was on its way between Rotterdam and Philadelphia when a gigantic meteor fell so close that waves were flung up over the decks of the vessel and members of the crew were compelled to seek shelter below from the clouds of gas that shot up from the spot. Another meteor missed a tramp steamer by only half a mile while the vessel was sailing for Hamburg from Florida. A considerable number of wrecks off the southern end of Vancouver Island are attributed to a mysterious zone of silence, a "dead air" spot, which shuts out the sounds of fog horns and bell buoys.

MARKER FOR PIES AND CAKES INSURES EQUAL PIECES

To mark pies and cakes so that they can be cut in equal portions, a sharp-toothed divider prevents waste and eliminates guesswork. The sections are attached to an aluminum handle which is placed in the center and the points pressed lightly down to form the indentations. Pies without crust and cakes without icing may be marked before baking. The divider can be had to give equal cuts of four to twelve, and for pies is adjustable up to a tin twelve inches in diameter.



❏ Fish have the sense of smell, according to a German physiologist.



Dispatcher's Hail and Farewell Is the Watchword of the Men Who Keep Trains Moving through Storms and Darkness

MIDNIGHT, and the "second-trick" man rises to turn the train dispatcher's desk over to the newcomer of the third shift. Together they read over the "slow orders" in the dispatcher's book, run down the complicated columns of the train sheet to fix the position and the troubles of all the rolling stock on the division. Then, with a sigh of relief, the 4:00-p.m.-to-midnight man dons coat and rubbers, calls a cheery "stay on the track" and leaves. That is the hail and farewell of the men on whose shoulders rests the safety of every one who rides a railroad train. In hundreds of division offices, scattered from one end of the country to the other, the dispatchers work the clock around guiding thousands of passenger and

freight trains safely over a maze of tracks, past the switch points of innumerable sidings and cross-overs and over the junction cross lines.

Pull up a chair and plug in an extra headset on the dispatcher's telephone line, a circuit which keeps an open connection into every signal tower and station on the division. Before the dispatcher is a telephone transmitter on an extension arm, and it ends in a megaphone of loud-speaker size into which he can talk while he writes his orders, keeps the train sheet and takes the incoming reports.

This is a big-league division, double-tracked all the way, equipped with electric interlocking towers, head-end cross-overs and all the



Train Dispatcher at His Desk Getting Incoming Reports by Loud Speaker

other essentials which go to make up speed and safety. Across the desk sits the dispatcher of the branch-line division, a single track on which occasional trains must pause while others pass. His branch leaves the main line fifty miles away, and he handles it in the old-fashioned way, by telegraph.

On our side of the double desk is the main-line train sheet, on which the dispatcher plays a game more complicated than chess, with the lives of train crews and passengers as pawns.

Picture a chess game played on the columns and squares of a vast sheet of paper, six feet long and two feet wide. Rule it in half down the center and then subdivide each section again, the pair at the right for eastbound passengers and freights, and those at the left for westbound trains. Down the side run the symbols, in telegraphic code letters, of every station and signal tower on the division, which stretches for some eighty miles south and east to Chicago. Across the top the dispatcher fills in the numbers of the passenger trains and the regular freights, and, one by one as they go out,

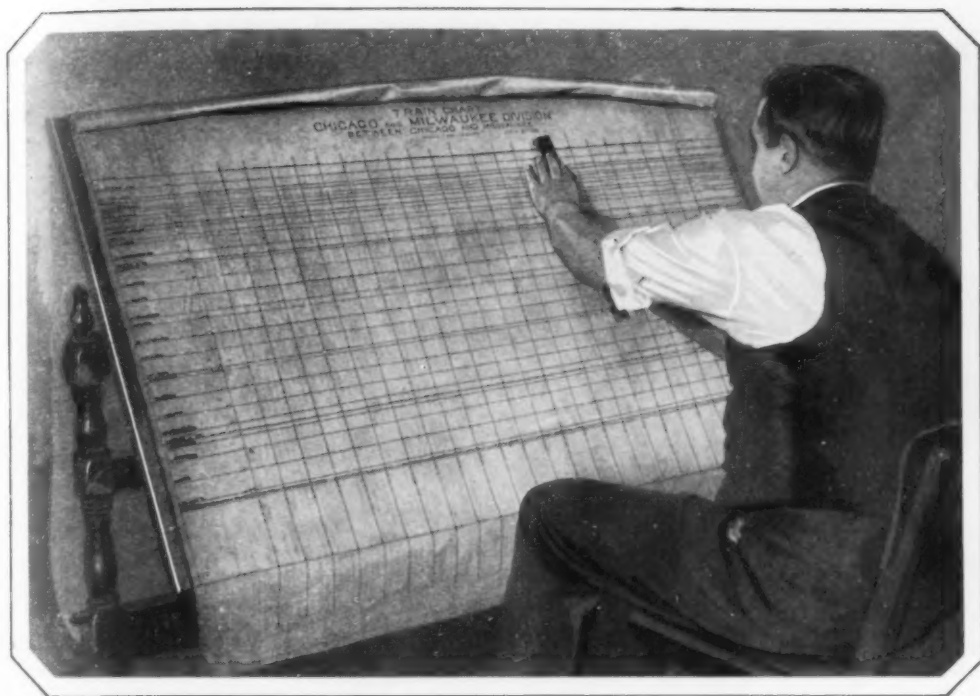
the engine number of each extra freight, and most of them are extras. Add the names of engineer, fireman and conductor, the number of cars and the tonnage in each train, and the game is ready to proceed. The list of stations and signal towers down the side takes only the top eighteen inches of the sheet. The last six is divided into sections, each with a note directing that here is to be entered the particulars of any unusual occurrence or delay.

The second-trick man has his game well under way, using the unfinished moves left over by the first shift. All the trains that were on the line at 4:00 p.m., have been transferred to the new sheet, and more are being added every few minutes, for this is a busy division, running twenty passenger trains each way daily, as well as that many, or more, freights.

A voice speaks in the open circuit of the dispatcher's telephone. Without preamble it announces, "8075 stalled one mile east of Lake. The wind is so bad it blows the sand off the track." No. 8075 is an outbound freight, started not long ago for Chicago, and now it is in trouble only



Electric Interlocking Signals Control the Network of Tracks Leading Out of the Terminal and Guide the Trains over the Route Designated by the Dispatcher's Office



When a New Time Table Is Required, the Dispatcher's Office First Lays It Out on a Chart, So That Wherever Two Lines Cross the Meeting Will Take Place at the Nearest Passing Track

eight miles on its way. Outside a howling blizzard, sprung up since noon, is raging, and, while the wind blows so hard it keeps the snow from drifting over the rails, it likewise takes off the sand that would give traction.

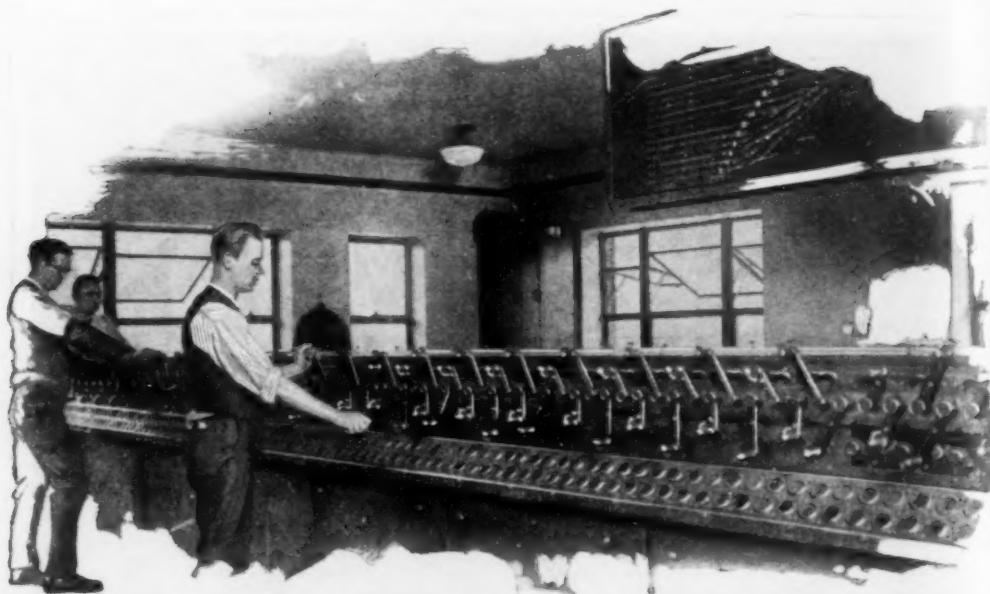
The dispatcher runs a pencil down the columns of the train sheet and finds a pawn to move to the rescue. A patrol engine is near Lake tower, shifting empty and loaded cars on industrial sidings. Lake is directed to hail it as soon as it approaches and send it down as a helper to get 8075 started.

There is a more serious problem on the train sheet, calling for the skill of an expert chess master. The morning dawned fair and mild, with a promise of spring in the air, so the trainmasters made up seventy-five car trains, with loads of better than 4,000 tons, and sent them on their way. Four thousand tons is an average fair-day load, but at noon, when the weather broke, the blizzard changed conditions completely.

No. 8237 left Chicago just before noon and at tower 13, thirteen miles out of the yards, ran into the storm. The big freight

hog puffed along to tower 20, where it took a siding to let a passenger train pass. And then it couldn't get started again. Lubricant in the axle journals was frozen, sand wouldn't stay on the track, and the biggest freight puller was left helpless. Added to that the freight was "in the dark," lost to the dispatcher, for tower 20 had been abandoned and no longer had a switch tender to report progress. A short-line telephone, from a near-by pole to the next tower, finally put the freight conductor in touch with the world again, just as the dispatcher had begun to get anxious over his lost train.

But 8237, which should have made the run in five or six hours is still on the siding, and an hour overdue. The train sheet shows a patrol at Racine "spotting," or distributing cars to factory sidings. It is ordered to the rescue, but then new trouble develops. No. 63, a regular freight, is stuck with too many tons and a grade to climb. The Racine patrol is nearest, so the order is changed and it starts to aid No. 63, help it down to tower 20, and then pick up the stalled freight and help it back north again.



Electric-Signal Controls in a Terminal Office; an Electric Chart in the Background Shows in Colored Lights the Movement of Every Train through the Yards and Prevents Accidents

Everything is serene—for less than half an hour. The patrol was nearly out of coal, and the extra demands of pushing a heavy freight exhausted it. The two engines were cut off and the freight hog towed the patrol to the nearest coal pocket—to find the fuel frozen in the chute. The near-by tower reports the thermometer down to 12 above zero and the engine crews chopping the coal loose.

Then a new difficulty arises. The patrol has been out all day, doing extra work because of the storm, and can't help the freights and get back again before its sixteen-hour period expires. No matter what happens, no crew can work more than sixteen hours, for that is a violation of federal law. So the patrol is laid up and the crew sent home, after getting No. 63 under way. That leaves extra 8237 still stuck on its siding at tower 20, sixty miles away.

The hours are passing, the crew has been out eight hours, and now starts drawing double pay, which will show in red when the dispatcher's reports are filed tomorrow, and call for an explanation, as extra pay always does.

The branch-line dispatcher, across the desk, has a patrol at work, and the branch joins the main line only a few miles from tower 20. The patrol gets down to the

main line by nine in the evening, but still has an hour or two of work there, and then its crew must be relieved. A special crew is ordered out and "dead-headed" south on a passenger to take over the patrol. By the time they get there and receive the engine it is 11:00 p.m., and the freight which left Chicago around noon is still only twenty miles out.

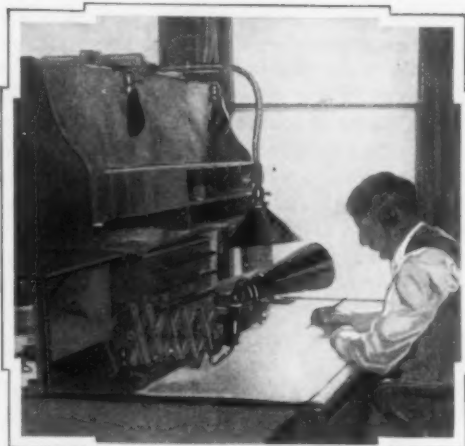
In the meantime the columns of the train sheet are filling up as each freight and passenger leaves the division ends. With every added train comes added trouble. No. 57, the fast mail, which won fame when a robber gang using tear-gas bombs stuck it up and made off with a million dollars in cash and bonds, should have left Chicago at 9:00 p.m., but didn't get away until 9:38. Because of the storm, the eastern mails were late and the government ordered 57 held for the Lake Shore pouches from New York. The government can hold the fast all-mail trains up to forty-five minutes, if desired.

The fast night express from Chicago is late in starting, held up by delayed express shipments from the east. Frequently the all-express trains are held three or four hours, if necessary, to make connections. Extra 8209 loses twenty minutes, and the cause goes down on the sheet. Section men were replacing a broken rail discov-

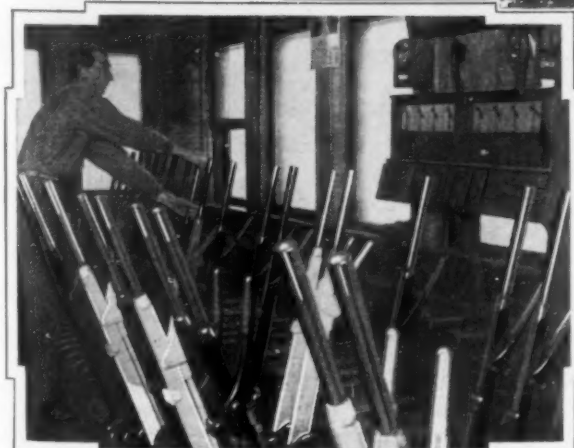
ered by a track walker. Passenger trains can't be delayed for such causes. No. 146 will have to cross over to the wrong main and round the obstruction. Orders are issued, and as the dispatcher talks into the phone he writes his words on a message blank for his record. Verbal messages not backed by written records don't go in railroading. Out comes a bottle of red ink and a zigzag line is drawn on the train sheet from the point where No. 146 takes to the wrong main to the point where it will go back on its own track. That red line must be watched and remembered until the maneuver is complete. The tower men have their orders, and, as this railroad has head-end crossing tracks, the passenger slips

from one track to the other, and then back again without a pause. There is no stopping to back, or to open or close switches, since the latter are controlled by the interlocking electric system, which provides three interlocking safeguards against carelessness or accident.

Chicago comes in on the telephone, reporting the night merchandise train made up and ready to leave, with sev-



Train Dispatcher Working at His Chart; Electrician Repairing Lights, and, Below, Part of the Levers in an Interlocking Tower



enty-six loaded cars and nine empties, a load of 2,650 tons. There is a car of horses, eleven cars of cattle and two of hogs, followed by the notation that they must be rested, fed and watered not later than 5:00 a.m. of the day after tomorrow. The feeding time of cattle in shipment is one of the charges which the dispatcher is required to watch. The government stipulates that they must have feed, water and rest at least once every twenty-eight hours, unless the shipper signs a waiver, in which case they can go thirty-five hours, but no longer. Feed costs money, and the unloading, feeding and reloading require men, so the good dispatcher tries to get the cars delivered to a connecting line before the time limit expires, and so let the other line pay the bill. And, of course, the other line is trying to do the same thing to him.

So the night goes, first one

trouble and then another, and the dispatcher must meet and solve them all. At midnight the third-trick man comes on for the "graveyard shift," which runs to 8:00 a.m., takes the uncompleted train chart of his predecessor and operates it while making up his own for the early morning hours. Business isn't so heavy during the third trick, with only through passenger trains and night freights under way, so the dispatcher has time to catch up on some of the bookkeeping of his job. The completed records for twenty-four hours must be ready when the office force comes on duty in the morning. The tonnage of all the trains handled must be footed up and divided by the number of trains to give the average for each. Back of the dispatcher, on the wall, hangs a chart, showing in red the average on each day of the corresponding month last year, and on each day of last month. It is the dispatcher's job to try and break those records each day, so that his final figures for the month will show that more business was moved with less cost than in any previous period.

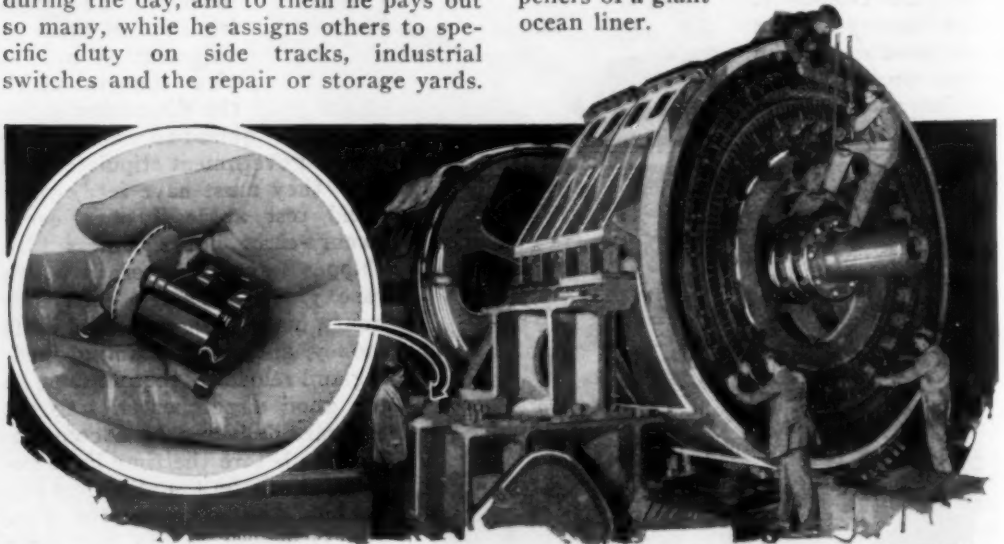
Then there are the books of the daily business to be balanced. The dispatcher handles cars like a banker handles dollars. He starts the day with so many cars on hand; his depositors—the branches and connecting lines—place so many with him during the day, and to them he pays out so many, while he assigns others to specific duty on side tracks, industrial switches and the repair or storage yards.

When the end of the day comes the books must balance again, so that the general office will know each day just how many cars the system has and where they are. Also, there is power to be watched and kept distributed where it will be needed most. If the heavy freight movement is mostly in one direction, that end of the division soon would have most of the engines, unless they were brought back with smaller trains.

This is only the story of an average night, when the trains all stay on the track. Given a derailment or a wreck, the game becomes more complicated. Because of that, the dispatcher's hail and farewell is "stay on the track." It is the one thing he hopes for in this life.

SMALLEST AND LARGEST MOTORS GIVE CONTRAST IN SIZE

The smallest practical motor in general use and one of the largest made recently were contrasted in the General Electric shops at Schenectady. The smallest motor, fitting in the palm of a man's hand, has a power output of only one-quarter of a millionth part of one horsepower, and is used in certain types of electric meters. The largest motor, fifteen feet in diameter and weighing 110 tons, has an output of 22,500 horsepower, enough to turn the propellers of a giant ocean liner.



Courtesy General Electric Co.

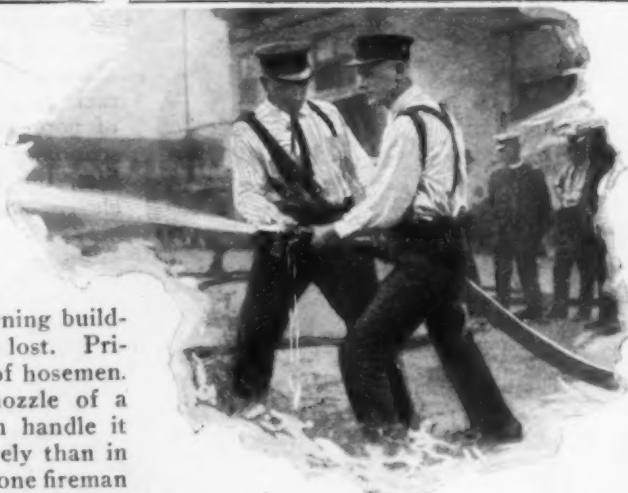
Smallest and Largest Motors, the One Fitting in the Palm of the Hand and the Other Standing as High as Several Men; Both Are Standardized Products Built for Regular Use

HOSE AND LIFE BELT COMBINED FOR FIRE FIGHTERS



Three Important Uses of the Combination Belt; Rescuing, Taking Hose up Ladder and Steadying Nozzle

More effective fire fighting is made possible by a combined hose and life belt, devised by a fireman who realized the need of it through his own experiences. It not only aids in fighting fires but is expected to save the lives of many persons caught in burning buildings who might otherwise be lost. Primarily, the belt is for the use of hosemen. It can be attached to the nozzle of a hose so that two firemen can handle it much more easily and effectively than in the ordinary way, which is for one fireman to place the hose under the arm and hold it there against the body, while another fireman behind him steadies it to direct the stream on the fire. With the belt attached to the nozzle, two firemen have successfully directed a stream of water with a pressure of 275 to 300 pounds, which usually would be a task for four or five men. The belt is easily and quickly adjusted and can be made into a life belt at a moment's notice. Recently, in a test, one fireman carried another on his back down a perpendicular ladder from the top



of a fifteen-story building. The belt holds the victim by his own weight to the rescuer, whose movements are left free because the weight of his burden falls on his shoulders and body in such a way as to be least bothersome. The belt also is proving of value in carrying heavy lengths of hose up ladders and fire escapes.

☛ When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

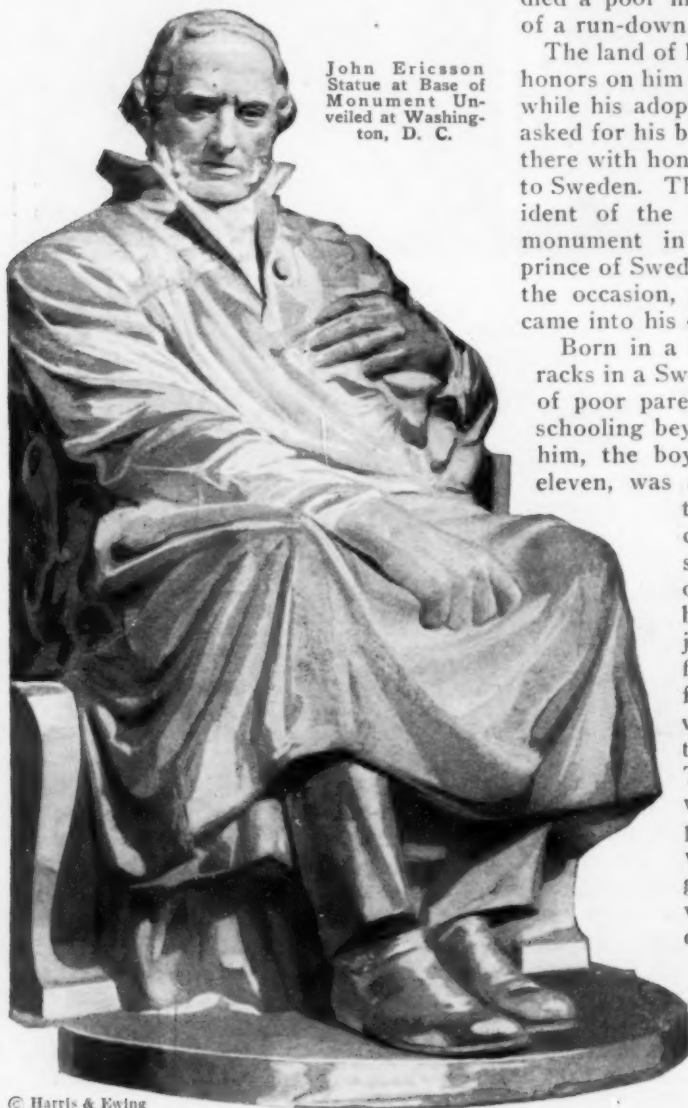
A Poor Boy Who Changed

THIRTY-SEVEN years ago, in a weather-worn old brownstone mansion, next door to a railway yard in New York city, there died one of the world's greatest geniuses, a Swede by birth and an American by adoption. His brain had reshaped the whole course of the world,

saved the Union in one of its darkest hours, taken the navies of the world out of their wooden walls and put them behind steel and iron, driven sails and paddle wheels off the sea, made high-speed locomotives and ships possible, done scores of other wonderful things—and he died a poor man in the shabby gentility of a run-down neighborhood.

The land of his birth, which had heaped honors on him for more than twenty years while his adopted country neglected him, asked for his body that it might be buried there with honor, and so it was sent back to Sweden. Then, the other day, the president of the United States unveiled a monument in his honor. The crown prince of Sweden came across the seas for the occasion, and John Ericsson finally came into his own.

Born in a log-timbered barnlike barracks in a Swedish mining camp, the son of poor parents, and with virtually no schooling beyond what his mother gave him, the boy Ericsson, at the age of eleven, was an inventor with at least two achievements to his credit. One was a practical sawmill, the working model of which was built with a borrowed file, gimlet and a jackknife, using a carefully filed strip of clock spring for a saw blade. The other was a windmill-driven pump to lift water from the mines. The boy had never seen a windmill, but from other people's descriptions he worked out the necessary gears and linkage to convert the rotary movement of the mill to the reciprocating stroke of the pump. His drawings of the apparatus were so well done they attracted the attention of Count Platen, president of the



John Ericsson
Statue at Base of
Monument Un-
veiled at Washing-
ton, D. C.

the World



Attacked by the "Cheese Box on a Raft," as the Monitor, at the Left, Was Dubbed by Navy Men, the Iron-clad "Merrimack," Right, Pride of the Confederate Navy, Finally Met Her Match

Gotha ship canal, then in process of building, and won for the boy, barely twelve years old, a place in the surveying crew. The drawings, by the way, were executed with no tools save a quill pen, dividers made of birchwood, and a ruling pen manufactured from a pair of steel tweezers.

Before he was fourteen, Ericsson was placed in charge of an entire section of the survey, with 600 soldiers working under him. One soldier was detailed to follow the boy around with a stool, on which he stood to peep through his instruments.

With such a start, he progressed rapidly. His next step was into the government survey corps, and from there to the army engineers, where he attained the rank of captain. In the meantime he

illustrated a book on the Gotha canal with sixty-four large plates, and incidentally invented an engraving machine to turn them out.

From engraving, he turned to the possibilities of flame as a source of power, and invented a hot-air engine. As late as forty years afterward a large part of the income he spent building model warships was derived from the sales of thousands of his engines, used to pump water to upper floors of New York buildings.

He obtained leave of absence to go to England to introduce his invention, and never thereafter returned to Sweden for any length of time. In England he turned out new inventions in wholesale lots. Arriving in 1826, by the year 1828 he had patented a new type of pump-



The Original Model of Ericsson's Double Propellers, Now at the Navy Department



Hot-Air Engine, One of Ericsson's Most Successful Inventions, Which Furnished Bulk of the Income He Spent on His Later Ship Experiments

ing engine, engines with surface condensers and no smokestack, and built a ship utilizing them; an apparatus for making salt from brine, for propelling boats on canals, a hydrostatic weighing machine, an instrument for taking deep-sea soundings, a file-cutting machine, and many others. The list includes fourteen inventions and forty new machines.

In 1829 he entered the competition for a steam locomotive, the rules calling for a minimum speed of ten miles an hour. Stephenson's Rocket and Ericsson's Novelty were two of four types entered. The Novelty ran away from the Rocket, going thirty miles an hour to the latter's twenty, but the Englishman's engine weighed twice as much and had greater pulling power, so it won the prize. Ericsson came back the next year with the invention of the forced draft, to which the development of railroads owes much. The same year he invented the first steam fire engine, and built one for use in London and another for the King of Prussia.

His active mind was still at work on improving the flame engine, and experiments continued until 1851, long after he came to America, when he finally abandoned it after a trial in the steamship "Ericsson," 260 feet in length. He discovered that the

efficiency of small engines did not extend to big ones needed for marine use. At the same time he was experimenting with engines to utilize solar rays, and actually built a small working model.

In the early eighteen-thirties he began experimenting with screw propellers to replace paddle wheels on boats, and built a successful working model. Next he constructed a twin-screw tug and tried it out on the Thames, achieving a speed of ten miles an hour and towing a fair-sized schooner. The admiralty agreed to give the new boat a trial, and Ericsson steamed up the river to Somerset house, took the naval barge in tow, hauled it down the river, around many bends, and back again. After that very satisfactory demonstration one of the authorities on board the barge pronounced the screw impractical because, he said, "even if the propeller had the power of propelling a vessel it would be found altogether useless in practice, because, the power being applied at the stern, it would be absolutely impossible to make the vessel steer."

Disgusted with such stupidity from one who had just been steered all over the river by a screw-propelled boat, Ericsson accepted an invitation from Francis B. Ogden, American consul at Liverpool, and Capt. Robert F. Stockton, U. S. N., to come to America. A vessel called the "Princeton" was ordered for the navy, and the screw propeller proved a success.

As early as 1854 the inventor conceived the idea for an armored turret mounted on a raft, and submitted it, without success, to Emperor Napoleon. When the Civil war broke out and the armored frigate "Merrimac," of the Confederate navy, sunk ship after ship of the Union's wooden fleet, the navy department called for designs for an armored ship, and Ericsson's "Monitor" plans were accepted. He built the ship in 100 days, and two days after completion, it met and whipped the "Merrimac." By that one invention of "a cheese box on a raft," as sailors dubbed it, he doomed wooden navies. The "Monitor" idea of a revolving turret mounting very heavy guns, was the father of the present battleships.

Having devised an apparatus that made wooden warships useless, Ericsson promptly set to work to perfect a ship

that could sink monitors. The result was a torpedo boat, which he named "Destroyer"—a name that has since been given to all of its class.

MYSTERY OF OCEAN CURRENTS SOLVED BY BOTTLES

The second mate fixes the steamer's position, writes down the bearings on a slip of paper and stuffs it into a bottle which is corked and thrown overboard. Nearly a year later, the bottle, covered with barnacles, is washed ashore 1,450 miles away, is found and returned to the navy department, increasing the navy's knowledge of the mysterious ways of the ocean. What is said to be the most remarkable trip of a bottle was started from the British steamship "Australplain" about 750 miles south and east of Africa. After three years, it was recovered off the coast of Chile, having traveled 8,800 miles.



Barnacle-Covered Bottle and Paper Which Was Placed Inside It by the Navy Department; the Blank Has Been Filled Out by the Finder



Placing Suit on Hanger for Packing in Handbag; It Keeps the Garments Flat

CLOTHES HANGER FOR HANDBAG PREVENTS WRINKLES

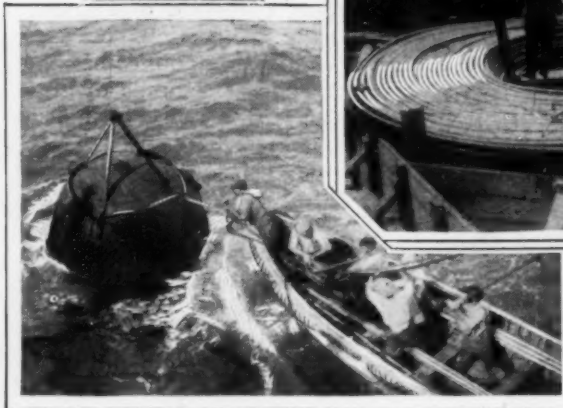
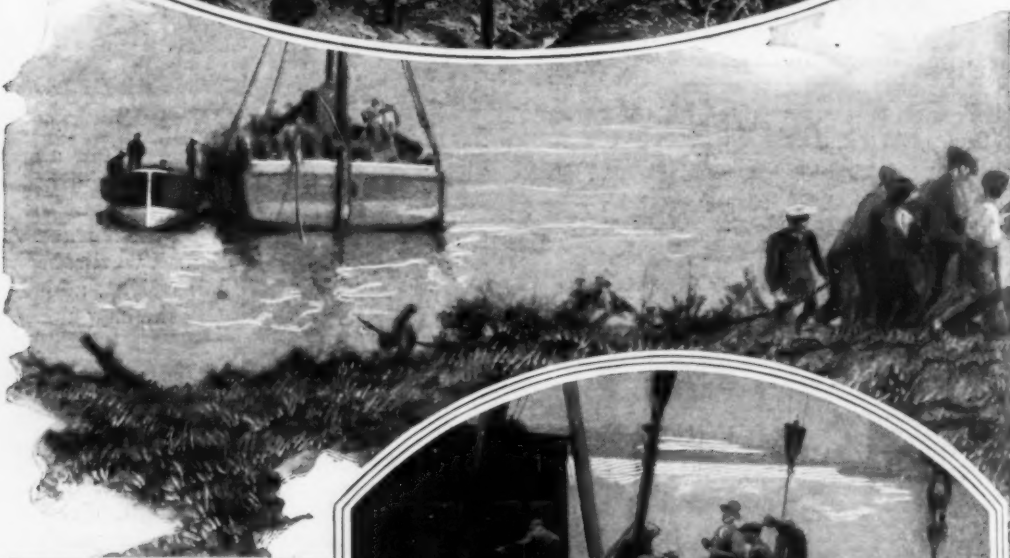
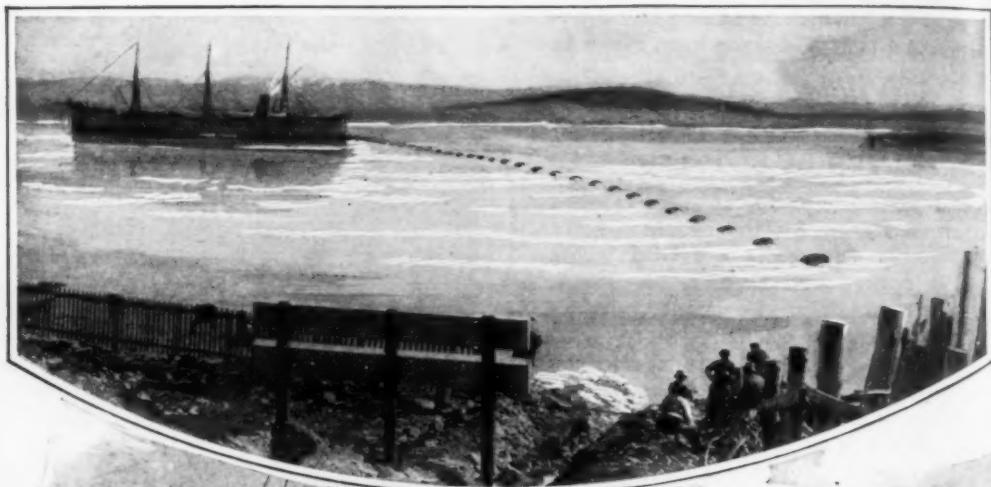
Suits of clothing can be carried in an ordinary handbag with less likelihood of becoming wrinkled with the aid of a hanger of flexible fiber now on the market. It converts the grip into a small wardrobe trunk, saves space and, being light, adds but little to the weight of the baggage.

SALT AS WELL AS MOLASSES USED IN PHONE BOOKS

Several items that appear strange to the layman enter into the making of telephone directories. For instance, in last year's supply for the state of Illinois, there were 183 pounds of molasses, eighty-nine pounds of salt, more than 15,000 pounds of glycerin and over twice as much glue. The Illinois Bell Telephone company printed 2,654,112 books that, together, contained nearly 2,500,000,000 pages and required more than 6,000,000 pounds of paper. Some 114,000 pounds of ink and 537 pounds of staples were needed to finish the books.

Ⓛ Bolted to the garbage-can lid, a disinfectant pad is said to remove odors.

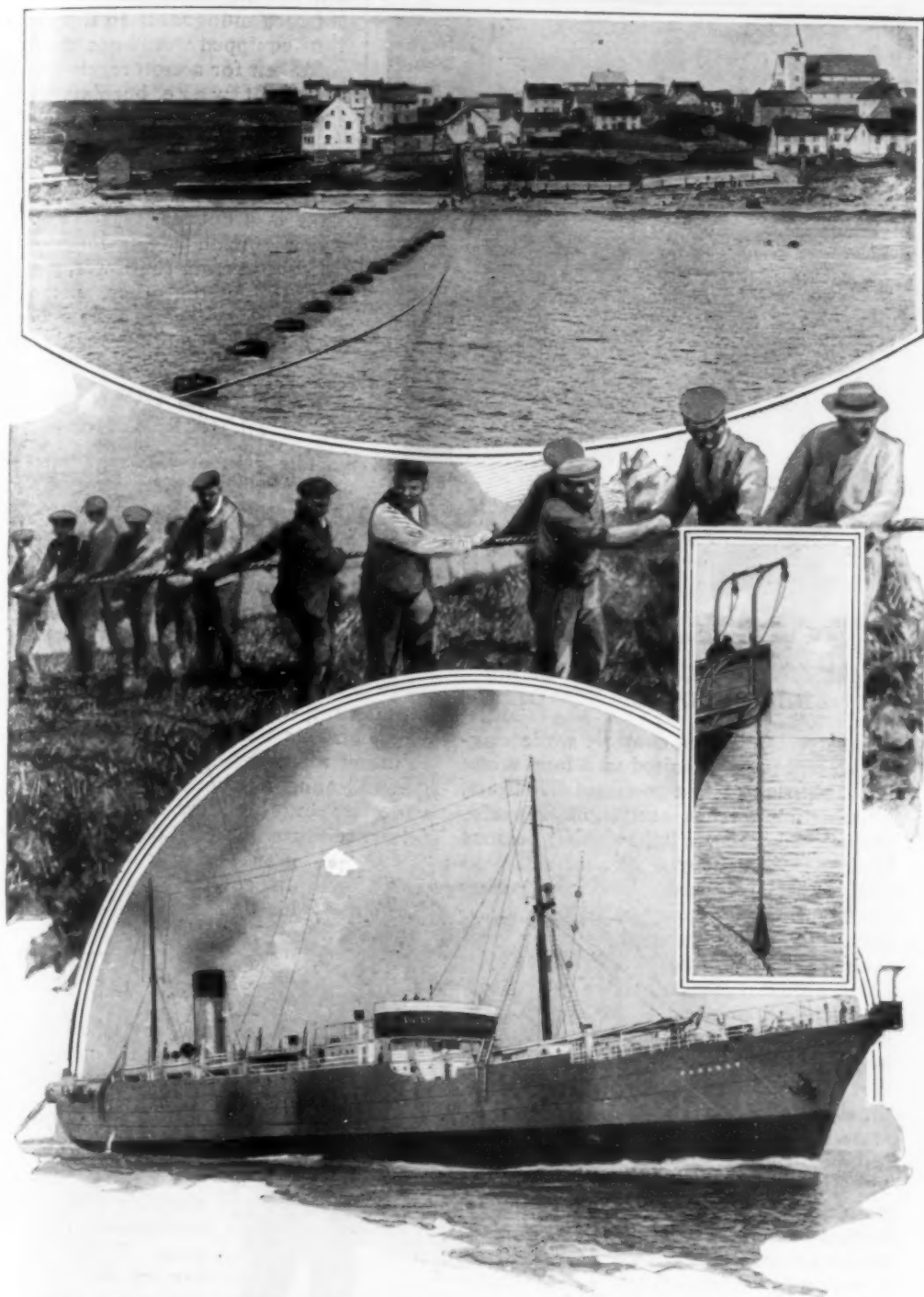
Fastest Cable to Span Atlantic Will



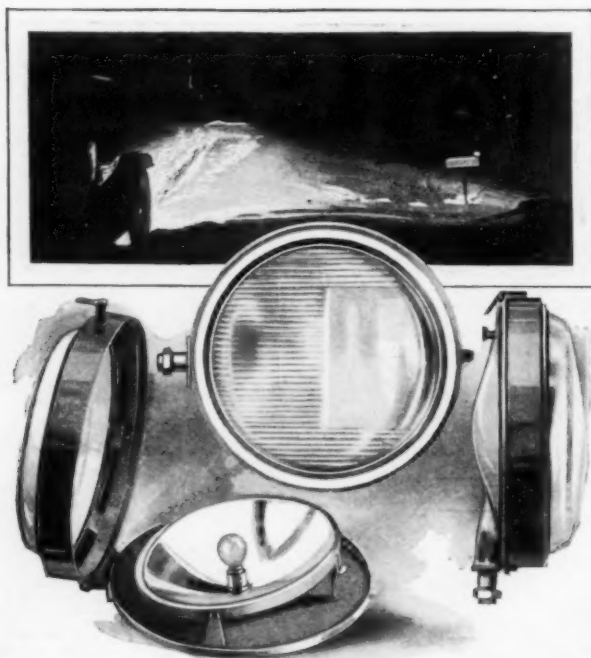
In Laying the Shore End, Barrel Buoys Temporarily Support the Line Until It Is Connected; a Coil Containing Seven and One-Half Nautical Miles of Cable; at Left, Buoy to Mark the Course; on Opposite Page, Inset, Grapple to Hoist Cable and Cable Ship "Faraday"

New York and London Are to Be Brought Closer with the Laying of the Twentieth Transatlantic Cable, 3,800 Nautical Miles Long, Affording Direct Communication between the Cities

Have Speed of 2,500 Words a Minute



The Line Is Partly Made of Permalloy, a Composition of Iron and Nickel, Wrapped as a Thin Strip, One-Eighth of an Inch Wide, around a Copper Conductor



Upper Photo Shows Both Side and Front Illumination Afforded by the Headlight; Details of the Lamp Below

GLARELESS AUTO HEADLAMP LIGHTS SIDE OF ROAD

Greater safety and comfort while driving at night are promised in a long-range headlight that casts a powerful side beam, illuminating ditches and signs. It also projects a backward light so that persons in the car can easily read signs when the front end of the auto is several feet past such legends. Tests have shown that, when the beam is set at one degree above horizontal, at 100 feet there is no glare, unless the observer, stationed at that distance, places his head almost to the ground. It was further demonstrated that the lights appear to grow dimmer as persons walk toward them. They illuminate the radi-

ator, bumpers and front end of the forward mudguards so that a car thus equipped would not likely be mistaken for a motorcycle if only one light were burning. The lamps are only about three inches thick and new bulbs are easily installed. Reflector and lens are so adjusted that a double crescent of light is produced, rays from the upper portion having long range and those from the lower, superimposed on the other, spreading evenly over the entire road, ditches, telegraph poles and trees.

DEATHRATE OVER FORTY IS INCREASING

The gain in life expectancy is due largely to the saving of lives under thirty-five, according to Dr. J. Howard Beard, of the university of Illinois, because the death-rate over forty is increasing. There are four more deaths per thousand persons between forty-five and fifty than twenty years ago, six more between fifty and fifty-five, and eight more at fifty-five to sixty. Better control of communicable diseases and decrease of infant mortality have lessened the dangers to younger persons, but the gain may be offset by the increasing number of fatal accidents. An epidemic of contagion is being succeeded by an epidemic of injury, in his opinion.

SOAP PULVERIZER CUTS WASTE

Easily attached to the wall, or other convenient place, a small box-shaped grinder that cuts cakes of soap into powder, reduces waste and prevents clogging drain pipes with pieces of unused soap. It will shave bars of any shape or degree of hardness, and is operated by turning a small key.



Grinding Out Powdered Soap from the Cutter Box Which Preserves and Keeps the Cake Clean

SHIPS' CLOCKS SOUNDING SEA BELLS IN MANY HOMES

Ships' clocks as the latest in home decoration have seized the fancy of thousands during recent months and caused a veritable run on supplies of the seagoing timepieces. Early last fall, for no apparent reason, orders for ship clocks began to pour in to the makers from all parts of the country. One company alone sold more than 13,000 during the winter. Clock makers attribute the sudden interest in the bell-striking clocks to the fad for ship models, old sea maps and other things nautical.

BICYCLE WITH JOINTED FRAME REDUCES SHOCK

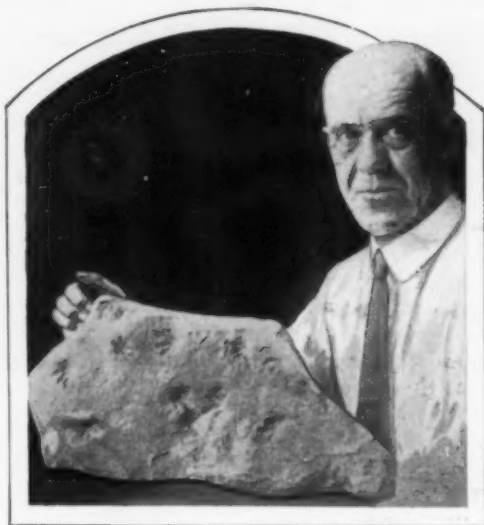
Equipped with a strong spring action in the center sprocket-bearing joint, a bicycle can be ridden over objects of considerable size without throwing the entire frame off line, thus lessening the shock to the rider. If, for instance, the hind wheel passes over an obstruction, the spring per-



Spring in Socket Joint Keeps Bicycle Frame on Line While Going over Obstructions

mits the rear section of the bicycle to rise, absorbing the bump so that only a small portion of the shock is communicated to the operator.

When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.



Fragment of Grand Canyon Rock Containing Several Footprints of Some Prehistoric Creature

FOSSIL FOOTPRINTS AGES OLD FOUND IN GRAND CANYON

Evidence of animal life that roamed the Grand canyon, thousands of years ago, has been taken to the Smithsonian institution in the form of fossil footprints. A ton and a half of sandstone and shale, in which the prehistoric creatures left records of their roving, was gathered from three different levels of the canyon by Dr. Charles W. Gilmore of the National museum. The lowest was at 1,800 feet below the rim and 400 feet underneath any prints previously found. It is believed that the animals were early amphibians and reptiles belonging to the same families as those of which skeletons have been found in deposits of the Permian period in Texas, Oklahoma and New Mexico. The rock must have been soft sand when the tracks were made. The footprints were covered by successive layers of sediment. Other creatures crawled across this surface, some leaving deep impressions, close together, indicating heavy, squat-legged animals, and others the unbroken trail of a worm. The Colorado river, cutting through these accumulated strata, has exposed the ancient pages so that fragments of the story of life at those times can now be gathered. In all, the trails of some fourteen different kinds of animals were found.

World's Queerest Race Track Built for Germs

Winners, Galloping Along under a Microscope, Prove to Doctors That Only Bacteria Charged with Electricity Are Harmful

THREE research workers, toiling in a laboratory at the university of Chicago, recently discovered that the deadly pneumonia germ became a harmless creature if an infinitesimal charge of electricity was removed from it; that it was turned again into a man destroyer when the charge was restored; and that past failures to perfect a serum to immunize against pneumonia were due to the fact that the pneumococci work just backward from germs which have already been conquered.

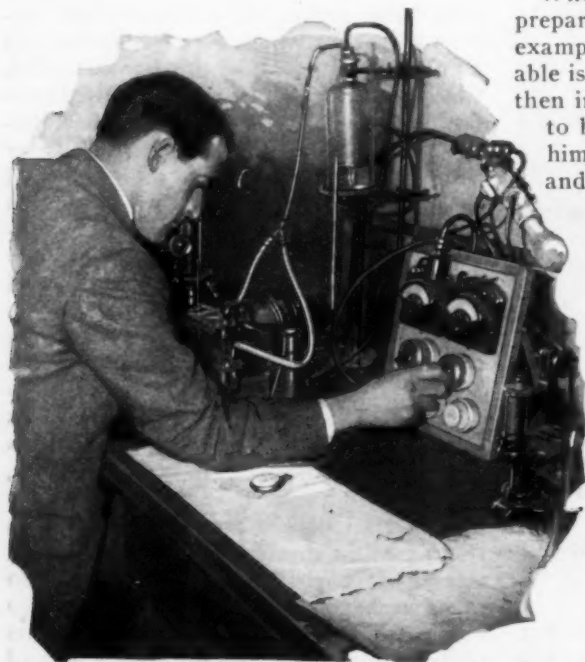
In those three discoveries—the result of two years of work by just one section of a vast scientific commission set up to rout influenza, pneumonia and all the pulmonary diseases—the research world has at last begun to penetrate the mystery of the life of the microscopic world which is inhabited by untold billions of germs.

Starting out to find the reason why germ cultures grown in the laboratory steadily lose their virulence with each succeeding generation, Dr. I. S. Falk and his

associates, H. A. Gussin and M. A. Jacobson, uncovered marvel after marvel. They found that each tiny germ—so small that it takes millions to form a cluster as big as the head of a pin—had a negative electrical charge, or potential difference, in direct proportion to its virulence. A fresh and deadly culture showed as much as twelve to fourteen-thousandths of a volt; and one that had lost its strength so far that no reasonable amount would kill even a mouse, showed the charge was almost gone, running as low as two or three-thousandths of a volt. They found harmful germs could be rendered harmless and harmless ones made virulent by simply adding to the food on which they were grown the necessary salt or acid or alkali to take away or put back the electricity. And then they found that the pneumonia germ is unlike any germ they had dealt with before, and, therefore, that all past attempts to make a serum to save people from the disease had been made with the wrong kind of culture.

When the laboratory wants to make a preparation to prevent typhoid fever, for example, the most deadly culture obtainable is used, the germs killed by heat, and then injected into the body of the person to be immunized—first a little to make him just a bit sick, then a bigger dose, and finally the biggest dose. The theory is that to protect from disease the worst germs available should be killed and used. But the thing that counts in making a serum is what the laboratory calls the antigens, and, unlike such diseases as typhoid, they discovered that pneumonia cultures contained more antigens when they were weak and harmless than when strong and virulent. So the next step in the experiments, which are to continue, may solve the serum problem.

The work started with a number of pneumonia cultures of various strengths. There was culture "A," which was so powerful that it would kill a mouse when



With One Eye on the Microscope and the Other on the Watch, Dr. Falk Turns the Switch That Starts the Germs down the Track

only one-millionth of a drop was used—this amount being so small that two or three individual germs were fatal; culture "B," which took as much as a thousandth of a cubic centimeter to produce fatal results, and others were non-fatal when as much as one-half of a cubic centimeter was injected.

A queer apparatus of glass tubes and valves and an electrical switchboard were built, with a glass funnel up at one side into which a mixture of fluid and germs could be poured. The whole thing was assembled around and over a microscope, and when the observer, with an eye at the microscope, a stop watch in one hand and the other hand on the electrical switch, turned the button that sent a current into the tubes of liquid, he saw one of the strangest races that was ever timed—dozens of disease spreaders galloping along, some fast, some slow, but all in one direction.

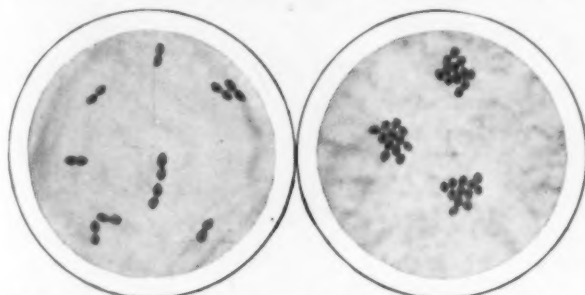
The germs all had negative potentials, and when the current was turned on they began moving toward the end of the tube where the positive wire led in, as electricity attracts opposites. But the speed at which they moved depended entirely on the amount of their negative potential—the greater the amount the greater the attraction, and so the faster they went. And the observer, with one eye at the eyepiece and the other on the stop watch, timed the galloping germs over a measured course, and by a system of involved figuring translated their speed back into terms of their electrical charge. Time after time, through hundreds of experiments, the figures were checked, always



Pouring the Mixture of Pneumonia Germs and Liquid into the Tubing of the Electrical Race Track, Built under a Microscope

with the same result. Bad germs had a big charge, not so bad ones moved at medium speed, and the harmless brands sauntered along so slowly as to show their potential difference was approaching the zero point.

Then the watchers began juggling the pneumococci's electricity. They knew that potential differences could be altered by addition of various things, so they sent word to the germ-culture kitchen, where the cooks brew the broth on which the cultures feed, and had a bit of this and that added to various lots of the culture medium; prepared clean, fresh flasks; heated up their platinum rods over the gas burners to sterilize them; deftly lifted out a bit of this culture and that, and transferred the germs to the new food. Into the incubators the tubes went and new colonies of germs were raised, children of those that had already been clocked over the measured race course. But when the young colonies were poured down the funnel, the current turned on, and the race started, everything was changed. The children of the bad but speedy germs lagged



What Electricity Does to Germs; Negative Charge Keeps Them Apart, on Left, and Its Removal Unites Clusters, on Right

behind—because the material added to their food had robbed them of their high negative charge. And the children of the poky but harmless germs sped across the field of the microscope propelled by the high potential which they had obtained from their food.

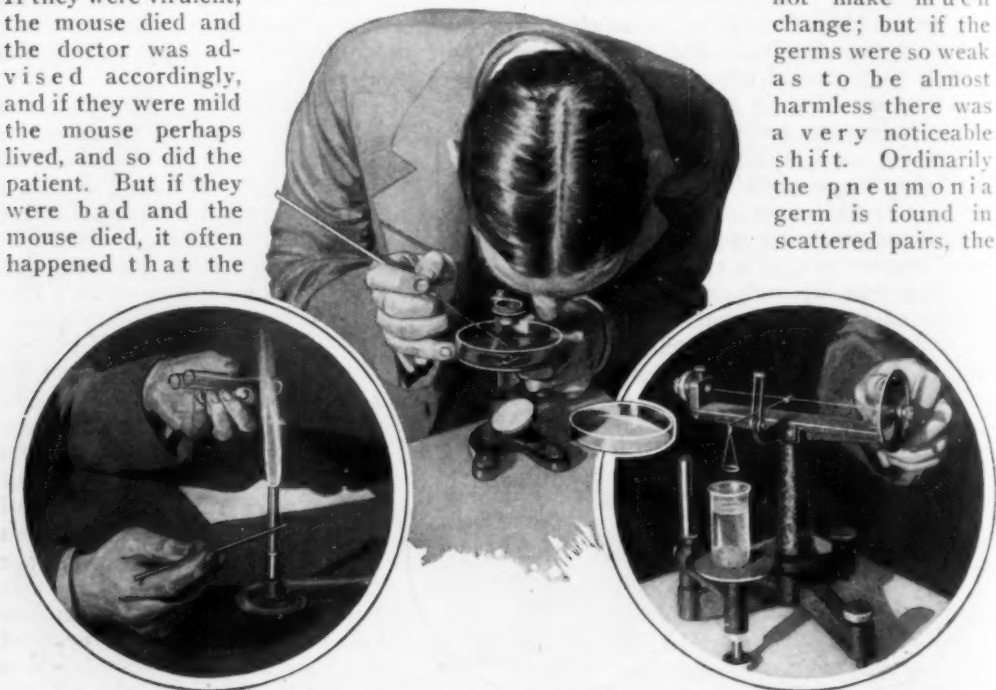
Then they grew a third generation, but switched the foods again, and in the third race, the grandchildren of the bad germs were bad again and the grandchildren of the harmless germs were harmless again.

The question arose whether a bit of salt or acid or alkali couldn't be injected into the veins of a pneumonia sufferer to take the charge off the germs in his system, and so save his life. A colony of rabbits was brought in, bad germs injected into them, and the experiment tried, with doubtful results. It may have worked, or it may not have—only further experiments can tell. But while that was going on another idea was tried, and with success. In the past, when the doctor wanted to know whether his patient had a mild or a virulent type of pneumonia, he took a culture and sent it to the laboratory, and the germs were tried out on a white mouse. If they were virulent, the mouse died and the doctor was advised accordingly, and if they were mild the mouse perhaps lived, and so did the patient. But if they were bad and the mouse died, it often happened that the

patient had died, too, before the information had been gained.

So Dr. Falk and his associates called for all the pneumonia cultures the hospitals of Chicago could provide. And they separated the germs in half, sent one-half through the mice in the usual way and put the other half through the microscope race course, clocked them over the measured course, and, as they moved fast or slow, advised the doctor that his patient had a good chance or a poor one. And usually the patient had the one or the other, just as the race track had indicated. So, right away, they cut many hours and days of delay from the analysis of the disease.

While the experiments were going on they found the answer to another puzzle that has perplexed the microbe hunters in the past. A mouse or a rabbit can be immunized against pneumonia by injecting freshly killed germs into its body, in increasing doses. Then it can be killed, a watery serum extracted from its blood and this serum mixed with pneumonia cultures. If the cultures were virulent, the observers had found, the serum did not make much change; but if the germs were so weak as to be almost harmless there was a very noticeable shift. Ordinarily the pneumonia germ is found in scattered pairs, the



Handling Deadly Germs; at Left, Preparing to Transfer a Fresh Culture; Above, Seeking Germs Growing on Special Diet Kitchen Food, and at Right, a New Device That Measures the Surface Tension of Bacteria

two little round cells forming a sort of figure eight. But when the serum is added to the weakened, non-virulent strains, these scattered clusters begin to clump together.

The measure of the potential difference of the germs showed that it was probably the negative charge that held them apart—as like repels like in electricity; and that when the serum was added it neutralized the last of the charge, already weak on the nearly harmless germs, and permitted them to cluster together. The clustering was helped along because each germ is covered by a thin film of liquid which differs, owing to its contact with the germ, from the surrounding liquid. When two germs met, the bubble films had a tendency to combine in one bubble, and the process continued as more bubbles joined them.

So the research workers decided to study this film, which may be likened to a rubber balloon. Inside, instead of gas, was the germ, exuding something that was trying to get out and injure man, just as the gas tries to get out of the balloon. And outside was the surrounding liquid, trying to get in, so that between the two conflicting forces the bubble film was under constant stress. And just then a new instrument came along which is so delicate that it can actually measure the surface tension of the film on a germ so small that a pin point would be a mountain beside it.

The practical results have not begun to appear as yet, at least in their entirety. Further experiments, and additional research in other laboratories are necessary before pneumonia is actually conquered. But in the meantime the way, it is believed, has been paved toward an entirely new understanding of the whys and wherefores of a germ.

☛ In Chile, wild potatoes grow about as large as hazelnuts.



Members of Class at Art Institute of Chicago with Puppy Posing, to Aid the Young Sculptors in Rapid Clay Modeling

PUPPY MODEL FOR ART CLASS AIDS YOUNG SCULPTORS

Members of a juvenile class at the Art institute of Chicago receive instruction in rapid molding with clay by using puppies and other pets as models. Instructors have found that the children take added interest in molding from such subjects.

BULB WITH LUMINOUS CROSS FOR HOME RITES

For religious observances at home, a bulb with a luminous cross on the inside operates on either direct or alternating current. It burns for about 3,000 hours.



Close View of Bulb with Luminous Cross, and Two Adaptations of Its Use

Artist's Sketches of Garage System in Jeweler's Building at Chicago: Only Attendants Have Access to the Storage Floors, Cars Are Not Touched by Human Hand from Entrance to Departure, and as Motors Are Not Running, Fumes and Wasted Gasoline Are Eliminated

AUTOS PARKED IN SKYSCRAPER ON TWENTY-TWO FLOORS

Part of the space on twenty-two of the forty-four stories of a new Chicago skyscraper are used for a garage with a total capacity of 572 cars.

A feature of the installation is that, from the time the auto enters the building until the owner gets it back again, it is not touched by human hand. This has been accomplished by an arrangement of tilting racks on each of the four elevators used and on the storage floors. The driver runs his car upon a loading platform before one of the elevators. From a

master control board near by, an attendant determines what storage rack on a certain floor is vacant. He pulls a key from the lock bearing the designation of the stall assigned and gives it to the owner as his claim check. Pulling the key completes electrical connections that cause a storage rack on the specified floor to come to rest in front of the elevator. The car rolls upon the lift as the loading platform is tilted by pressing a button, the elevator operator dials an indicator, the car is raised to the floor selected, the elevator doors open automatically and, by again tilting the platform, the auto is rolled to the storage rack. To remove a car from storage, the owner receives a receipted bill from the cashier and presents the claim key to an attendant, who inserts it in the lock on the control board, according to symbols on the key. This causes connections to be made which set in motion a transfer car on the floor assigned and the storage rack automatically comes to rest in front of the elevator. The elevator operator, given a ticket to get the car, dials the indicator to the floor assigned and the lift stops at that floor, and again the doors automatically open. The operator pulls a handle which

causes the tilting platform on the storage rack to rise at the rear and the car rolls back upon the elevator from which it is discharged to the ground floor ready to be driven away. Advantages claimed for

this system are that it eliminates practically all chance of damaging the car while taking it in or removing it from the building, gives protection against theft and eliminates gas fumes.



Statue of Horse for English Church, to Commemorate
Chargers That Served during War

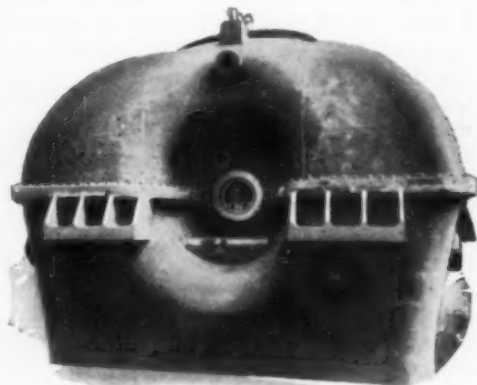
MONUMENT TO WAR HORSES IN CHURCH

In memory of the 375,000 horses killed in British units during the World war, a monument has been unveiled in an English church near London. It shows

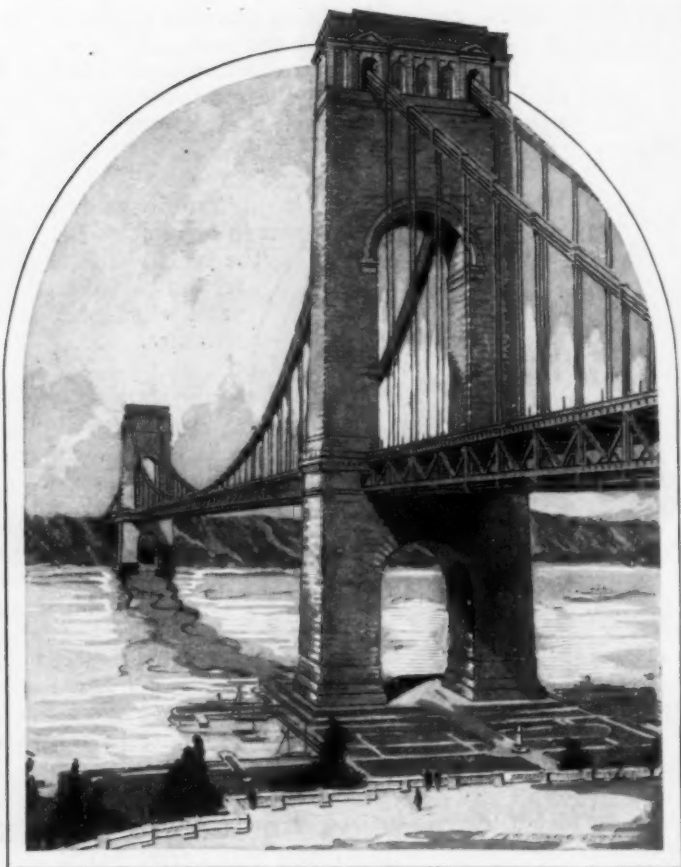
the figure of a single charger and bears a suitable inscription in honor of the part played by the horse in battle.

FIFTY-TON TURBINE DOES WORK OF FOUR MILLION MEN

Power generated by a 50,000-kilowatt turbine constructed by an eastern company, will be sufficient to do the work of 4,000,000 men, it is estimated. The huge casting is nearly twenty-five feet high.



Head of Man Appearing in Center Opening Illustrates
Size of Huge Turbine Casting



Architect's Sketch of the Hudson River Bridge, with Riverside Drive Passing beneath It in the Foreground and the Palisades across the River

BIGGEST BRIDGE IS PLANNED TO SPAN HUDSON

Plans for the New York-New Jersey bridge across the Hudson river, recently completed by Cass Gilbert, architect, call for the longest suspension span in the world, carried by the highest towers, and with record-breaking clearance beneath it for ships. The single river span will be 3,500 feet in length, as compared with the 1,750-foot span of the big Philadelphia-Camden bridge, recently completed. The bridge floor will be 200 feet above the water, and the towers at either end 650 feet high, while those of the Delaware river structure are

only 380 feet. For another comparison, they will be just ninety-five feet higher than the Washington monument, with bases seventy-five by 220 feet, whereas the monument base is only fifty-five feet square. The great height of the bridge will not require particularly long approaches, as it springs from the Washington Heights above the river on the New York side and from the Fort Lee Palisades on the opposite shore. Riverside drive and Haven avenue will be crossed by great masonry arches, terminating in an anchor abutment between the drive and railroad cut. The anchor span from the main tower to this abutment and the similar span from the New Jersey tower to the Palisades will each measure 650 feet. The actual roadway will be 235 feet above high-water level and will pass through the towers in arches

ninety-five feet wide and 230 feet high. On the New Jersey side the road, high as it is, will be below the top of the Palisades and will emerge through a deep cut, topped by an arch carrying a footwalk along the river heights.

SLIDING METAL BACK ON COMB KEEPS OUT DIRT

Provided with a sliding metal back, a comb introduced in England is easily kept clean, as the metal strip, fitting close against the comb, keeps dirt from lodging between the teeth at their base. The sliding back is easily removed for washing.



© C. A. Oldroyd
Metal Back Partly Removed from Comb; It Fits Snugly at Base of Teeth

THESE TESTS FOR AIR PILOTS MAY BE TRIED AT HOME

War-time tests for flyers, which centered around a whirling chair in which the prospective pilot could be strapped and then revolved head over heels, have been refined recently to the point where many of them can be tried out by the candidate at home. Among the tests standardized for British pilots are standing on one foot with the eyes shut, holding the breath as long as possible, lifting a balanced rod without upsetting it, and a series of lung-capacity measurements.

The candidate for flying papers is required to take a deep breath and hold it for more than 45 seconds—most of them achieve a minute or more, and 69 seconds is considered exceptionally good, though some pass even that mark. Next he is required to shut his eyes and then balance on one foot for fifteen seconds, without moving. It is easy to balance with the eyes open, and fairly simple to lift one foot first and then close the eyes, but much harder to close the eyes first and then lift the foot.

The next stunt is to lift a board from the table with one hand, raise it shoulder-high, lower it to the table again, and then repeat with the other hand; all this without upsetting a small metal rod standing upright on the other end of the board. The test is designed to measure the co-ordination between mind and muscle and determine whether the pilot's muscles respond quickly enough to make instantaneous adjustment of his flight controls.

Other tests include pulse fluctuations caused by sitting down and getting up several times, and one of the hearing, in which he must repeat whispered sentences.



Golf Putter Here Is Adjusted Short; the Handle Is Collapsible

GOLF PUTTER IS ADJUSTABLE TO SHORT OR LONG SHOTS

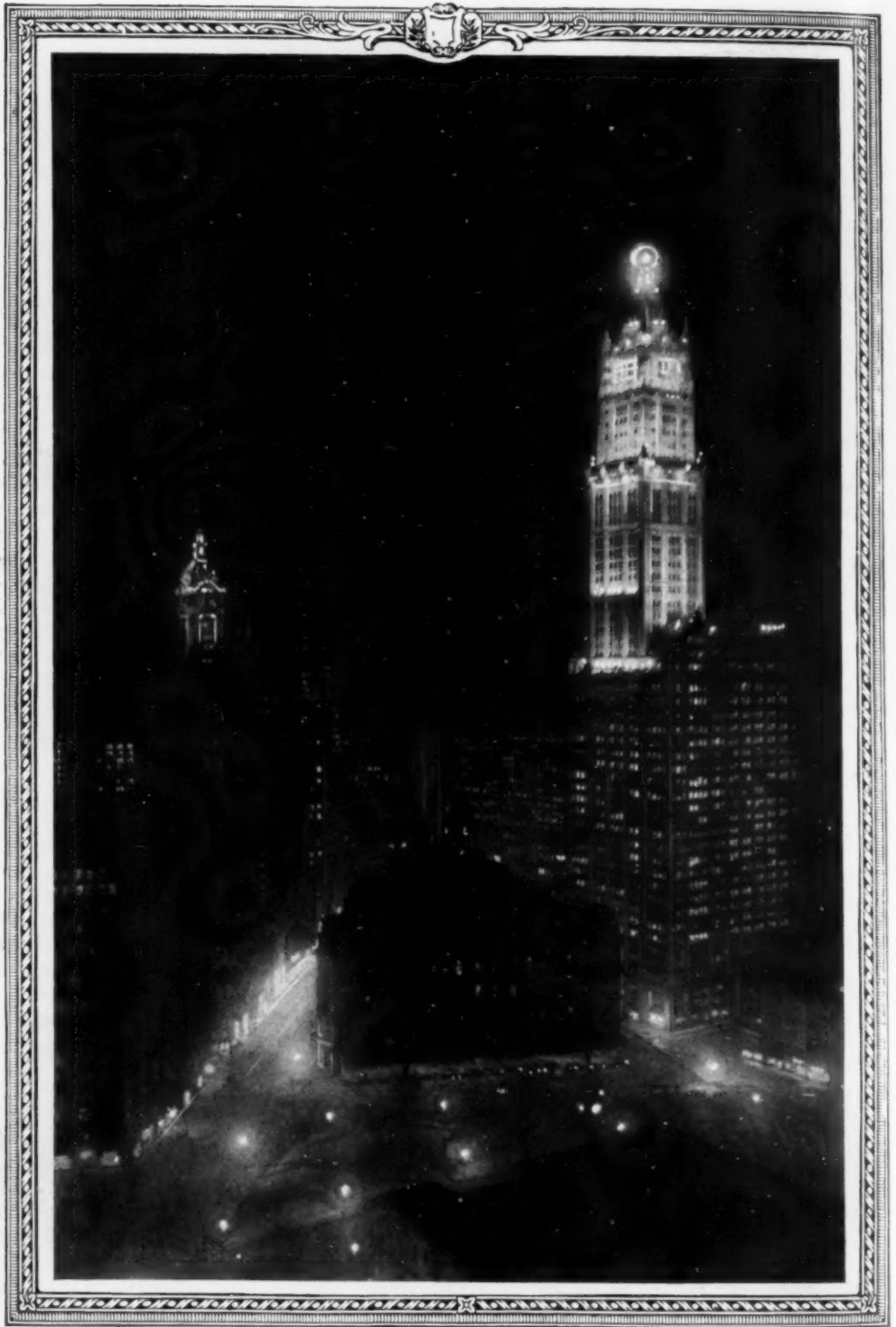
With an extension handle, a golf putter now on the market can be made short or long to suit the player on shots of varying distance. The adjustment is quickly accomplished, a turn of the club's head and a push or pull on the handle, the lower part of which telescopes into the upper, being sufficient to give the desired length.

EIGHT-WHEELED MOTOR COACH RUN BY RAILROAD

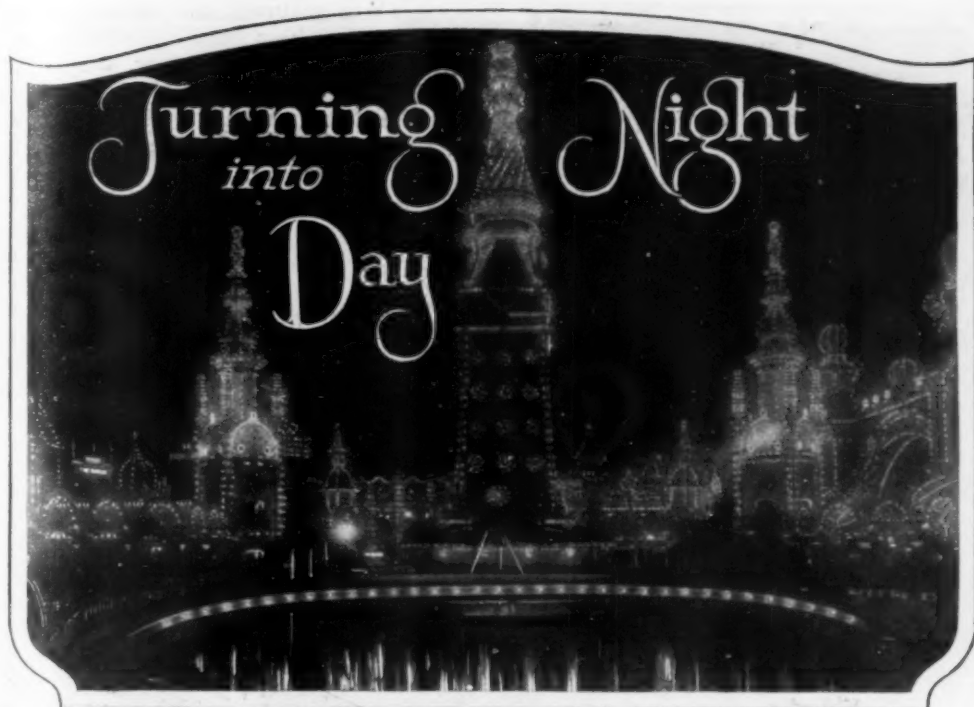
To meet competition from bus lines, a mid-western railroad has inaugurated passenger service in an eight-wheeled motor coach equipped with air brakes to supplement steam-train schedules. The bus has seats for thirty-five persons, is said to be the largest in the world, and its wheels are on two separate trucks.



Rail-road's Answer to Motor-Bus Competition; Huge Thirty-Five-Passenger Coach with Eight Wheels and Air Brakes Operated on Regular Schedules to Supplement Train Service



Two of the Gleaming Architectural Jewels of Night-Time Manhattan, the Woolworth Building, Tallest in the World, at the Right, and the Singer Building, on the Left



Part of the Fairy Tracery of Coney Island, Rising above the Sea with All the Gay Unreality of Some Strange Phantom Picked Bodily Out of a Tale of Gilded Nights in Arabia

Millions of Lights in Huge Signs Transform Cities and Turn Skyscrapers and Public Buildings into Scintillating Jewels

FLASHING 25,000,000 candlepower of light against the sky each night, New York's "great white way" lays claim to being literally the brightest spot on earth. The revolution that electric signs have wrought in the night-time appearance of a city within a few years is shown by the fact that the first electric sign on Broadway, which startled New Yorkers of thirty years ago, had but 200 lights, and their carbon filaments shed a yellowish glow that would pale into insignificance beside the modern white and colored lights.

Compared to this pioneer sign, the largest one in the world, re-

cently removed to make way for another skyscraper, carried 19,000 lamps and required 21 miles of wire to connect them all. The first sign cost less than \$200 to build, while now one company spends \$600,000 annually for rental of sign space alone. Night illumination of cities has grown so rapidly and become such a recognized sight that it is hard to hark back to the latter years of the last century, when an electric display was a novelty.

The theaters, which paved the way and fixed Broadway in the public mind as a street illuminated by theatrical advertising, have become lost in the maze



Welcoming the Newcomer, the Statue of Liberty Is Lighted by Night



The Making of Electric Signs Is a Highly Skilled Profession; Center Shows a "Flasher" Assembly for an Animated Advertisement

of other signs, until today they rank seventh on the list. Of the 17,000 electric signs on Manhattan island below 135th street, restaurants lead the way with more than 2,000, barber shops boast in excess of 1,300, tobacco advertisers alone have 1,100; 867 advertise various kinds of clothing, and 763 are devoted to automobiles and accessories, while the theaters have but 706. Even the churches have turned to electricity to spread their call, using illuminated crosses, as well as words, and today they stand halfway up on the list of eighty different kinds of electrical advertisers.

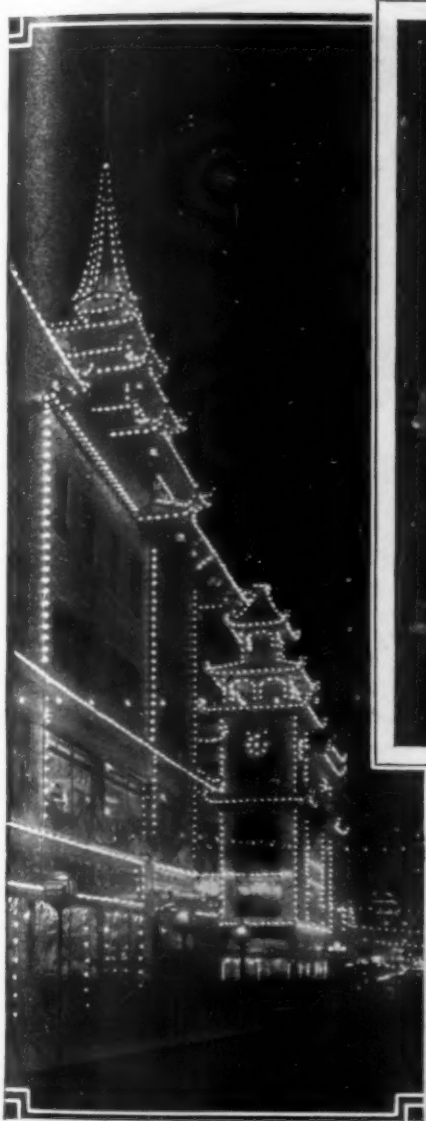
The glow of Manhattan island, visible far out at sea on a clear night, has become one of the wonders of the world. Artists, poets and writers have been enthralled by it, and in paint and print have tried to depict its glory. Picked out at night by floodlights and glowing windows, the sky-

scrapers are pictured as "cathedrals of commerce." The tallest building in the world, the Woolworth tower, the Bush Terminal building and the black-and-gold American Radiator building have become famous over two continents because of their night lighting, but it is the huge signs in the theatrical district that impress the visitor most. New York leads in electricity consumed, but other cities have done as much or more in ornamental floodlighting. The electrification of the Niagara Falls recently stands out as the finest example of beautiful effects yet achieved. In Washington, the capitol dome and the upper portion of the Washington monument are flooded each night with light so that they may be seen for miles. The capitol of Texas has a lighted dome which may be seen for

fifty miles, a glowing counterpart of the lone star from which the state takes its name.

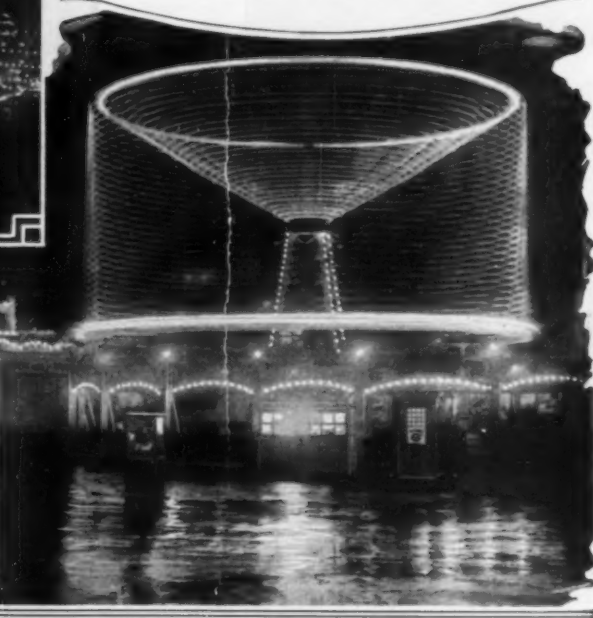
A Chicago church, which owns a loop skyscraper surmounted by the

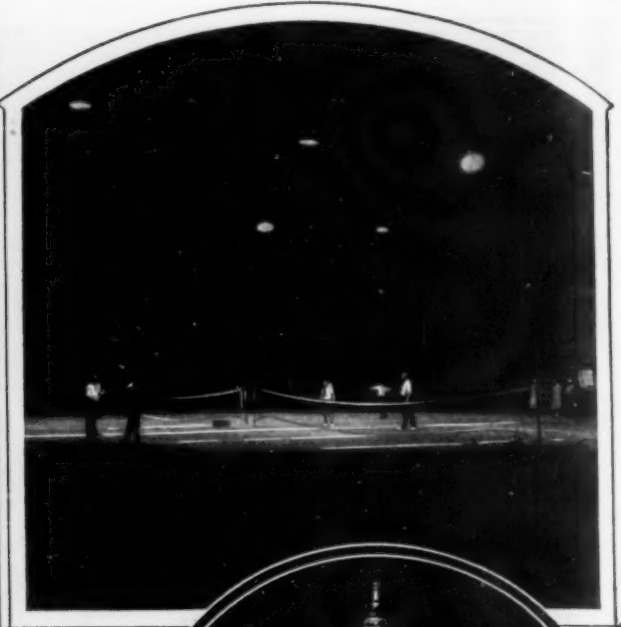




An Ancient Whaling Ship, Illuminated by Night, Is a Famous Sight on the Massachusetts Coast; at Left, Chinatown, San Francisco, Picked Out at Night by Myriads of Colored Globes

The "Flying Boat" at an English Amusement Park, Gives a Weird Effect When Its Hundreds of Rapidly Revolving Lights Are Caught by the Camera; the Amusement Parks, like the Theaters, Were among the First to Seize on Electric Lights as a Means of Popularizing Night-Time Play by Turning the Dark Hours into Day





The Glowing Steeple of Chicago Temple, a Combined Church and Office Skyscraper; a Night Tennis Court and Dome of Texas Capitol



highest steeple in the country, illuminates the white concrete sides, and tops it with a brilliant cross that is visible far across the lake on the Michigan shore.

How much electricity has done to

lengthen the play hours of the day is little realized. Tennis courts, croquet grounds



Illuminated by Floodlights, Soldiers' Field, Chicago's New Stadium, Becomes a Place for Night Play and Pageantry, Doubling Its Usefulness to the Millions of City Dwellers

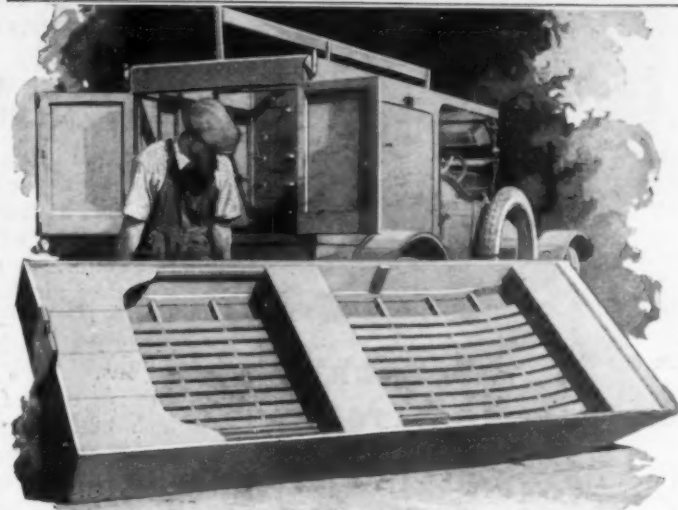
and other outdoor athletic fields are made possible by night illumination. At Springfield, Ill., several successful tennis tournaments have been played at night on open-air courts.

Despite the vast increase in lighting, only half the homes in the United States had electric lights at the end of 1924. The other half, however, included several million farm houses. Salt Lake City, at last reports, was the most perfectly lighted city in the country, with fewer than seventy-five homes unconnected in its area.

WHALE HUNTERS USE AIRPLANE AND RADIO

For the first time in the history of the whaling industry, airplanes are being used in the north Pacific to sight the herds. The hunters are also adapting another modern invention to their work, the radio. When the whales are sighted, communication is established by wireless from the plane to the fleet, which may be several miles away. These more efficient methods of capture have been employed in an effort to make up for the scarcity of the animals. For a number of years, results of the whaling operations off this coast have been unsatisfactory. It is believed that migrations to southern waters may possibly be responsible for the shortage. To determine this, whales are being tagged with bright metal disks in an effort to trace their wanderings.

¶ Six weeks is the average span of life of the honey bee.



Upper Photograph Shows Top on Auto, and Lower, Removed, Turned Over and Ready for Service as a Duck Boat

AUTO TOP IS ROLLED OFF CAR FOR USE AS DUCK BOAT

Resting on rollers so that it can be removed easily, the top of a special auto for sportsmen, serves as a flat-bottomed duck boat. It may be propelled by oars or with a small motor and is said to be seaworthy.

BOUQUET MODELED IN DOUGH BY PRISON COOK



Prison Pastry Chef's Creation in Dough; the Bouquet Represents Products of the Institution's Farm

Fashioned entirely of bread dough, a bouquet of lilies, roses, leaves and fruits of various sorts, molded by the cook of an Ohio prison, was considered an excellent illustration of the pastry chef's art. The assembly was realistically tinted.



"Footlights" for the Piano Music Rack; a Soft Glareless Glow Radiates from the Holder

MUSIC LIGHT RACK FOR PIANO PREVENTS GLARE

Light is said to be evenly diffused upon the music, without injurious glare, from a special extension for the piano rack. It is constructed of corrugated wood and the electric lights, under glass, are so arranged that their rays are projected upward on the sheet in the manner of stage footlights. Asbestos lining prevents overheating and damage to the wood, and a button at one end of the fixture controls the current. The rack is furnished in various styles to harmonize with different pianos and may also be used on music stands, desks, pulpits and elsewhere in place of overhead fixtures.

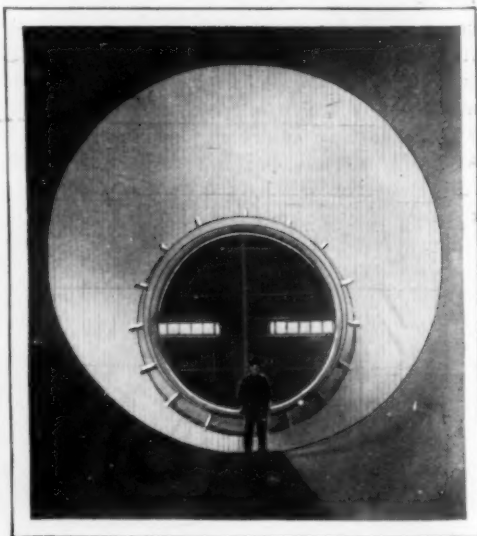
ELECTRIC CURRENT IN NERVES DETECTED BY RADIO

By means of a three-tube radio apparatus, Dr. E. D. Adrian of Cambridge university is reported to have detected the electric current that shoots along a single nerve fiber of a frog's leg under the stimulus of a message to the brain. This is said to be the first time that such a record has been obtained from just one fiber and the experiment is regarded as opening up a new field of research, one in which it may

be possible to read the main types of messages entering and leaving the nervous system and record the actual events in the brain by means of photographic impressions of the electric impulses that pass along the nerves. For some time, it has been known that messages are attended with electrical disturbances in the nervous system but it has been possible to record the effects only from large groups.

BIG WIND TUNNEL TESTS FULL-SIZE PLANES

Big enough to hold within it a full-size airplane, a new wind tunnel built at Langley field, Va., for the national advisory committee on aeronautics, a government organization, will take airplane design and testing out of the model class and permit experts to study real planes under actual flying conditions. Two 3,000-horsepower Diesel engines, taken from an old submarine, furnish motive power for the huge propellers which will drive wind currents through the tunnels at speeds of 100 miles an hour or more, giving the same effect on the plane suspended in the tunnel as a free flight at that rate through still air. Thousands of curved vanes guide the air as it is sucked into the building and drawn past the full-sized models.



Interior of New Wind Tunnel for Testing Full-Sized Airplanes; Note Size in Comparison to Man

NIAGARA RECEDES TWO FEET A YEAR

Besides being the source of tremendous amounts of power, Niagara Falls is a sort of gigantic clock by which scientists estimate time. From repeated annual measurements it has been found that the cataract is cutting back at the rate of two feet a year. At this rate, it has taken it at least 30,000 years to recede from its original site at Queenstown, 60,000 feet from the present location. Another check on time is afforded at the Mississippi delta. By measuring the sediment in a quart of the water at different seasons of the year and figuring the total volume, an estimate is made possible as to how fast the land is wearing away.

ELECTRIC BELL TRANSFORMER FITS CONDUIT BOX COVER

Fastened directly to the cover of the conduit box, a small transformer for use with an electric bell is easily adjusted and is said to have met the approval of inspectors and fire underwriters. It takes up but little space, projecting only a trifle over two inches from the cover. The input wires are suitably marked so that the polarities may be recognized.



A CORRECTION

In an article in the June issue, describing the bursting of a tile grain tank, no explanation was given as to the cause of the accident. According to a structural engineer, imperfect reinforcing and not the tile, was responsible for the break.



© Henry Miller

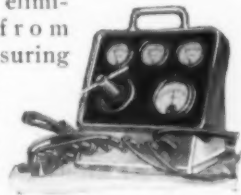
Safe and Dry in His Life-Preserver Canoe, the Fisherman Ventures into Deep Water Away from the Brush

LIFE PRESERVER USED AS BOAT KEEPS FISHERMAN DRY

Fishermen and hunters are protected from dampness and cold and can venture safely into deep water with a combination life preserver and canoe introduced in Germany. It is made of a strong rubberized fabric that will endure heavy wear and exposure and is not torn by projecting branches. The wearer stands in an upright position within it, so that he is partly concealed, an advantage in hunting.

TESTER FOR AUTO BATTERIES SAVES REMOVAL FROM CAR

All three cells of an automobile battery can be tested at one time without removing it, under discharge conditions such as exist when the car is actually in use. This is done by a tester with a carbon-pile rheostat, properly calibrated ammeter and three voltmeters. A supplementary jack is provided which eliminates the rheostat from the circuit for measuring the amount of current used by the starting motor. The outfit is included in a compact aluminum case with a handle, and has a bakelite instrument board arranged for easy reading.





On Top of the High Tower; a Sturdy Japanese Directs the Water Gun during a Test of Nippon's Latest Fire Equipment

LOFTY LADDER FOR WATER GUN AIDS JAP FIRE FIGHTERS

Modern high buildings in Japan have necessitated the adoption of fire ladders for added protection against flames in that country. The nimble native firemen have shown, in tests and at actual fires, that they are specially suited to scaling the highest rungs of the extension ladder and directing the bucking nozzle where it will best strike the fire. Guy ropes are attached to the top of the ladders and are held at the bottom by other firemen, or may be tied to any solid object.

☞ Air forms from forty to fifty per cent of the content of ice cream.

HOW AN ENGINE "BREATHES"

A railroad locomotive puffs approximately four times to each revolution of the driving wheels, regardless of their circumference. The sound is caused by the exhaust steam at the end of each stroke of the pistons, passing up through the smokestack where it aids the fire draft. It has been figured that an engine with drivers twenty feet in circumference and going fifty miles an hour will give 880 puffs a minute, or 52,800 an hour, the drivers making 13,200 complete revolutions in the sixty minutes.

HIGH-SPEED AUTO CARRIES MOTOR IN REAR

With the motor at the rear instead of in front, a German auto affords the driver a less obstruct-

ed view of the road and in warm weather contributes somewhat to his comfort, as he is not exposed to the heat of the engine. Although the motor is only sixteen horsepower, it develops high speed and consumes relatively little gasoline.



Engine Heat Does Not Bother the Driver of This German Car, For Motor Is Placed at the Rear



An Expensive Investment in Dry Hole; Lee No. 1, an Oilless Well Sunk in the Arctic Wilderness, with the Mast of the Radio Station Visible in the Foreground

Three-Year Fight against Gales, Blizzards, Raging Seas, Earthquakes and Volcanoes Ends in a Dry Hole, a Mile Deep

ABANDONING a three-year fight against every element that nature could bring to bear against them, an American oil company recently gave up one of the hardest-fought battles in oil-drilling history, when a "wildcat" well sunk in Alaska brought only a "duster," or dry hole, at a depth of nearly a mile.

For three years a crew of sixteen men, cut off from civilization most of the time, and with only a radio set to keep in touch with the outside world, drove steel tools down through the deepest hard-rock strata ever encountered in oil drilling. While they worked, gales blew their supply ship ashore, lifted the lighters up on the beach, and whirled the camp stable away with the horses inside; blizzards buried the roofs under snow; volcanoes turned the snow black and blinded the workers with fine sand and powdered lava; spring rains made roads impassable and floods washed their bridges away.

And after more than three years' work, that cost countless thousands, they ended up with a dry hole, 5,034 feet deep!

The story of the search in Alaska for more oil to keep America's automobiles running goes back to August, 1922, when

the crew of sixteen sailed out of Seattle harbor on a chartered ship with a complete outfit for drilling one well. The equipment included lumber for the derrick, machinery, drilling tools, a mile or more of well casing, two ten-ton tractors, supplies for the men and fuel for the equipment, and the wireless outfit. Their destination was a spot on the Alaskan peninsula, that long arm that stretches westward toward Asia, and seventeen miles inland, across two mountain ranges, from Portage Bay.

It took nine days' sailing to reach the bay, and then seventeen more just to lighter the cargo to the beach, swept day after day by the williwaws—the fierce and sudden storms that later brought one of the round-the-world flyers to grief not far away and sent the well drillers out to aid in the hunt for him.

Once on the beach, they had to build a road to the drilling site, over the two ranges of mountains and across several miles of swamp. Working through the winter blizzards, they built the road, moved the equipment to the site, erected it and, in March, 1923, the well was spudded in. It was just three years later, al-

most to a day, that work was abandoned. "The outstanding feature of this wildcat well," says the final report, "was the amount of hole made in hard formations. Very often no more than a foot of hole per day was made during the first 1,600 feet of drilling. Deeper wells than this have been drilled and harder formations encountered, but it is believed that, in all the annals of well drilling, there is not another instance where bits were called upon to penetrate to the depth attained through formation of equal hardness."

The best story of the three-year fight, however, is told by excerpts from the radio reports of the drilling crew:

"Nov. 5, 1922. Our mechanic thinks this is the hardest test tractors ever were subjected to. It keeps two men employed at repair work most of the time. Average time of the trip from Lake Becharof to location with a load of three tons is about ten hours. The latter part of the week we

went through one of the worst blizzards to date. We had a storm no one could face and live long. Our men were driven into camp at Lake Becharof.

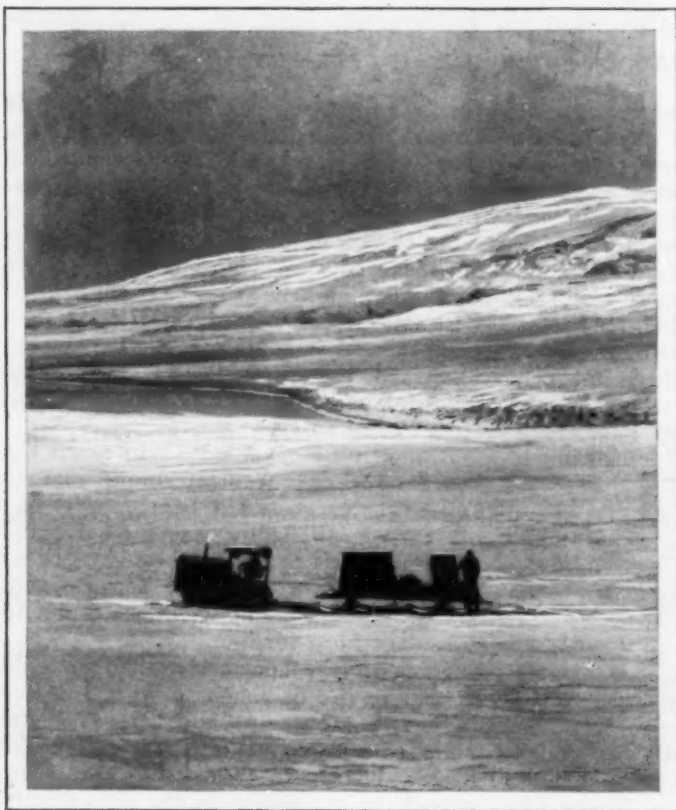
"Nov. 26. On the night of Nov. 25, we sent the 'Pilgrim' [their supply boat] to rescue the crew of the 'Grizzly,' a gas-boat freighter. They had been nine days on Jute island and were seen from the mainland by a native trapper, who informed us. Enough food and blankets had been salvaged before the boat broke up to keep them alive.

"Jan. 1, 1923. Conditions have changed entirely this week, due to the cold north wind. We have had some snow and cold weather which froze the ground and streams, making it difficult to get down to Ugashik creek. Both of our tractors broke through the ice, damaging the radiators. On Dec. 24, Mt. Pavalo and Mt. Moses broke loose on the peninsula, some distance west of us, and threw enough ashes and sand on the mountains around our camp to darken the snow. The fine sand was painful to the eyes of those out in the wind.

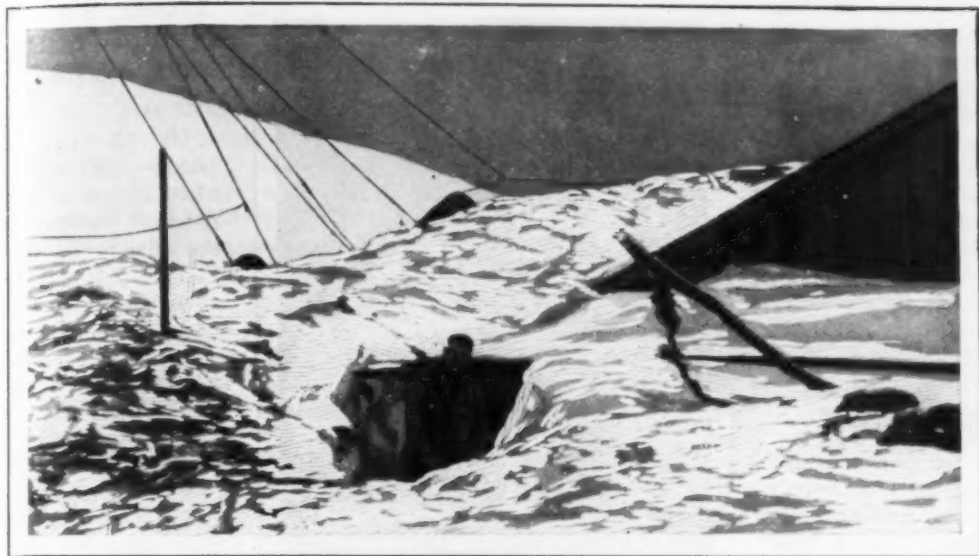
"Jan. 14. The latter part of the week has been one of very severe weather, accompanied by N.W. wind which drifted the snow so as to bury our road. Some idea of the fierceness of the wind may be had from the fact that it blew down a part of our warehouse, carried three-inch planks for a distance of fifty yards and tore strips of corrugated iron in two pieces.

"Feb. 11. The ice commenced to drift out to Lake Ruth and was the cause of washing a part of our bridge away. The lumber was recovered and the bridge replacement begun.

"March 4. March entered in true form with a severe blizzard, but soon



Sledding in the Supplies with a Tractor-Drawn Sledge, Battling Along over Windswept Ice of Lake Becharof



Frequently Howling Blizzards Covered the Camp with Snow, Requiring Tunnels to Reach the Doors, and Then Spouting Volcanoes Flecked the White Waste with Sand and Powdered Lava

changed to milder weather, and we were able to get through the pass with a tractor and four horse loads of provisions. We started over with a load of drilling tools; the stem broke down the sled on Becharof hill, and we were obliged to go to camp for another.

"April 7. The latter part of the week we have been compelled to use the trailers on account of the lack of snow on a great part of the road. The south winds have started melting the snow and thawing the ground so as to make our roads swampy and more difficult traveling in places.

"May 5. The roads have become almost impassable on account of the water from the melting snow.

"Oct. 20. Kanatak was badly damaged by the high tide and storm on Oct. 12 and 13. There was no loss of life. Buildings were washed away and boats and barges washed into the center of the town.

"Dec. 30. Very severe weather during the month, necessitating a twenty-four-hour shut-down. One can readily believe that the wind blows in Alaska, as our barn at the camp, which is fourteen by sixteen feet with two-inch plank floor, and with a horse inside, was carried (horse and all) a distance of forty feet during one of the storms. On Sunday night, Dec. 9, in a blizzard and rough sea, the S. S. 'Starr' went on the rocks on Raspberry island,

coming from Kodiak. Mr. Wright (our wireless operator) was trying to connect with the 'Starr' when, about 7:25, he heard their SOS calls for help. No help was near. Their lifeboats, covered with ice, sank as soon as lowered. We heard all messages asking if help were coming; that they were sinking, and the operator's farewell message to his wife. At 11:30 p.m., the boat slipped off the rocks, righted herself and floated, and they were able to anchor and keep afloat until towed to Kodiak.

"Jan. 15, 1924. Mt. Ravalof erupted today, throwing out ashes and clouds of black smoke. A series of earth tremors occurred, lasting about seven minutes.

"Jan. 30. The 'Starr' arrived today and attempted to discharge freight. In landing the mail and passengers, one man's face was frozen and another man's fingers.

"Feb. The first week in February was one of the worst continued spells of cold weather we have experienced. It has been from ten to twenty-two degrees below zero, with a north wind. Many days a dog team could not travel. Our water lines, although well covered, have frozen and our cookhouse is entirely covered with snow. On Dec. 2 the 'Viking,' one of the best equipped gas boats on this coast, was obliged to come into Portage Bay on account of bad weather. The 'Viking' carried a party of San Francis-

cans who had been hunting bear along the coast. All of the party and crew, except one, came ashore. At 5:00 a.m. the boat broke anchor and drifted out to sea. No hope was held for the safety of the man, as the worst of the storm followed his disappearance. We notified all stations of the boat being adrift, but nothing has been heard or seen of man or boat since. (In a later report it was announced that, two months after the incident, the man

was found living on a small island near Kodiak, having salvaged enough material from the wreck to keep alive.)

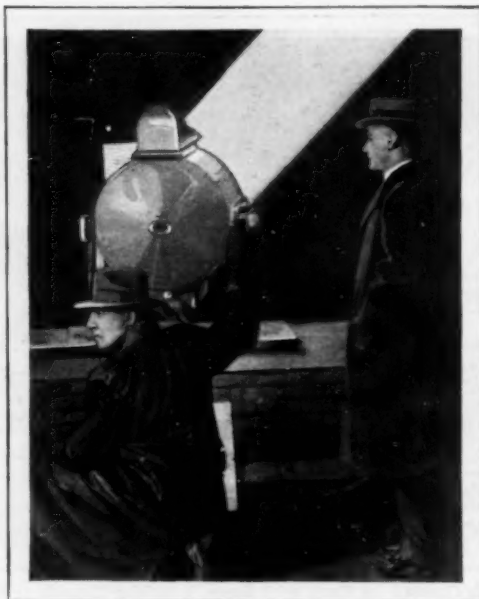
"March. As usual, experiencing bad weather and the road through Ugashik was completely obliterated during the last week in February. It was necessary for the tractors to pass over drifts eight to ten feet deep.

"June. The snow is melting and the bunkhouse is now in sight.

"April, 1925. We have had the heaviest snowfall of the season, and it has drifted badly. Guide stakes, four and five feet high, along the trail are entirely covered. We came near having to make a survey to locate our horses one morning this week. A hole, five feet deep, was dug before striking the highest part of the barn.

"July. We have experienced no such rainfall and high water as we are having this week. Considerable damage is being done to roads, and transportation is difficult. The barge was blown loose from moorings and carried high and dry on the beach."

And so it went on until March of this year, when work was finally stopped, the tools pulled from the dry hole, and the entire investment written down as another loss in the hunt for oil.



Measuring Altitude of Clouds with Powerful Searchlight; Observer Is at a Known Distance from Beam

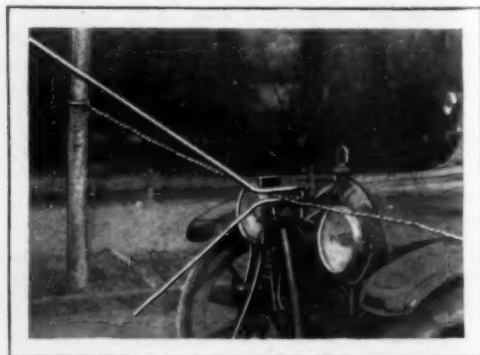
LIGHT TELLS HEIGHT OF CLOUDS

With the aid of a 42,000,000 - candle-power searchlight, attaches of the weather bureau at the Pittsburgh station are quickly able to measure the altitude of clouds. The beam is usually directed vertically upward, while an observer, at a known distance from the searchlight, focuses a theodolite on the illuminated spot to note the angular elevation from his position. He thus

has the base and an acute angle of a right-angled triangle. From these data, it is easy to compute the length of the light shaft to the cloud, its elevation.

WIRE CUTTER ON AUTO FRONT HELPS FOIL BANDITS

Wire barriers stretched by bandits to obstruct pursuit are quickly removed with a powerful cutter a German has devised for attachment to the front of the auto. It does not interfere with the steering, is quickly fastened to the car and may be taken off easily when not needed.



© Henry Miller

Wire Barriers Have Little Effect against This Auto Equipped with Powerful Cutter in Front

STEAMER DODGES HURRICANES WITH STORM FINDER

Radio, barometric-pressure charts and weather maps were used successfully by navigators on the cargo ship "Kittery" recently in sidestepping disastrous storms on the run between Hampton Roads and the West Indies. With the aid of data furnished them, observers were able to plot lines of equal pressure and thus calculate the rate of speed and the direction of travel of the hurricane or storm areas which are unfailingly indicated by troughs of low barometric pressure. The ship was either put back into port before the winds arrived or was steered out of their course. It is predicted that this system will come into general use.

HOSE CLAMP WITHOUT SCREWS IS QUICKLY APPLIED

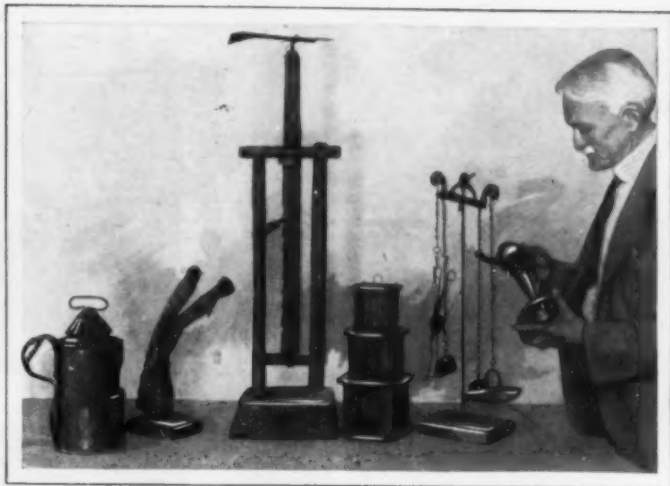
Held in position by spring tension, a hose clamp without screws is easily adjusted. A series of notches, raised on one side of the clamp, provides a hold for the spring fastener, which is tightened by a finger lever.



The manufacturers assert that the attachment affords a constant pressure of forty pounds, evenly distributed. The clamp may also be used as a ground clip for the radio set.

ANTS LIVE FIFTEEN YEARS

Long life as well as great strength is a distinguishing characteristic of the ant. The queens of some species live fifteen years and longer. The workers, which are undeveloped females, live four or five years, while the male ants are short-lived, like the drones in the bee colony.



Part of Odd Collection of Lamps at Smithsonian Institution; Tall Object in Center Is a Finnish Pine-Splint Holder

QUAINT COLLECTION OF LAMPS TELLS STORY OF LIGHTING

Development of artificial illumination through the centuries is seen at a glance in an odd collection of lamps at the Smithsonian institution. Among them is a fire-fly lantern used by natives of the West Indies a century ago, a crude boat-shaped beam lamp, commonly seen in the fourteenth century, and a horn dark lantern with which households of Revolutionary days were familiar. A Spanish rosin torch shows how men found their way at night during the Middle Ages.

TIRE IS LOCKED WITHOUT KEY AT PRESS OF FINGER

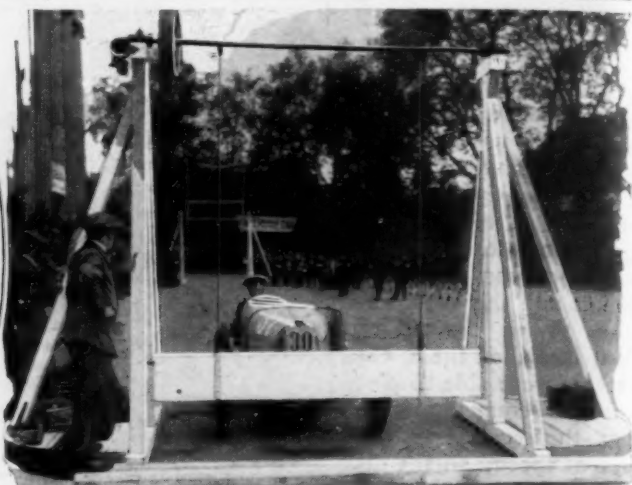
To guard the spare tire, a lock that fits the carriers on most of the popular cars has an elongated nut which is attached in place of the regular unit and is equipped with a hardened-steel housing. This is fitted with a pin-tumbler locking cylinder which is secured with the fingers, no key being needed. The cylinder is provided with a cap to protect it from dust and weather.



AUTO DRIVERS' SKILL IS TESTED IN STRANGE RACES



Tests of Steady Driving; in a German Contest, a Motorcycle Rider Guided His Machine between Traps That Fired Shots, If They Were Struck, and, at Upper Right, an Autoist Trying to Halt His Car Exactly at the Barrier Connected to a Horn Which Sounded If Board Was Pushed beyond the Mark



A German Run between Wine Bottles, and Below, a Similar Test on Curved Roadway at a Denver, Colo., Trial; in This Test, 314 Women Attempted the Feat, but Only One, a Sixteen-Year-Old Girl, Made a Perfect Score



WIRELESS PHONES ON AIRSHIPS LATEST TRAVEL LUXURY

Experiments with wireless telephony from moving airplanes have proved successful in Germany and it is reported that the equipment soon will be added to other conveniences on several of the big liners of the air. A passenger thus will be able to talk with any subscriber in any large city in Germany while speeding on his journey. Motion pictures and phonograph music already have been furnished for patrons. One of the features of the wireless-telephone system is the overcoming of the noise from the three 120-horse-power motors.

ELECTRIC HANDSAW OUTFIT PERFORMS MANY TASKS

Driven by a 110-volt motor, an electric handsaw is like a portable woodworking plant, for it can be used with a straight blade, a table saw for cutting at angles up to forty-five degrees or cross or ripping, and is provided with attachments for da-doing, fluting, boring and other operations. As a circular handsaw, it weighs but sixteen pounds, ready to run, and the seven-inch blade develops a speed of 4,737 feet a minute at the teeth. A miter square and ripping guide, miter box for cutting at any desired bevel and angle are furnished and the straight-blade reciprocating saw attachment will take material up to eight inches in thickness. The borer operates at any angle in an arc of ninety degrees relative to the saw frame. On electric wiring jobs, for instance, it can be used between fourteen-inch joists and will bore within an inch of the underside of flooring.

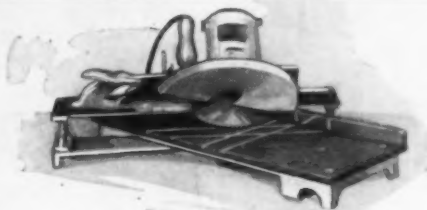
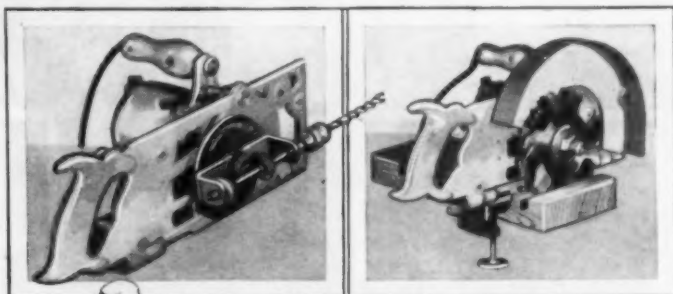
☛The Popular Mechanics' Bureau of Information offers its free service to all our readers. Names and addresses of manufacturers will be promptly furnished.



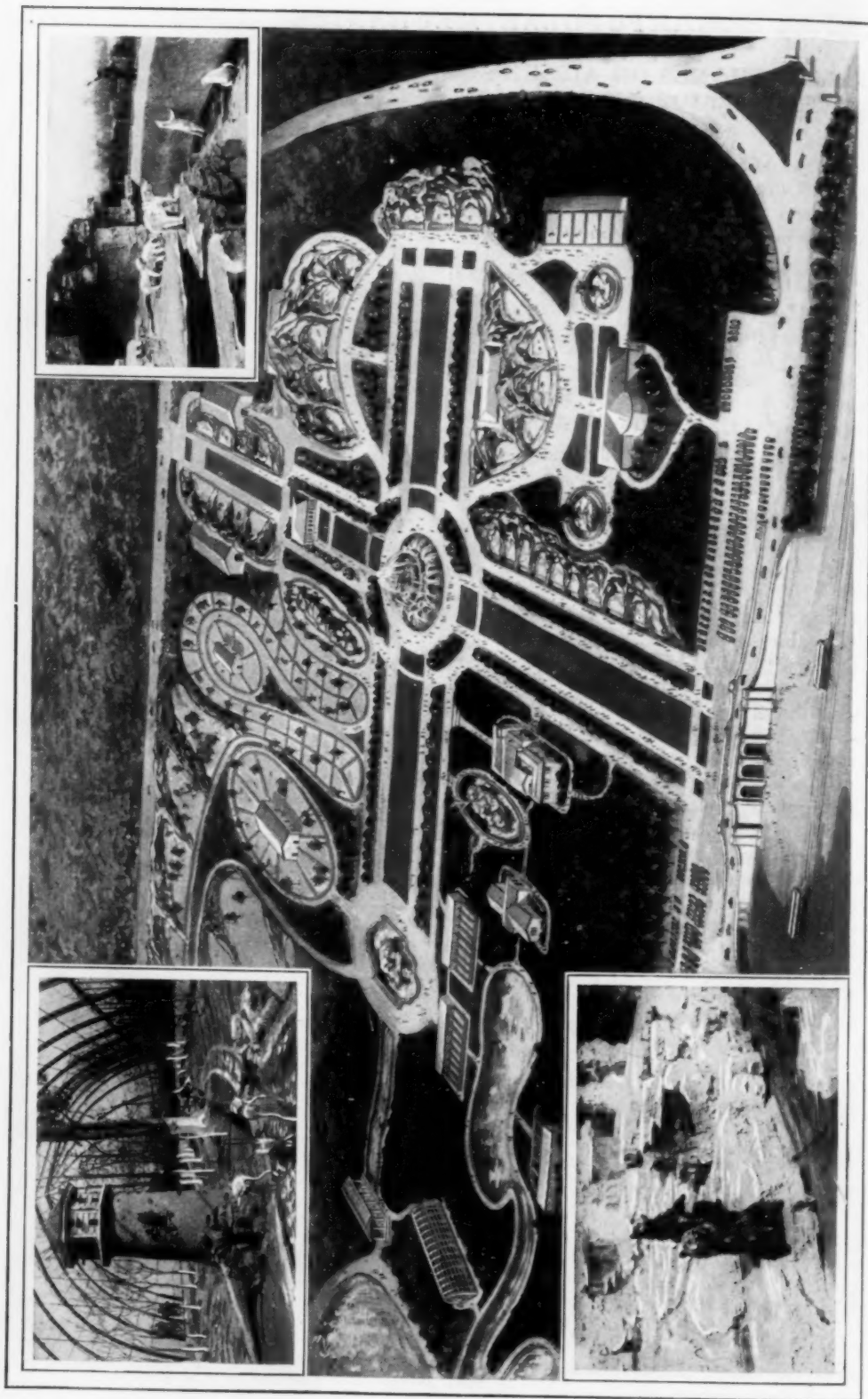
Sample of Sidewalk Street Numbers for Houses; the Numerals Glow in the Dark

HOUSE NUMBERS ON SIDEWALK GLOW IN DARK

House numbers in paint containing a radium substance and placed on the sidewalk where they can easily be seen at night, have been devised by a western inventor. They are said to glow with sufficient light to be plainly legible in darkness and are readily seen by day. Inclosed in a neat holder, they present an attractive appearance.



Illustrating Four Uses of the Outfit; Driving a Bit, Cutting a Groove, Operating Straight-Blade Saw, and in Miter Box



Architect's Plan for New Open-Air Zoo, Where Animals Will Roam in Barless Freedom; in the Inserts, Rock Dens of the Type to Be Used to House the Chief Exhibits, and, in Top Left Corner, Picture of a Flying Cage for Rare Birds

GREAT CAGELESS ZOO TO COST FOUR MILLION DOLLARS

A vast open-air zoo, in which lions, tigers, bears and other animals will roam about in barless freedom, separated from the spectators only by moats and running water, is to be built in the forest preserves just outside of Chicago as result of approval by the voters of a \$4,000,000 bond issue for the project. Work is to start this year and about two years will be required to complete the project.

Plans for the zoo, prepared after study not only of similar institutions in America, but also of the big open-air zoos of Rome and London, and the Hagenbecks, at Hamburg, Germany, provide for groups of animal dens built up of cement to imitate natural rock fastnesses. The imitation walls will be carefully undercut just enough to prevent the animals from climbing into the neighboring pits, while across the front a deep moat will make it impossible for them to reach visitors. In addition to the open dens there will be permanent winter homes for the more delicate animals; year-round buildings for those from tropical climes; an insect house modeled after the one at the London zoo; an indoor bird house and a vast flying cage for the birds that can be exhibited in the open.

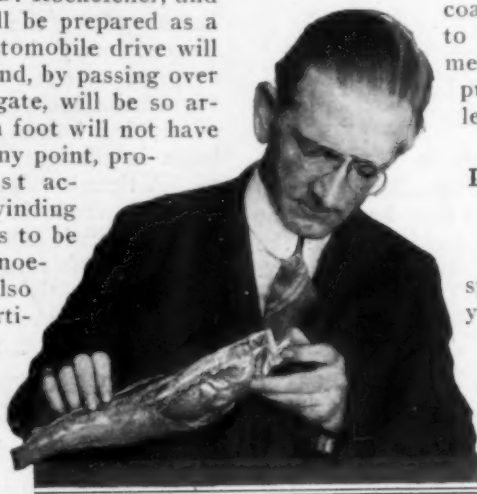
The zoo will occupy one end of a big tract of land donated for the purpose by the daughter of John D. Rockefeller, and the remaining part will be prepared as a picnic ground. An automobile drive will circle the entire plot, and, by passing over the roof of the main gate, will be so arranged that visitors on foot will not have to cross the drive at any point, protecting them against accidents. A creek winding through the grounds is to be dammed to provide canoeing, while its waters also will fill a series of artificial lakes and the moats. When completed, the zoo will be one of the largest in the world and will include features not seen in the United States before.



Rear View Showing Folded Cords of Parachute, Which Is Worn as a Coat

PARACHUTE AS BACK OF COAT INCREASES FLYER'S COMFORT

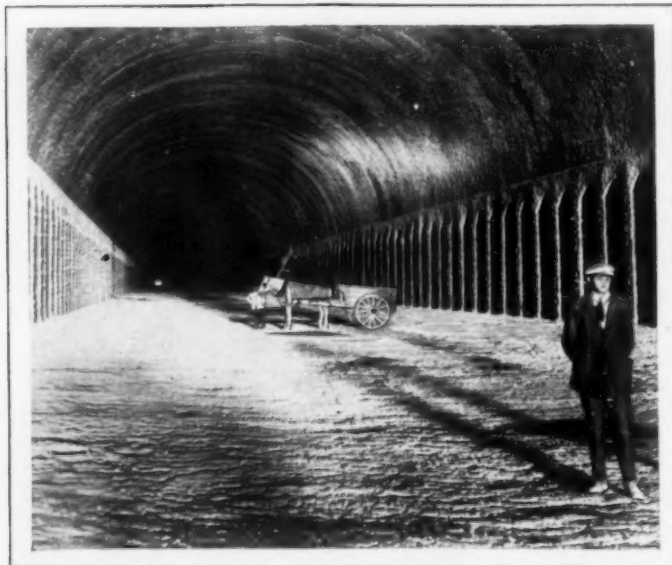
Fashioned so that it can be worn as a coat instead of being strapped on as a separate and cumbersome article, a parachute devised by a western aviator is said to have withstood actual tests successfully. It is constructed as part of the coat itself, being built into the back of the garment, and is opened by pulling a ring under the left shoulder.



Examining Mouth of Curious Deep-Sea Fish Which Makes a Whistling Sound

DEEP-SEA FISH CAN WHISTLE

One of the strangest species of ocean fish yet discovered makes a whistling sound, and while edible at certain seasons, it is poisonous at others. Its body is illuminated by a row of phosphorescent spots along both sides.



Where Ships Run through a Mountain; Section of Subterranean Canal near Marseilles, France, Before Water Was Turned In

SHIP CANAL RUNS UNDER HILLS THROUGH FOUR-MILE TUNNEL

What is said to be the longest subterranean canal in the world has been constructed near Marseilles, France, as part of a ship passage to link that port with a smaller one inland. For four miles, the canal runs under a chain of hills. In this section, it is nearly fifty feet high and seventy feet wide. Building it required an expenditure of more than half the total cost of the canal.

RAZOR DRIER ON LAMP SHADE SAVES TIME AND TROUBLE

Heat from the bathroom electric-light bulb is utilized by a California inventor to dry his safety razor so that he does not



need to take the instrument apart. The light's shade is molded with a depression in which is fitted a metal box large enough to contain the razor. Its top is flush with the top edge of the globe so that it is not conspicuous. After rinsing, the razor is placed in this holder where it dries thoroughly before it is needed again.

POWDERING FOOD TO SAVE CROPS

Pulverizing fruits and other crops in order to preserve them and keep their nutritive properties in concentrated form, has been the object of experiments by Prof. G. W. Cavanaugh of Cornell university. He believes that a reduction of waste can be effected by this method which has practically the same purpose as has been achieved with milk, which is now put up in powdered form that retains all its original substances and is shipped to great distances without spoiling. Should the pulverization

treatment prove successful with fruits and grains, farmers would be assured of a market for all their crops, Prof. Cavanaugh points out.

FOUNTAIN BRUSH FOR CLEANING HOLDS LIQUID IN HANDLE

Cleaning liquids are carried in the handle of a brush now on the market so that the solvent may be supplied as needed and the bother of dipping into a basin is eliminated.



A thumb valve and plunger are provided to feed the liquid to the brush, which is made up of alternate layers of bristles and felt and may be removed for cleaning. A tight-fitting brass cap for the handle prevents spilling the contents.

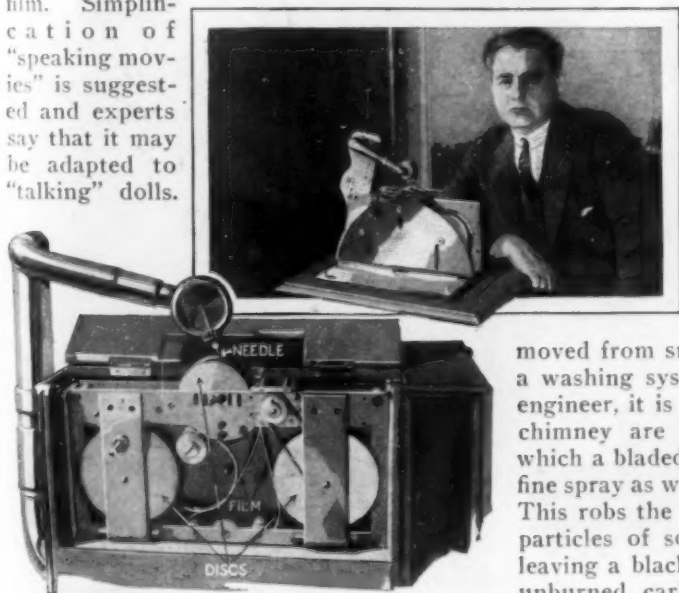
FOOT TRAFFIC PAST STORES HELPS FIX RENTS

The relation of pedestrian traffic to rental values is being investigated by an association of building owners. Reports from several cities indicated that a traffic

of 500 persons per hour means a revenue of \$100 a month for each front foot for the retail-store proprietor. On the same basis of calculation, the property owner generally figures that he can ask a rental of \$2 per front foot for each 100 persons passing each hour. From actual counts made in more than a dozen large cities, it was found that the south and west sides of the streets generally have the largest volume of foot traffic, although there are notable exceptions to the condition. One explanation of this is believed to lie in the fact that women shoppers, appearing in larger numbers in the afternoons than in the mornings, prefer the shady sides of the streets, while men are more numerous on the sidewalks in the mornings.

PHONOGRAPH RECORDS ON FILM TO REPLACE DISKS?

Phonograph records are made on motion-picture film by a process developed in France. A comparatively short length will hold impressions that would require forty large-sized disks, it is said, and long speeches and musical selections may be reproduced without interruption. In making the record, a heated needle and a special solution are used to facilitate registering the variable sound waves on the film. Simplification of "speaking movies" is suggested and experts say that it may be adapted to "talking" dolls.



Views of the Film-Record Phonograph Showing the Winding Reels and Position of Needle



Successively Flashing Lights Lead from Imitation Pump to "Tank" on Auto, Part of Filling-Station Sign

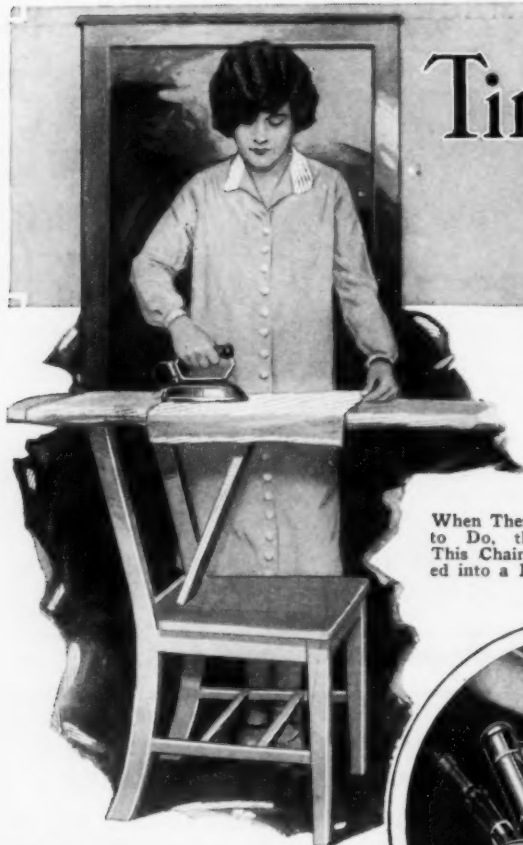
UNUSUAL GAS STATION SIGN SHOWS CAR BEING FILLED

Replenishing the auto gasoline tank is represented in a lifelike manner by a huge flashing electric sign at a mid-western filling station. Nearly 2,000 lights are used, some of them arranged to go on and off in series to imitate the flow of the liquid from and into the replica of a pump and others set to outline a reproduction of an auto as it appears at night.

WASHED SMOKE YIELDS FUEL

Most of the dirt is removed from smoke and saved for fuel by a washing system devised by an English engineer, it is reported. Fumes from the chimney are passed through a box in which a bladed wheel revolves and casts a fine spray as water is played on the spokes. This robs the smoke of its gases and fine particles of soot. The water is filtered, leaving a black residue, much of which is unburned carbon, and this is collected, dried and used as fuel.

Time *and* Money for Your



When There Is Ironing to Do, the Back of This Chair Is Converted into a Handy Board



Unightly Marks Are Kept from Carpets, Table Tops and Tile by Means of This Rubber Rim That Fits Bottom of Pails and Jugs



Electric Iron with Water Reservoir Eliminates Sprinkling



Burned to the Oven-Door Lining, This Cooking Chart Cannot Get Torn and Is Always Accessible

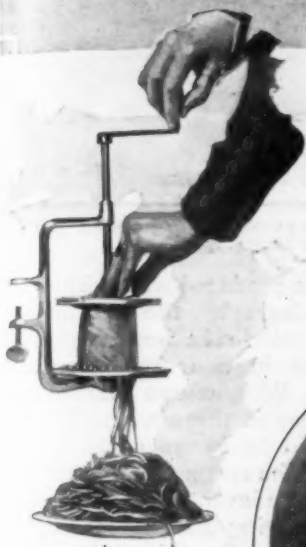


Handle of Cabbage Slicer Serves as Apple Corer



Electric Ironer Run from Light Socket Has Switch Giving Three Degrees of Heat

Saving Things *Home*



To Save the Hands,
This Rapid Fruit or
Vegetable Slicer and
Shredder Prepares
Foods in a Number of
Different Ways

Fur Coats and
Other Garments Are
Protected from
Moths, Dust and
Dampness in Metal
Vault Which May
Be Built into the
Wall or Used as
Separate Article of
Furniture; the Cab-
inets Are Air-Tight
and Permit Thor-
ough Fumigation



Marcel Waves at
Home with Electri-
cally Heated Iron



Fruit-Jar Sealer and Open-
er Smooths Kinks in Old
Caps



Trousers Press
in Back of
Chair Opens
like a Door



Tub Is Converted into Clothes
Washer by Electric Agitator



Miss Cody About to Leave the Speeding Motorboat and Climb the Ladder to the Airplane; Several Trials Were Necessary Before Success Rewarded Performers and Photographer

GIRL IN THRILLING MOVIE STUNT LEAPS OFF BOAT TO PLANE

While the boat was traveling at high speed, Miss Mable Cody, niece of the late Buffalo Bill, stepped from its deck, caught a ladder swaying from an airplane roaring above her and climbed up safely while a motion-picture camera recorded her daring deed. The stunt was done near St. Augustine, Fla., and required four days for successful completion. In one trial, spray from the speeding boat fogged the camera lens; in another, the photographer was too far from the boat and in a third attempt, the plane crashed and the boat caught fire.

YOUR BRAINIEST PERIOD OF LIFE

Inventors seem to produce their best work between the ages of twenty and thirty-five, and military genius develops at fifty-five, while business men are in their zenith at fifty-three, according to the findings of scientists. Research shows that the average age at which twenty of the greatest

inventions were produced was thirty-two, but wireless telegraphy, the self-binding reaper and the air brake were developed largely by men in their twenty-second year. Wilbur Wright was thirty-eight when he conquered the air, and Edison was thirty when he invented the incandescent light. The steam turbine and the steam engine were invented by men thirty years old, the sewing machine's inventor was twenty-six, and the discoverer of the process for the cheap production of aluminum was only twenty-three. Some statesmen and generals do not reach their peak of power until past seventy.

LAWN SHEARS ON STICK HANDLE SAVE KNEES AND BACK



Trimming Lawn Edges near Sidewalk without Having to Stoop; Shears Also Cut and Trim Shrubbery

Trimming the lawn edges without kneeling, crawling or soiling the hands or clothing can be done quickly and easily with shears fixed to a swivel at the end of a hardwood standard and operated by a pair of handles, waist-high. The blades can be adjusted to different angles for cutting around shrubbery or hedges.

OLD FALLACIES ABOUT FOOD REFUTED BY DOCTORS

Like heirlooms, superstitions are handed down from generation to generation and some of them which have gathered about food and eating habits often have been detrimental to health, physicians assert. As an example, they cite the widespread belief that tomatoes thin the blood. This mistaken idea probably is the result of a queer mental twist. Tomatoes are red like blood and juicy, but thinner than blood, therefore they must thin the blood. But doctors declare that the fact is that the vegetables are exceedingly healthful and their juice is widely fed to babies, as a substitute for that of the orange, to promote growth. The belief that milk and acid fruits eaten together curdle in the stomach and therefore produce ill effects is also widely held. If they do curdle, doctors see no cause for alarm, because milk goes through this reaction with the gastric juice as soon as it reaches the stomach. Many women spend hours soaking cucumbers "to draw off the poison" without stopping to think that if the peel really were poisonous, the injurious substances would soak all the way through the cucumber. Special foods are in wide demand in some parts because they are said to be rich in helpful iron content. Ordinary lean meat, spinach, carrots, lettuce and egg yolk are considered sufficiently filled with iron to supply the normal body needs. That fish is a brain food is another common cookery delusion.

BOYS IN RAT AND INSECT GARB WARN AGAINST PESTS

Boys dressed like rats and mosquitoes learned to imitate the movements of the pests as a means of warning persons attending the exhibits shown during baby week in Bombay, India. The costumes all but concealed the actors, who illustrated by pantomime how the mosquito inflicts its poisonous bite and how the rat carries disease and destroys food as well as other things.

Electric Shiner in Operation;
Extra Brushes Are Kept in Rack;
Footrests Fold Back and Current
Is Shut Off Automatically



ELECTRIC SHOE-SHINING STAND SAVES TIME AND WORK

A motor-driven set of brushes and folding footrests are features of an electric shoe-shining outfit to replace old-fashioned hand methods. Brushes can be changed while the motor is running, three being used generally for one shine, a cleaning brush, the polisher and then a finish rub with a yarn brush. Lifting a lever when the shine is done, automatically folds the footrests back and stops the motor. Each shine is registered on a counter. It is said that patrons do not have to brace their feet when the brushes are used and the movement of the polishers imparts a pleasing sensation.

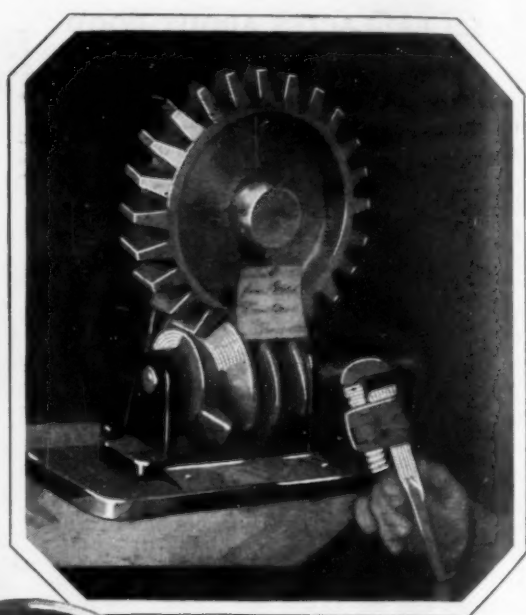


Indian Boy Actors in Their Pest-Masquerade Costumes during a Health-Education Exhibit in Bombay

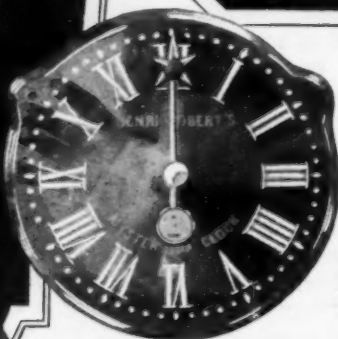
FIRST MODELS OF NOW FAMOUS INVENTIONS



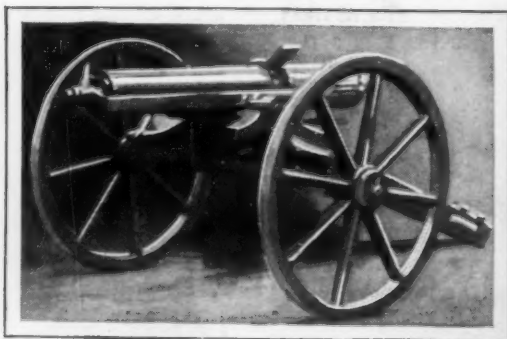
One of the First Vacuum Tubes Invented; It Is Seven Feet Long



Original Model of Stillson Wrench and a Driving Gear, Early Patent-Office Relics



Famous Mystery Clock of 1879; the Mechanism Was Hidden in the Counterweight



Above, Model of Rapid-Firing Gun and, at Right, Disappearing-Gun Model Devised by James B. Eads, Famous Bridge Builder

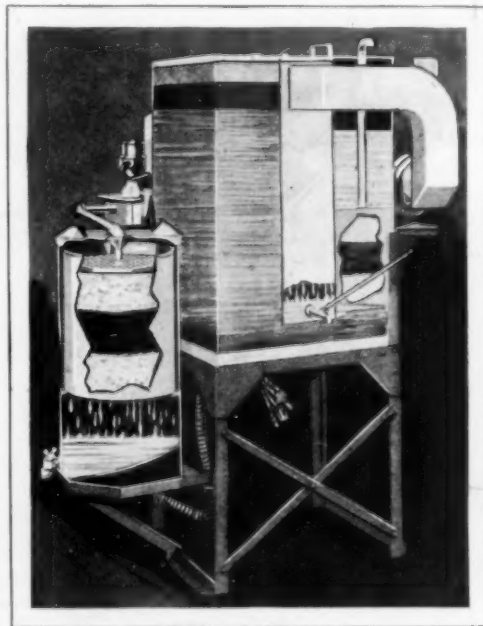


SIGN CONVERTED INTO MOVIE BY COLORED LIGHTS

By means of changing colored lights, the illusion of moving signs is produced on a patented billboard. Red, orange, magenta, pink and yellow lettering against a white background, appear to vanish when a red light is turned on but stand out in bold relief against black when the same color of illumination is used. With blue-green and other shades of light, similar quick changes are produced.

IMPROVED AUTO-OIL FILTERS TO REDUCE WASTE

Crankcase oil is said to be thoroughly reclaimed at the rate of two and one-half gallons an hour and at a cost of less than nine cents a gallon in an apparatus a mid-western firm has introduced. One of its special features is the use of secret chemical preparations in the filters. They are said to remove floating carbon for which they have an affinity. Oils of little or no lubricating value are driven off by electric heat while water and sludge are removed by gravity. During the reclaiming process, a high-grade light oil is extracted which may be used as a lubricant for typewriters and fire-arms, or for fuel. It is estimated that American motorists throw away at least 200,000,000 gallons of old oil every year. Reduction of this waste and increase of the length of service, are regarded as important next steps in automotive economy. Bureau of standards tests have shown that lubricating oil does not wear out, while some experts declare that oil which has been reclaimed thoroughly is better than the original.



Sectional Sketch of Filter; Reclaimed Oil Is Dripping into Bottom of Tank at Left



Embalming a Gas Main; This Expert Taper Can Cover a Twenty-Foot Length in Two Minutes

GAS PIPE EMBALMED IN TAPE TO PROLONG LIFE

Several miles of gas main laid in southern Illinois were coated with tar and other ingredients, wrapped in linen tape, and then covered with a special paint. It is believed that this treatment not only will prevent leaks but possibly prolong the life of the pipe from an average of about twenty years to more than a hundred. The "embalming" was applied after the lengths had been welded and tested under high air pressure. Some of the wrappers became so expert that they could tape a twenty-foot length of pipe in two minutes.

¶ In its brief lifetime, a silkworm spins about 4,000 yards of thread.

Things To Avoid in Buying a

By A DEALER

THERE are two vital facts necessary to know in order to obtain a bargain in a used car—when the car was built and how far it has been driven.

Another thing which must not be overlooked is the personality of the owner and his reason for selling. Many owners are good salesmen and have an inflated idea of the value of their old cars.

When I deal with such a man, I listen patiently while he tells me how good his car is, and when he is finished, I ask him to give me a ride. I make him do the driving and select the roughest and most crowded streets I can find.

Then I keep my mouth shut and my eyes on his feet. Almost invariably this greatly embarrasses the seller and he stalls his engine, clashes his gears and generally becomes so self-conscious that he makes a very poor demonstration. The result is to deflate his idea of his car's value and make him more ready to accept a fair price. I have saved thousands of dollars by this one trick.

Don't forget that there is a wide variation in cars even of the same make and

model. A cylinder block may be properly aged for months in the open before it is machined, or it may be pickled in an acid bath to hurry production. There is no way for the buyer to tell the difference. But it is a pretty safe rule to figure the life of the average car at 30,000 miles. There are exceptions, of course, but usually this is the point where the cost of the repairs, such as cylinder grinding, taking up main engine bearings and fitting new pistons, become prohibitive. So the first point is not to buy a car that has gone more than this distance and to figure the transportation you are getting as the difference between 30,000 miles and the number covered by the car.

Obviously the real value of a car is represented by the miles of service remaining in it, but the depreciation is figured almost entirely on its age. Thus depreciation of the average new car is figured at thirty per cent in three months, forty-two per cent in a year, sixty-four per cent in two years, and at the end of three years it is worth

Smoke from the Exhaust May Indicate Worn Cylinders, Which Would Make Necessary a Costly Regrinding Job



Used Car

only twenty-seven per cent of its purchase price. Therefore, be sure of the exact age of the car you are thinking of buying. Don't take the owner's word for it, but check the model number with the dealer.

Although it may only have been driven a few hundred miles, the value of a \$1,000 automobile at the end of three months is estimated at \$700, after a year at \$580, and when three years old at \$270. Suppose it has lain in storage most of this time and the speedometer only shows 2,000 miles. Obviously it is a bargain, for you are getting 28,000 miles of transportation for \$270.

Again, suppose this same car was run 10,000 miles the first year and received good care. In buying it you would be paying \$580 for 20,000 miles of transportation. In this case you could use it for two years and then sell it for about \$270.

Of course, the first instance would have been the best buy, although you would have received little or nothing for the car after it had reached the 30,000-mile mark.

Next you must consider the condition of the car. Contrary to popular belief, the first thing that wears out in an automobile is the frame, the body comes next and then the clutch, differential and transmission, in the order named. The motor usually is the last unit to go. The frame is the foundation of the car and is called upon to absorb all of the road shocks. As a result, the rivets work loose, causing "weave," which in turn ruins the body. In such cases they must be replaced with taper bolts.

Of course, it is impossible to go over the frame without disassembling the car, but there is an easy test of its condition.



Drive one front wheel up on the curbing, stop the motor and then try to open the doors of the body. If they jam or bind when the car is in this position, don't buy it at any price. Also, make sure of the condition of the tires, as their replacement is costly. Standard tires, if properly cared for, should be good for from 10,000 to 18,000 miles or even more.

Then try the motor at various speeds, watching the exhaust. If it is smoky, that is a sign of oil pumping due either to scored cylinders or wear on the walls. If the car has gone under 15,000 miles and smokes, don't buy it, as this trouble is not normal and probably is due to scored cylinder walls, which will have to be rebored, or to badly fitted pistons. If, however, it has gone from 18,000 to 20,000 miles, some smoke may be expected and a new set of patent rings will give 10,000 more miles of service without regrinding and at small cost.

Some idea of the internal condition of the motor may be obtained easily, without removing the head, by taking out all

of the spark plugs. In the average four, the first and second cylinders, counting from the radiator, should show the most carbon. In sixes, numbers one and six

20,000 miles. The average car is at its best at from 12,000 to 20,000 miles, after which replacements are needed.

American manufacturers are building



Put One Wheel on the Curb and Try Doors to See If They Bind; Also Inspect the Spark Plugs for the Uneven Formation of Carbon

have the greatest tendency to foul. If, then, in the four, more carbon is found in either number three or four than in one and two, this may indicate scored cylinders calling for a costly regrind job and new pistons and rings. The same is true of sixes. If more carbon is found in numbers two, three, four and five than in one and six, insist on removing the head to be sure none of the cylinders are scored.

If the average car has been properly cared for, the carbon will have to be removed at about 4,000 miles, the lower rods taken up at 7,000 to 12,000 miles, and new pistons or rings fitted at about 18,000 to

better and more sturdy cars than ever before. The days when some models developed weakness in certain parts are over, so that almost any good used car can be purchased on a mileage basis with the certainty of profit and pleasure.

In buying a used car, you eliminate the factory profit, dealer's commission and freight charges, and the market is filled with bargains capable of providing the most economical transportation available.

Above all things, make sure that the owner from whom you purchase has a clean bill of sale. Failure to do this may cost you the car and the sum you paid.

TINY THREE-INCH TYPEWRITER WEIGHS ONE OUNCE

What is believed to be the smallest typewriter in the world has been constructed by a Pennsylvania inventor after some fourteen years of work. Although but three inches in diameter and weighing only one ounce, it contains all the letters of the alphabet and has been used by the inventor in an-



swering the many letters of inquiry he has received concerning the tiny machine. A central knob turns the disk to print the proper characters.

RANGE OF TREE SEEDS' FLIGHT TESTED IN DEEP SHAFT

To find out how far the wind carries seeds from trees, a series of interesting experiments were conducted by the forestry department in the 160-foot elevator shaft of the Campanile at the University of California. Twenty-seven lots of seeds were dropped from the top of the shaft and the time it took them to reach the cloth screens spread at the bottom was

measured by a stop watch. Absence of appreciable air currents aided accurate timing. After the rate of fall per second was calculated, the approximate distance a seed would travel from a parent tree when exposed to winds of various speeds before striking the ground was estimated. It was found that many seeds journey farther than had been supposed. Seeds of the Sitka spruce, for instance, drifted down so slowly that even slight stirrings of air carried them temporarily out of sight.

COMPACT HOME WORKSHOP

Including a motor, jig and circular saw with special beveling attachment, wood or metal lathe, a drill and several other tools, a compact home workshop outfit now on the market can be assembled in a space no larger than that of the kitchen-table top. The instruments are not toys but real tools similar to those various manufacturing plants are using for lighter tasks and they are accurately made. The motor is run from the house-lighting circuit and arrangements are made for operating more than one machine at a time.



Using Jigsaw of Set; Other Tools Grouped on Table to Show Variety and Convenient Size



Where Derricks Serve as Masons; Lowering Side of Concrete House as Unit to Foundation during Rapid Construction

HOUSES ARE BUILT IN ONE DAY OF CONCRETE SLABS

Builders are seeking a solution of the shortage of houses near Berlin, Germany, by erecting small cottages of concrete that can be put together and made ready for occupancy in twenty-four hours. The walls are constructed as units, then raised one at a time and secured on the foundation and to each other. This method of building is said to be from thirty to forty per cent cheaper than others, each house costing only slightly more than \$2,000.

METAL SHEET PRINTS COPIES FROM TYPEWRITING

As many as 6,000 copies an hour can be made from a thin sheet of metal, according to reports of the substance which is of German origin. The material is so flexible that it will easily work in the typewriter or register impressions from handwriting. A special duplicating press is used with the metal.



Fire Tower in Action from Front at New York Night Blaze, While Mate, Driven down Narrow Alley, Attacks the Fire from the Rear

SKILL OF CHAUFFEUR ENABLES FIREMEN TO BEAT BLAZE

The skill of a chauffeur, who piloted a huge water tower down a fifteen-foot alley and around a right-angle turn, enabled New York firemen recently to conquer a stubborn fire which had started in a ten-story building, broken through the roof and jumped to a fifteen-story skyscraper alongside. At the back, across a narrow alley, was a row of old five-story paper warehouses, and the firemen did not dare attack the flames from the front with high-pressure streams for fear of driving the fire through the building and across the alley. The latter, because of its nar-

rowness and the right-angle turn, seemed an impossible place for a water tower, but one of the fireman chauffeurs volunteered to try to place his machine there, and succeeded in doing it. Caught between streams from two towers, the flames were snuffed out as neatly and almost as quickly as one snuffs out a candle. While the water tower was maneuvering into position, firemen climbed to the roof of the fifteen-story building, carrying reels of hose, attached the lines to standpipes and, lying along the cornice, lowered the nozzles with ropes until they came opposite the windows where the fire was located, and thus directed streams into the interior, breaking out the window panes by swinging the heavy nozzles against them.

AUTO LIGHT SHIELD STOPS GLARE

Easily attached to any automobile headlight without the use of tools,

deflectors now on the market are intended to remove the objectionable glare of the lamps and make it unnecessary to touch the dimming switch while driving. They are installed by opening the headlight, re-

moving the bulb and inserting it within the deflector, which consists of a double-wing arrangement with a central barrel that fits over the bulb and a reflector band held in



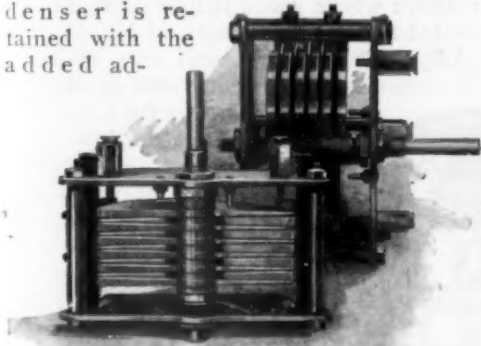
place by two small vacuum cups and extending horizontally across it.

Finishing Radio Cabinet

Many radio fans can boast of as fine a homemade set as can be bought anywhere, but most of us are not well satisfied with the appearance of the homemade radio cabinet. Of course, we have sanded and finished it with care, but it does not quite come up to the manufactured product, especially of the two-tone type. The two-tone effect can be obtained easily and at little cost as follows: If the cabinet has already been finished take off the finish with varnish remover. Then sand the cabinet well and, with a small brush, paint the parts you wish to be lighter-colored with white shellac. Sand again after the shellac has dried, until the treated parts are level with the rest of the surface and smooth. Finish with a coat or two of some good varnish stain and the pleasing result will more than repay you for the trouble. If a piano finish is desired afterward, it is advisable to add a coat of clear varnish and allow it to stand six days, then rub down with rottenstone and oil to the required brilliancy.

Variable Condenser Has Plates That Are Wedge-Shaped

A new straight-line-frequency condenser differs from the usual design in that the plates are wedge-shaped. The mechanical strength of the old-type condenser is retained with the added ad-



Side View Showing Wedge-Shaped Rotor and Stationary Plates

vantage that there are no widely extended rotor plates to cause crowding of parts on the usual 7-in. panel.

⦿ A moist ground is the best as it offers the least resistance.



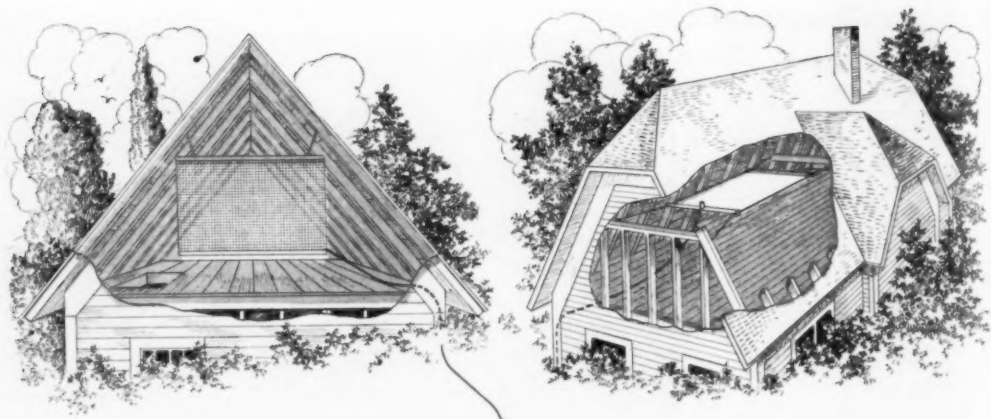
Cone-Type Loud Speaker Showing Method of Easel Mounting; Insert, Speaker Hung on Wall

Cone Speaker for Wall or Easel

The cone speaker shown in the illustration is one of the late arrivals on the market, and is featured by its adaptability for mounting on an easel base or hanging on the wall, to which end it is provided with a detachable base and a silk hanging cord. When suspended on the wall, it decorates the room and is less subject to the vibrations encountered by the table type of speaker. The seamless diaphragm is replaceable at small cost, and is claimed to be immune to atmospheric effects. It has a mahogany back which acts as a sounding board, increasing the volume.

Hints on Connecting Aerials

When building the aerial keep the connections as few as possible. Try to have the aerial wire in one piece; this can be done by threading the wire through the end of the insulator at the lead-in end, taking two turns around the horizontal wire and continuing on down with the same wire for the lead-in. Keep the horizontal part of the aerial as straight as possible, without bends. This also applies to the lead-in wire; do not try to fit it around corners. When planning the aerial, see that the lead-in wire will reach the set by the shortest way. The ground wire should also be as short as possible. For these short connections it is necessary to carefully consider the location of the set in the building and of the aerial on the roof.



Installing an Aerial in Your Attic

By F. L. BRITTIN

ATTIC aerials, if properly constructed, give almost as good results as the elaborate outdoor types and are easier to build. No lightning arrester is required for them and another advantage is that they are protected from soot and corrosion due to smoke and weather conditions.

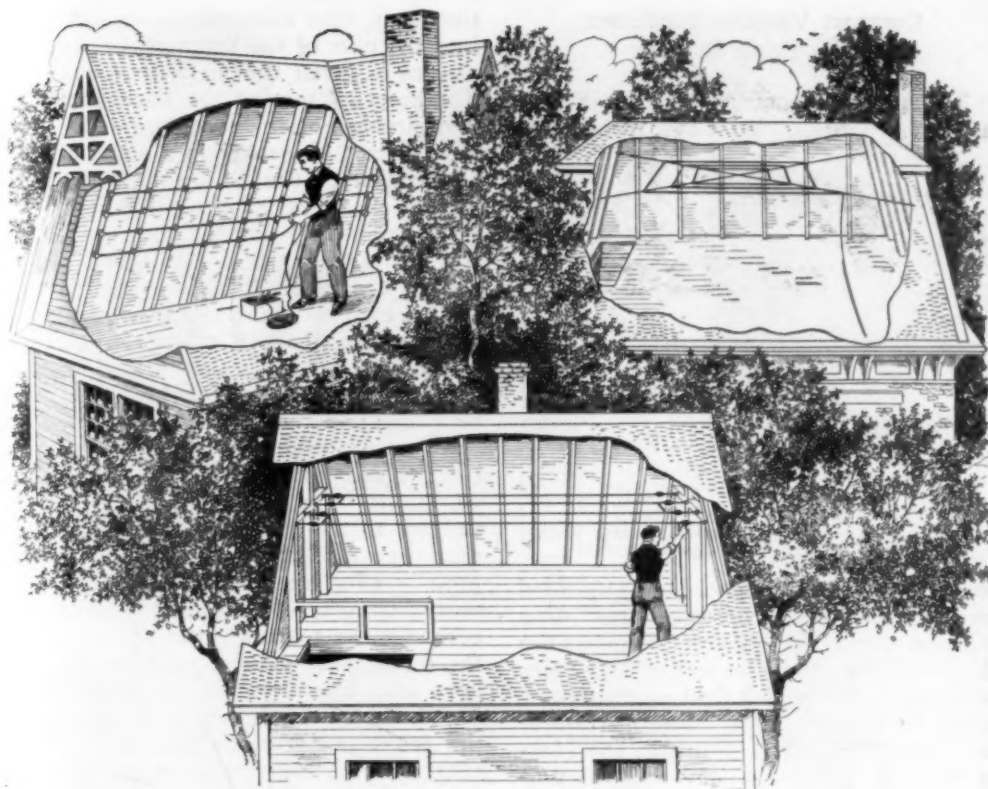
When selecting the type of attic aerial to use, it is necessary to take into consideration the size and shape of the attic. The illustrations give the builder a number of different types and methods of installation, all of which are good. We will first consider the end-to-end type, shown in the lower illustration on next page. It consists of four wires run the full length of the attic and connected to insulators at each end. Jumper wires are then soldered across, as shown, so as to make one continuous wire. The lead-in wire is soldered to the end indicated by the worker's hand, and is connected just inside of the insulator; from this point it is taken down to the set. The lead should be of insulated No. 14 wire and can be run down between the partitions and brought out to a wall plate in the room where the set is to be

located. Brass wall plates are now available for this purpose, and some are equipped for both the aerial and ground connections. The aerial and ground leads from the set are then provided with small plugs which are inserted in the wall plate, making simple and efficient connections that eliminate long unsightly wires running around the room.

At the upper left in the same illustration is shown a similar type of aerial consisting of one continuous wire fastened to the rafters with porcelain insulators of the split-unit type. This aerial is recommended where space is limited, as in hip-roofed attics. One length of No. 14 wire, 150 to 200 ft. long, will give excellent results. It will be noted in each of these aerials, the far end of the wire is left dead.

The flat-loop aerial, shown at the upper right, is preferred by some experimenters as it is especially useful where space is at a premium. Two lengths of clothesline or light rope are strung across the attic from corner to corner, and are tied together at the crossing point. The aerial wire is fastened to the ropes, as shown, and is





tied firmly at every point where it touches the rope. The inner end is the dead one and the outer end is connected to the lead wire to the set. The turns should be spaced about 1 ft. apart.

The curtain and mat types of aerial, shown in the colored illustration, are very popular. The one at the upper right is a manufactured type built in the shape of a large mat, and consists of numerous small wires between two thicknesses of heavy paper. The wires are bound with metal strips at each end and the lead wire is taken from one of these strips. The mat is suspended from the rafters by means of short ropes. The aerial at the left is homemade and of the curtain type. It consists of a section of copper screen with wood strips at top and bottom. The lead-in wire is soldered directly to the copper screen.

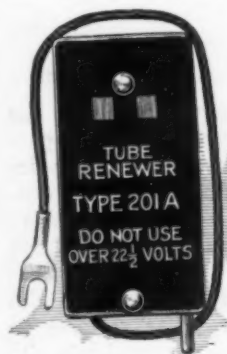
Do not neglect a good ground for the set; this is fully as important as a good aerial, and one of the best grounds obtainable is a cold-water pipe located as near the set as possible. Use a ground clamp

and see that the pipe is free from rust or paint at the point where the clamp is to be fastened to it.

Tube Rejuvenator Operates from Radio Batteries

A tube booster, or rejuvenator, that operates from the batteries of the radio set instead of the lighting socket, is now

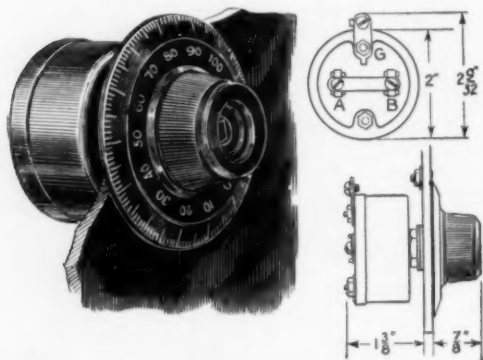
available. This makes tube boosting instantly possible wherever the set may be, at the summer camp, on a farm or in the city. The direct current from the batteries is claimed to have greater efficiency, due to the absence of periods that tend to cool the filament



between the "flashing" of the tubes at the high voltage.

Compact Variable Condenser Has Triple Range

Three capacity ranges feature a new and compact variable condenser. This



Triple-Range Condenser and Details Showing Method of Mounting, and Small Space Required

low-loss instrument is thoroughly shielded and is adapted for convenient mounting without special drilling jigs. It meets the demand for a condenser unit of small size which covers a wider field of usefulness than the ordinary type. The method of mounting the unit is shown in the illustration. It will be noticed that the unit extends only $1\frac{3}{8}$ in. back of the panel. The end view shows three terminals, A, G and B; connections to terminals G and B give a range equivalent to an ordinary 11-plate condenser, to terminals G and A, the equivalent of the ordinary 23-plate condenser, and to terminals G and AB (using busbar), the equivalent of the ordinary 43-plate condenser. Terminal G is in contact with the condenser case or "shield," and may be grounded to eliminate body capacity.

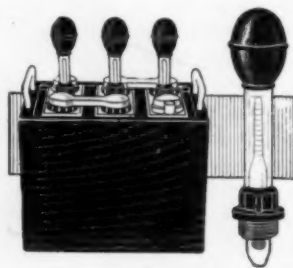
Position of Loud Speaker Important

A number of tests have shown that the position of the loud speaker in any particular room or apartment has a very decided influence on its acoustical performance. In several cases where results were not satisfactory and the difficulty had been blamed on the set, the trouble was discovered to lie not in the set, but in the location of the loud speaker relative to the listeners. A common mistake is sitting too near the speaker, or placing the horn too near the set or on top of it, with

the result that voice or music is blasted into the ears of the listeners, because no chance is given the mellowing effect of distance to filter out the background of undesirable noises. To get the best effect, place the speaker in a corner opposite the set. Curtains, tapestries, rugs and thick draperies are detrimental to good reproduction. A lightly furnished room invariably gives better results, although echoes are likely to develop in it. In that case certain draperies may be necessary. No definite rules can be laid down, however, and a little experimenting will be necessary to obtain best reception. Sometimes the mere parting of curtains between rooms will give the desired result. Never place a loud speaker where vibrations from it can be transmitted to the set; this applies to both the horn and cone-type of speaker. The latter is especially effective if suspended from the ceiling or picture molding, or placed in a corner so as to throw the sound across the room. Try several positions for the horn and, after the best place has been found, fasten an extension cord around the room and connect the horn permanently. Take the wire along the junction of the floor and wall, or run it behind the picture molding where it is hidden.

Permanent Hydrometers Simplify Battery Testing

A hydrometer mounted permanently in each battery cap takes the danger to rugs and floors out of this method of battery testing and is always ready for use. The



units are available in sets of three and can be adjusted to fit in any battery. The reading of each cell may be taken by compress-

ing each bulb in turn and returning the electrolyte to the cell after the reading has been taken. As the instruments are not withdrawn from the cells, there is no danger of spilling the corrosive solution, as with the common type.

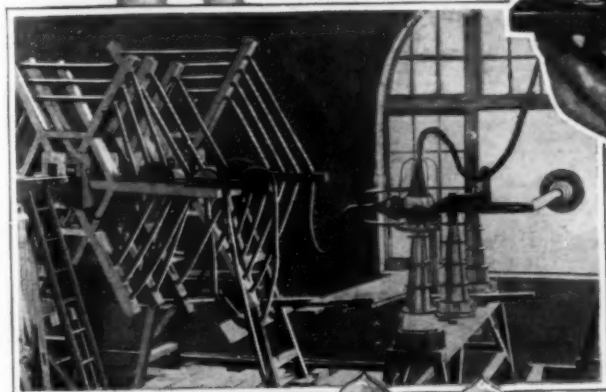
HERE IS A RADIO TUBE THAT WON'T BURN OUT



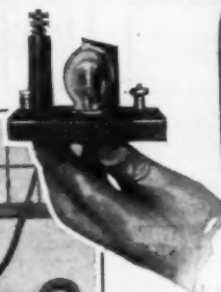
One of the Latest Developments of Radio Is the Waterproof Cabinet for Use on Boats; the Five-Tube Set in the Photo, Ready for Operation, Is of This Type



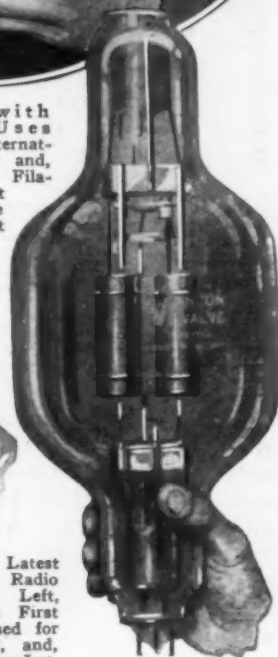
New Tube with Parts; It Uses 110-Volt Alternating Current and, Having No Filament, It Cannot Be Burned Out



Above, the Huge Induction Coil and Lead-In at the GPO Wireless Station, near Rugby, England; This Is the Largest Station in England and Is Now in Touch with the United States; Right, the Automatic Device Used to Send Out Calls to Be Checked by the Byrd Arctic Expedition; the Calls Were Received by the Powerful Sets with Which Byrd's Plane Was Equipped

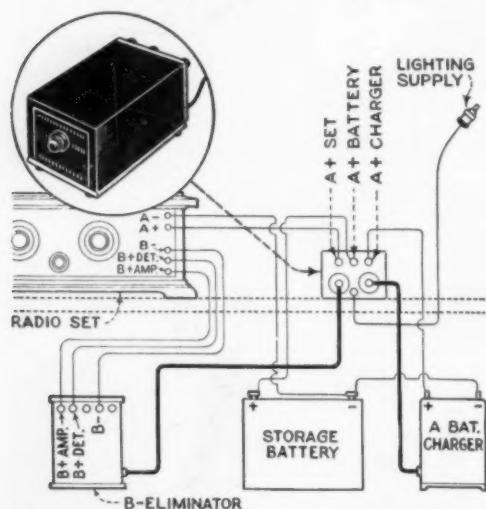


First and Latest Types of Radio Tubes; Left, Fleming's First Valve Used for Receiving, and, Right, the Latest Type of Transmitter



Power Control Simplifies Set Wiring

A simple device for controlling the power supply to the A-battery charger and B-eliminator is now on the market.



Insert Shows Compact Form of Power-Control Unit; Below, Rear View and Detailed Wiring Diagram

The device, shown in the illustration, eliminates much of the intricate wiring used in the modern set employing a battery charger and B-eliminator. It is operated by turning the small knob on the front. A cord and plug are provided for connection to a wall socket and the A-battery charger and B-eliminator are then plugged into the switching device. The other connections are made to the three terminal posts on the rear of the unit.

In one position (the arrow on the knob pointing to the left) the switch turns the lighting current on the B-battery eliminator, so that the set receives the B-battery current. It also connects the storage or A-battery on the set and enables the receiver to operate. It is not necessary to use any other A-battery switches or rheostats to turn the set on or off; if such a switch is provided it should be left on at all times, and the rheostats left at their proper positions for best operation. Turning the switch knob to the right, the device performs the following functions in the order given: disconnects the power supply from the B-eliminator and opens the A-battery circuit to the set; connects the charger to the storage battery and turns on the power supply to the charging

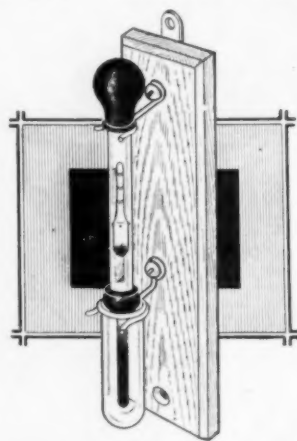
unit. The switch is so designed that, when opening circuits, it breaks connections on both lines, and will handle safely a lighting supply of 115 volts.

Advantages of Variable Gridleak

For distance, volume and tone quality, the grid circuit of the set must be "tuned" to the particular transmitting station desired. This is not practical in general use, so a compromise of some fixed gridleak value is made. However, for those who wish to go to extremes for added efficiency, a gridleak of the variable type that can be adjusted with a front-panel control is desirable. If the value of leakage is too high or too low for the station sending, the set will be out of tune or pitch with the sender. The gridleak of the fixed type will, of course, get a few stations with perfect volume and clarity, but will be limited to these few. With the adjustable gridleak all stations will come in with full volume and clearness.

Holder Keeps Hydrometer Safe

After breaking several hydrometers and laying several more down carelessly where the electrolyte damaged rugs and furniture, I made the little holder shown in the illustration. The back may be a

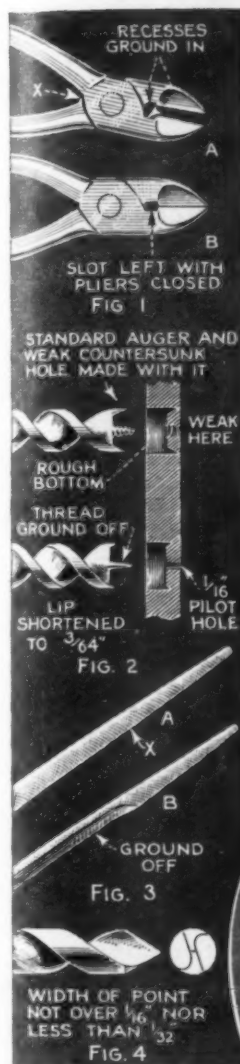


piece of wood or scrap bakelite. The brackets holding the hydrometer and test tube are fashioned from short pieces of busbar wire. About the only part that will have to be purchased is the test tube, and this

can be obtained from any drug store for about five cents. Fifteen minutes' work is all that is required to complete the device and you will always know where to look for the battery tester.—W. J. Langan, Freeport, Ill.

Tool Kinks for Radio Builders

By ROBERT S. KRUSE

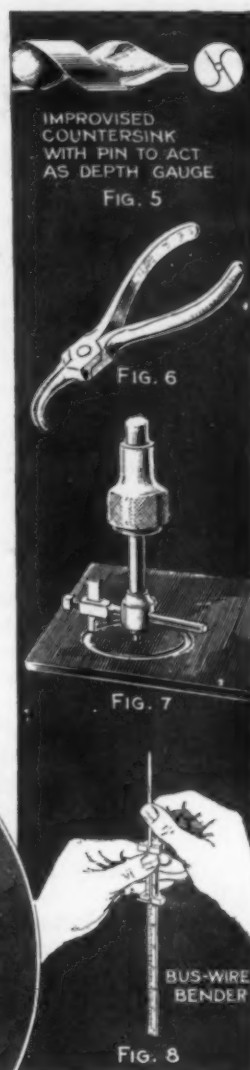


THE kinks and suggestions given in this article are not intended to be strikingly novel but simply to point out to the radio builder some handy ways of making the tool fit the job.

When wiring radio receivers, or anything else, wherein "annunciator" wire is used, there isn't a doubt that the handiest cutting pliers are the so-called "diagonals," which have a very pleasing way of reaching into close corners and making the cut at exactly the right place after the wire is in position. Unfortunately these pliers have no convenient place in which the rubber-wound wire can be squeezed to break the insulation before stripping it from the wire. A simple way to provide such a surface is shown in Fig. 1, $\frac{3}{16}$ in. of the cutting edge nearest the hinge being sacrificed. The flats are formed by grinding, as shown at A. When the pliers are closed, as at B, the slot should just allow the smallest size of wire to



slide through after the insulation has been stripped. Usually the smallest wire is No. 22. Since the recesses should be reasonably square-cornered and the steel is usually too hard to file, it is convenient to finish the cut with a small slip of carborundum stone. If this is not available, it can be done with a small file plus oil and carborundum powder; this may ruin the file, so if a worn-out file can be used so much the better.



When assembling radio sets or other light devices on a wooden baseboard, it is frequently necessary to countersink a round-headed machine screw in it, usually with a washer under the head. The hurry-up amateur way of doing this is to use an auger, with the result shown in Fig. 2, a weak uneven bottom being obtained that will not support the machine screw and washer because the edges are almost cut through.

A bit can be prepared for this work by grinding off the threads of the lead screw and shortening the lips to $\frac{3}{16}$ in., as shown in the lower sketch. Care should be taken to leave the guiding spur true. In using a bit of this type, a $\frac{1}{16}$ -in. pilot hole is first made with any type of drill, after which the auger will follow exactly. When the hole has reached the right depth, take one turn without feeding, and the bottom of the hole will be made smooth.

Sooner or later one has to ream holes in insulating material; some of this will not stand up under the reamer and the only remedy seems to be to work with a tapering round file, which, however, persists in jamming in the hole. Fig. 3 shows a way of grinding such a file so that it will be more easily handled. The first third of the file is left round and the rest ground off on one side. This may sound foolish, but is a great help.

A good countersink tool for insulating materials is shown in Fig. 4, and is made by grinding an ordinary twist drill to a long point. Flat-head screws are supposed to have their heads made to a standard angle, but this is not true with the smaller brass screws. It is best to make the point of the drill a little too sharp; very little clearance should be ground off to prevent hogging. This sort of counter-

sink keeps the chuck far enough from the work to permit a clear view which is important because a single hole countersunk too far will often spoil the job.

The difficulty of judging the proper depth of the countersink can often be avoided by the kink shown in Fig. 5, although it is good only when the insulating parts are of uniform thickness, the pin acting as a depth guide. If the panel is of rubber, the pin must be a bit undersized to prevent seizing. A countersink of this type can be ground from an ordinary twist drill.

When drilling or countersinking holes, stand directly above the work in the position shown in the photograph. Keep the drill straight up and down and apply only sufficient pressure to insure a good cutting action. Excessive pressure will break out the underside of the material; a block of wood under it will prevent this and insure a clean hole. Large holes for voltmeters often try the patience of the amateur, but by using an expanding bit of the type shown in Fig. 7, this part of the work will be found very simple. The bus-wire bender shown in Fig. 8 is a new and useful tool, saving time and wire, as it measures the wire to the length of each bend, and after a little practice surprisingly quick and accurate work may be done with it.

Neighborly Aerial Installation

The aerial installation shown in the illustration has several advantages where two neighbors have the same problem to solve. In suburban localities difficulties sometimes arise preventing a de-

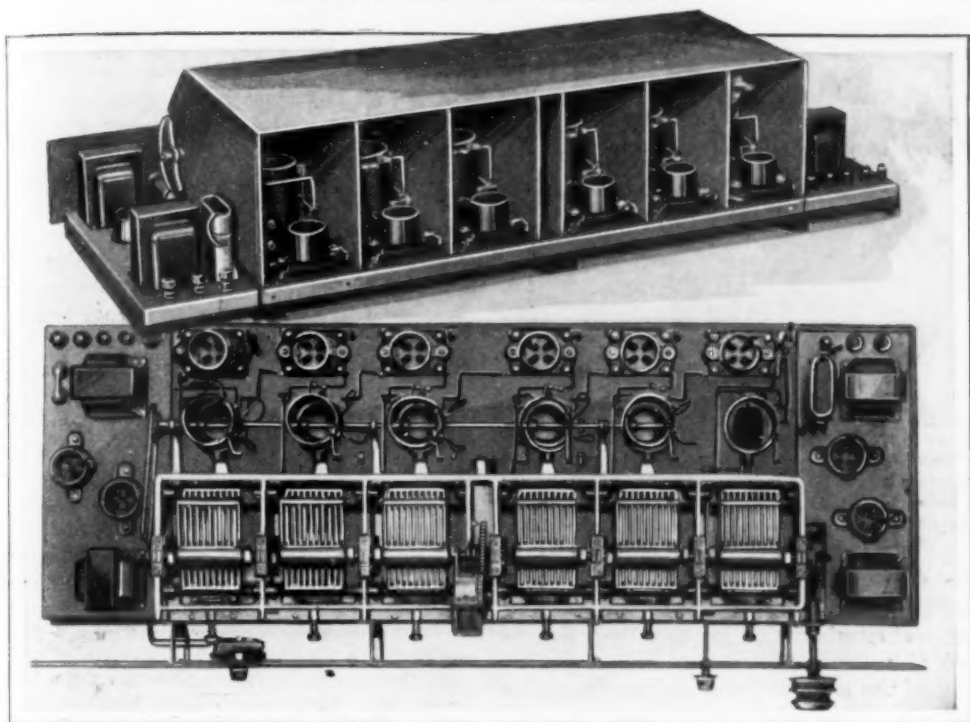


Divided Aerial Showing the Position of the Insulator Midway between the Two Houses

sirable location of the aerial for best results. Everyone wishes to run his aerial in the direction best suited for the greatest number of broadcasting stations, and if the houses are facing north or south, for instance, the limited width of the average lot will not permit a very long east-and-west aerial. With a little co-operation this difficulty can be overcome, the single-wire aerial being divided in the exact center by an insulator.

Ten-Tube, Six-Condenser Set Has Single Control

We are familiar with single-control sets of the five-tube variety, but when ten tubes are placed under a single control our curiosity is aroused. The photos show the arrangement of a well-designed receiver of this type. Five stages of tuned r.f. amplification, a tuned detector, and



Above, Rear View Showing Method of Shielding; Below, Shield Removed Showing Gauged Condensers and Rotating Mechanism

four stages of low-ratio a.f. transformer-coupled amplification are used.

The five tuned r.f. stages and the detector stage are well shielded and are all tuned by variable condensers operated from a single shaft. A small coil in the plate circuit of each stage, coupled with the succeeding grid circuit, is rotated whenever the main tuning control shaft is turned, and automatically maintains each stage of the amplifier at the best coupling point as the wavelength is varied. All of the rotor coils are mounted on one shaft, which is in turn driven from the main condenser shaft by a link mechanism. Special one-to-one ratio a.f. transformers, with unusually large iron section and winding space, are used. An output transformer to match the loud-speaker units, which are supplied with the set, is incorporated in the receiver.

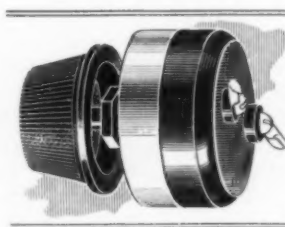
With the one tuning dial it is possible to run over the entire broadcast range of the receiver in less than a minute, and to note the nature of the program from every station within range at the moment.

The frame of the six-unit variable condenser serves as the chassis of the set it-

self and within this frame are mounted the die-cast stators of the six condensers.

The set is available in several antique models of period type, each cabinet containing a battery compartment, and is equipped with dual loud speakers covering the entire musical range. A pilot light is mounted within the cabinet to illuminate the dial, and this light is controlled by the switch on the panel which places the set in operation.

Dustproof Case on Rheostat

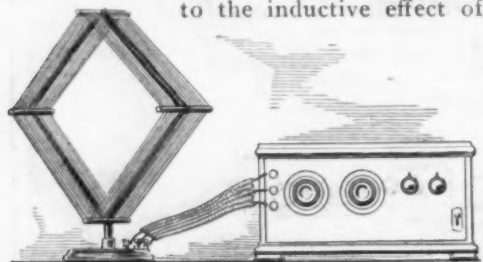


A bakelite and polished-nickel case completely encloses this new rheostat. Its moving parts are thoroughly protected from

mechanical injury or accumulation of dust and the instrument takes up very little room behind the panel. Mounting requires the drilling of only one hole for the center bushing and locking nut.

Webbing for Loop Connections

The usual loose and haphazard way of connecting loop aerials to sets has been the cause of considerable annoyance due to the inductive effect of



Loop Leads Are Threaded through Webbing to Prevent Induction and Improve Appearance

the varying distances between the lead wires. This condition has been especially noticeable when turning the loop to obtain directional effects, the changing position of the leads making distant reception difficult. One of the best ways to overcome this inductive disturbance is to obtain a piece of cotton webbing similar to that used in trunk straps. Remove the two outside cords and, if the loop is of the three-tap type, also the center cord. The loop leads of No. 22 copper wire are then threaded through the conduits thus formed. For best results the terminals should be connected to a binding-post strip fastened to the base of the loop, leaving enough slack in the flexible wires so that the loop can be rotated.

Preventing Interference in Congested Districts

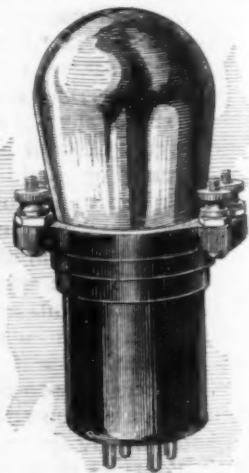
Interference from the multitude of causes present in the crowded localities of large cities has for some time been the main topic of conversation in radio-engineering circles. Motors used for operating the blowers of home oil burners cause quite a bit of this interference. The trouble is usually caused by sparking at the commutator brushes; if the commutator is rough, it should be smoothed with a piece of fine sandpaper and the brushes reset correctly. A large by-pass condenser across the brushes will do no harm to the machine, and will help to

stop this sparking, as well as increase the efficiency of the brushes and commutator. If the aerial is paralleling a high-tension line, it should be changed so as to run at right angles to the line; this also applies to street-car and elevated lines. Often humming sounds that are difficult to locate, are found to be caused by the d.c. lighting circuit. If the building is supplied with a d.c. source, try putting a large by-pass condenser across the line at the main switch. Disconnect the ground wire from the receiver, and, if the hum has disappeared, it is an indication that the interference is coming in over the ground wire. The best remedy in this case is to use a counterpoise instead of a ground wire. An effective counterpoise can be made by running the same amount of wire you now have in your aerial around behind the picture molding of the room. The lead from the counterpoise is then connected to the ground post of the set instead of the usual ground.

New Power Tube Has External Posts

Power tubes having external binding posts for the necessary battery connections, eliminating wiring changes in the set, have now appeared on the market.

These tubes fit in the standard sockets and the extra C and B-battery connections greatly simplify the installation. The two binding posts are connected if the proper C and B-batteries are already in the set. Power tubes, when used in the last stage of a.f. amplification, prevent overloading and distortion.



When several low-powered stations are difficult to separate and bring in clearly, increase the detector and amplifier filament voltage slightly.



By ROBERT H. KIRBY

THE thrill of bringing in a really distant station comes only to those who make possible the conditions favorable to long-distance reception. Now that the ideal radio weather will soon be with us, it is high time to look over the radio set, aerial and ground connections and see what can be done to obtain the very best results.

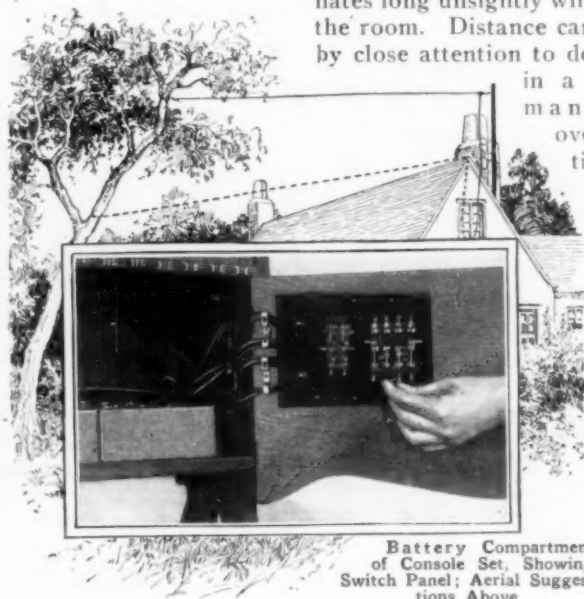
We will assume that the receiving set is a good one, not necessarily a large set, but one that is well designed and carefully built. A well-built 'three-tube set will often step out and bring in surprisingly distant stations if given a chance; however, the larger sets have a decided advantage, enabling them to overcome conditions smaller sets cannot cope with. Good tubes and fresh batteries are, of course, of first importance; if the tubes have been in use for some time, they may need rejuvenating or, if beyond such help, must be replaced with new ones.

Short battery leads are important; photos are shown of typical installations to give the reader an idea of the right and wrong way of placing the batteries. The switchboard on the door of the console cabinet is a good idea for an elaborate installation

when A and B-batteries and charger are combined in one compartment. However, there are several compact power-control devices now on the market that take up less space. The main idea is to keep all batteries close to the set, and at the same time out of sight or as nearly so as possible. Note the untidy arrangement in the photo showing the batteries on the floor with long straggling leads running to the set; an installation of this kind cannot be expected to give maximum results. The same set is shown at the right with the batteries placed on a shelf under the table, making possible short battery leads and certainly a neater appearance.

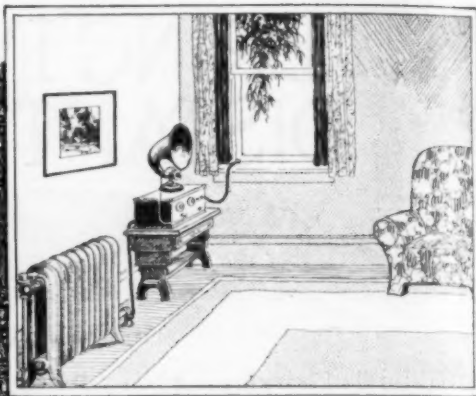
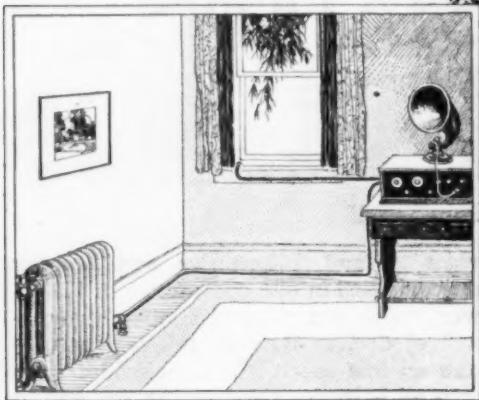
Proper placing of the set in the room, so as to obtain short aerial and ground leads, as shown in the illustrations, often results in greater efficiency, and eliminates long unsightly wires running around the room. Distance can only be obtained by close attention to details. If you live

in a city, there are many obstacles to be overcome and sometimes they make distant reception impossible; however, these conditions are not common and only exist in certain localities. One sketch shows a busy city street and the various points from which interference may come. City and



Battery Compartment of Console Set, Showing Switch Panel; Aerial Suggestions Above

er-plant officials are co-operating to minimize these sources of interference and much improvement is already in evidence. The radio listener can help



Left, Inefficient Arrangement of the Set, Making Long Aerial and Ground Leads Necessary; Above, Efficient Arrangement Showing Short Aerial and Ground Connections

himself under these conditions by making sure his aerial does not parallel any such power lines, and notifying the officials when any particularly annoying interference is present in the neighborhood.

Atmospheric disturbances, known as static, are nature's great obstacle to long-

distance reception, and, as yet, little has been accomplished in the way of a remedy. Static is present the greater part of the year, and is at its lowest ebb during the winter months. It knows no wavelength and when the so-called static-interference level is above the signal strength of the transmitting station, the receiver is cut off completely. This effect is illustrated by the beam of light cut off by the intervening wave in one of the drawings; the static waves offer the

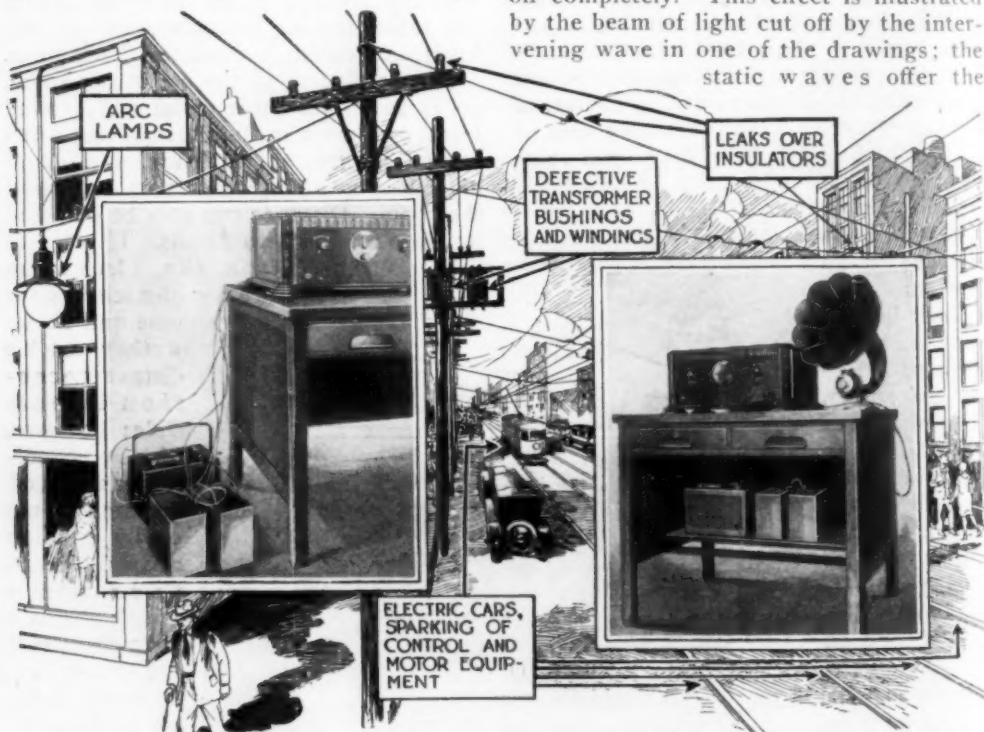
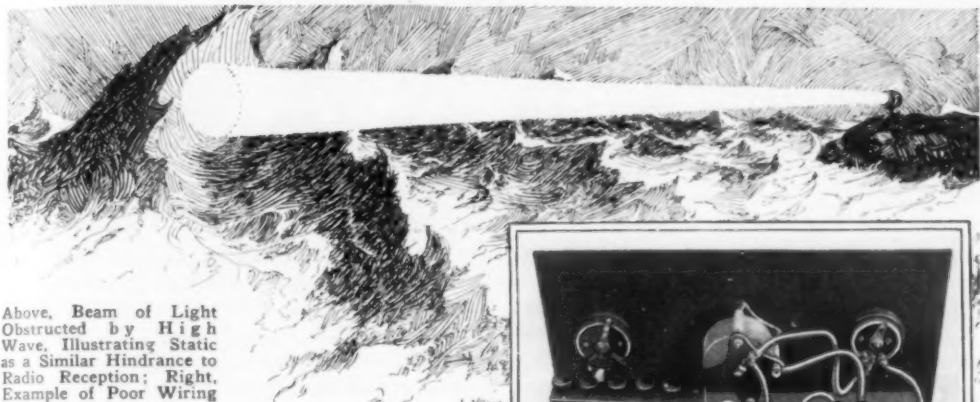


Photo at Left Shows Poor Battery Arrangement and Careless Wiring; Correct Method Shown at Right; Sketch Indicates Sources of Interference in the Average City

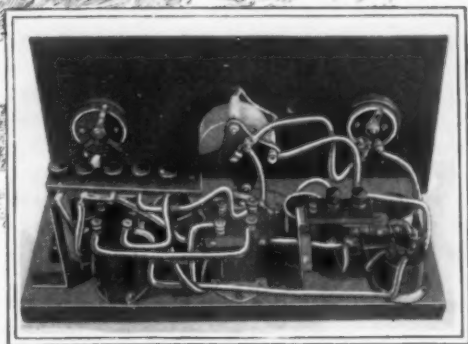


Above, Beam of Light Obstructed by High Wave, Illustrating Static as a Similar Hindrance to Radio Reception; Right, Example of Poor Wiring

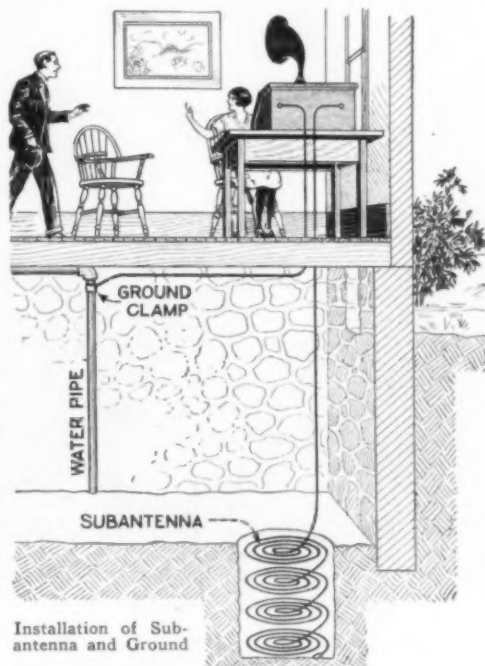
same interference to the signal. Static interference can be minimized by the use of sets employing loop aeralis, and one of the best methods yet found for sets of the aerial type is the underground or sub-antenna. This type of antenna is now available and comes ready to install, either in the yard or under the building. The results are much better during the static season with this subantenna, and the signal strength is about the same as that obtained with an outdoor aerial. The illustration shows the method of installation in a hole 3 ft. in diameter and about 4 ft. deep. The antenna is coiled in layers and the earth filled in between the coils up to the surface level.

The rear view of a set showing the terrible example of bad wiring, is an actual photo; indeed, the photo flatters it. No one can expect to get distant stations with a receiver of this kind; it is a marvel that it works at all. Some radio builders are apparently satisfied if the set brings in signals, but there is little gained by buying good parts and then throwing a bunch of wire around them. Anyone can build a neat and efficient radio set without even soldering a joint if a little pains is taken. If a soldering iron is not available, neat and good work can be done with busbar wire and a pair of long-nosed pliers, or special wire-bending pliers. Loops may be made over the various terminals, good electrical connections obtained and the wiring run direct to each instrument.

For the distance or DX fan, there are several ways by which he can extend his range and bring in stations he has not heard before. The addition of a stage



of tuned radio frequency will often give surprising results in better selectivity, range and volume. There has long been a demand for a self-contained independent unit of this type and several such units have lately appeared on the market. The one shown in connection with this article may be obtained either as a finished unit, as shown, in a case, or as a knockdown kit



Installation of Sub-antenna and Ground

that can be built up as shown at the left. This instrument is simply connected between the aerial and the set; it takes the impulses from the desired station and delivers them to the receiver in a highly amplified form. In effect, the station selected is brought closer to the exclusion of all others. All connecting wires are furnished and the battery connections are given; no alterations are necessary in the set, and the unit can be placed on top of the receiver. No additional batteries are required, as the instrument is operated from the same batteries as the set.

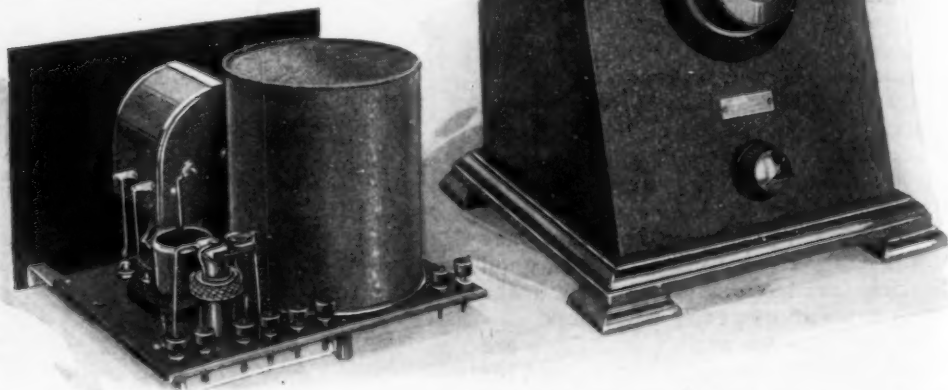
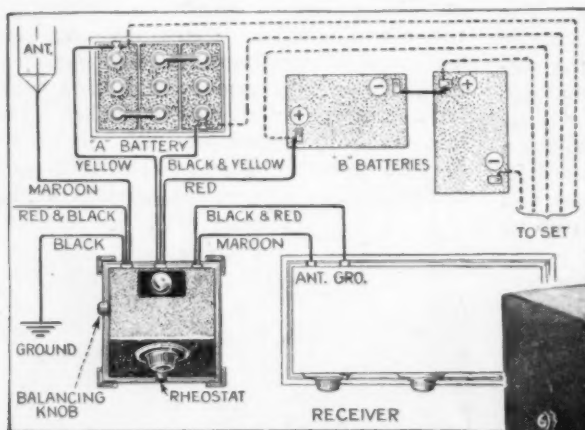
After the set and installation have been carefully checked and everything done to insure maximum results, there is one remaining factor to be considered before a far-distant station can be brought in; this is the personal factor, and everyone has the same problem.

You must learn to tune your set; this comes more quickly to some than to

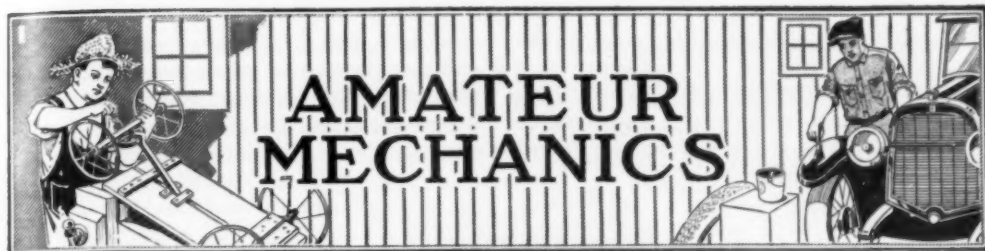
others. Patience is necessary in learning to tune a receiver and practice makes perfect. Do not twirl the dials and turn up the rheostats aimlessly; begin with local stations and log them carefully, noting the position of the rheostats for best results. The same relative positions will be best for the far-away stations, and the delicate balance maintained between the tuning and filament controls will bring the reward of distant reception. Vernier controls add much to delicate tuning, as often a very slight movement of a dial will tune in several different stations. After the desired station has been located, it is easy to readjust the controls so as to get it at maximum strength.

Terminal Clips for A.C. Tubes

The new a.c. tubes are provided with two heater terminals; these are placed at the top of the tube, protruding from a small bakelite connection block, and do not offer a very handy connection. The manufacturers have now placed on the market a small clip that fits on the tube connections and is equipped with small binding-post terminals for holding the connecting wires.



Left, Tuned Radio-Frequency Unit Made Up from Knock-Down Kit; Right, Ready-Built Unit of the Same Type; Above, Unit in Position with Battery Connections

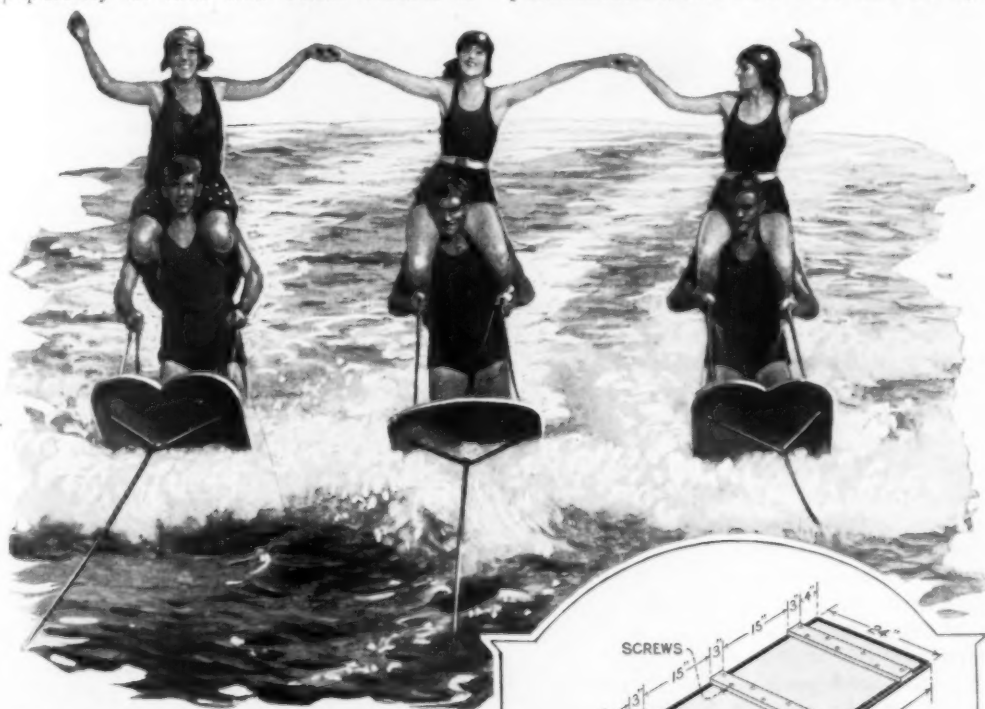


Build Yourself a "Water Sprite"

By R. L. SIMONS

A SPORT that has, during recent seasons, experienced a great wave of popularity at lake and ocean resorts is

afforded so much pleasure that he made several others for friends. After some experimentation, two sizes were decided up-

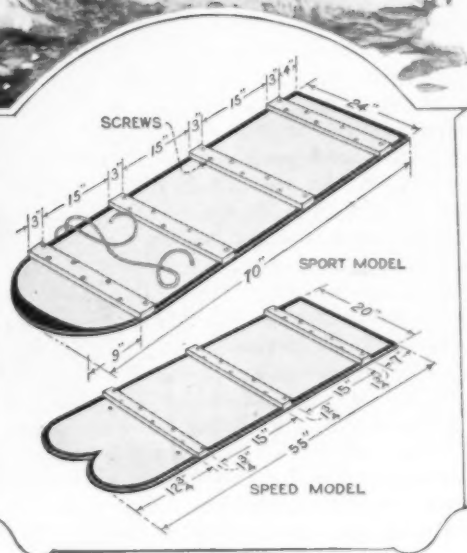


Right, Constructional Details of the "Water Sprites" or Aquaplanes; Above, Aquaplanes in Action

that of aquaplaning; riding on a board towed by a motorboat. One ride is sufficient to convert any normal citizen into an enthusiastic fan.

Anyone with the usual household equipment of tools can with ease and pleasure make a "water sprite," as the aquaplanes have been nicknamed, and if reasonable care is exercised it will be quite as good as a commercial board.

During the summer season of 1925, the writer made his first water sprite, and it



on as most satisfactory, the sport model and the speed model. The former is a larger plane, capable of being towed by a slower boat and carrying as many as three passengers. The latter is a smaller board which, having less area exposed to the water, must be drawn faster in order to plane with its single passenger. It offers the greater kick of the two styles, for it travels faster and requires greater skill in balancing and riding. The larger or sport model—family model one spectator called it—will plane with one passenger at a speed of six miles an hour, though the real thrill comes at higher speeds. The speed model, and the sport type when it is carrying two passengers, require about double this speed.

Dimensions for both types are given in the drawing. There is nothing arbitrary about these sizes, and they may be varied at will, but as they have been found satisfactory there would be no point in departing too far from them, unless the material available made this necessary. If the sprite is too narrow it will be very nearly impossible to stay on it; on the other hand, it should not be too wide. Any smooth, unsplintered wood may be used for the board part, on which the rider stands, or tries to stand. In the case of the writer, the board was made of tongued-and-grooved white-pine stock, clamped up with marine glue in the joints and strengthened by cleats, but such elaborate joints are an entirely unnecessary refinement, and were used only to improve the looks of the finished sprite.

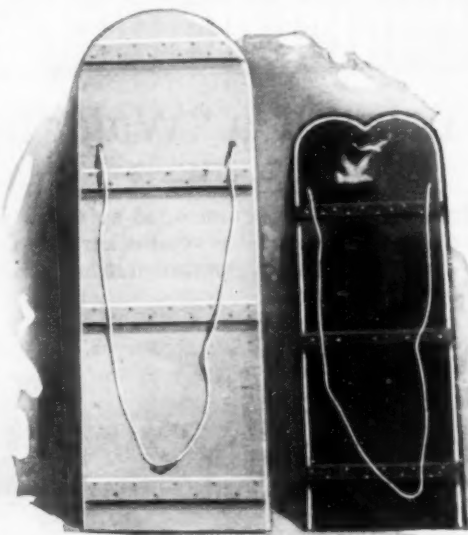
It will be quite satisfactory to hold the boards together by three or four cleats running across. These should be held firmly in place by flat-head countersunk wood screws, staggered to distribute the strain, as the water sprite receives a great

deal of pounding while in use, and all precautions should be taken to have it strong enough. The edges of the cleats should be beveled, as the rider braces his feet against them. Similarly, the edges of the

board should be beveled, as the rider will find himself grasping at the side to climb back on, after inevitably losing his balance. The towrope should be passed through holes bored into the forward cleat and under part, for greater strength, in the speed model, and the second cleat in the sport model. The rope to which the rider holds should be put through holes in front of the towline. Each rope is held by a knot on the end. The towline is led out

on the bottom side of the board, and knotted on top. The sprite may be finished with clear varnish or painted in color. The writer has tried both and favors the natural wood, varnished, as presenting the more professional-looking job. However, the board, while in use, has the appearance of snap and life if painted in brilliant colors. The writer further embellished his boards with seagulls on one, a diving girl on another, and other marine suggestions, the decoration being on the forward part. A stripe of color around it, near the rim, also looks well.

In use the water sprite runs 15 or 20 ft. astern of the towing boat. Very little in the way of instructions can be offered for riding the board, as it is largely a matter of experience. The writer's practice is to lie flat on the board, taking a short hold on the hand rope and allowing plenty of slack cord, between the stomach and the sprite. As it gains speed I slide back, keeping the weight well aft, for if the weight is too far forward, the stern will tip up, the bow will dive and the entire board will spin around. As the sprite attains



Left, the Sport Model, for One or More Persons;
Right, the Speed Model for One

full speed I assume a squatting, then a standing, position. Practice will enable the rider to do various stunts. A friend of the writer can carry another person on his shoulders, can stand on his head and hands on the fast-moving board, and can ride without the use of the hand rope.

Raising a Sagging Door

When a door sags and the bottom scrapes on the floor, it may be raised to clear the threshold by slipping a hairpin, or other similarly bent wire, under the upper half of one of the hinges around the pin and then twisting it. This will serve as well as an extra washer. In replacing a door which has been removed, the hinges can more easily be brought into alinement if the bottom of the door is rested on the toe of the boot and steadied while the hinge pins are guided into the holes.—Dexter W. Allis, Everett, Mass.

Combination Steps and Driveway

A novel method of combining steps and an automobile driveway, where the house is built on a terrace, is shown in the photo. The steps are built inside of the concrete strips which form the roadway and curbs are laid on the outside of these. By this method of construction a passage is provided for deliveries to the rear of the house without taking up additional room, which is a feature worth considering where the house is built on a narrow lot. In order to make steps easy for ascent and descent they should be proportioned so that the height of two risers plus the width of one tread will be about 24 in. Thus steps 6 in. high should be 12 in. wide. A wooden float should be used in finishing.



Combination Steps and Auto Drive on Terraced Lawns Found Convenient and Space-Saving

Lens Mounted on Sewing Table



Magnifying Lens Mounted on Edge of Sewing Machine or Table Eliminates Eye Strain

Eye strain can be eliminated to some extent by attaching a reading glass to the sewing table. A spring and washer on a pivot screw serve to hold the handle of the glass against a beveled block and a small collar on the pivot screw enters a recess in the handle, as shown. The glass is removed by pressing it down from the catch and pulling it away from the pivot. When not in use, the glass is swung under the table top where it is safe. The beveled block should have such a slant that the lens will be held at an angle convenient for threading needles. Cloth, held on the knees, can be cut along a thread without strain, and certain knots in embroidery may be tied much more quickly. — Harold E. Benson, Boulder, Colorado.

Chair-Arm Ash Trays

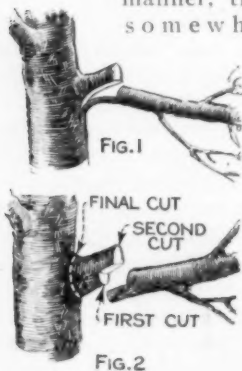
Individual ash trays for use on the arms of overstuffed chairs can easily be made in a few moments. Obtain a piece of silk velvet, about 2 in. wide by 1 ft. long, of a color to harmonize with the chair. Get a little tray, and two small strips of lead or iron to weight the ends of the piece of velvet. The strips



should not be over 2 in. wide, and should be of sufficient weight to hold the tray in place. Punch a small hole in the bottom of the tray and attach it to the center of the cloth by using a small split brake-band rivet, or else punch two small holes in it and sew the tray to the cloth. The weights are attached by folding the ends of the cloth over them, and sewing them in place as shown in the drawing.—Glen F. Stillwell, Collinsville, Ill.

Cutting Large Branches

When large tree branches are to be removed, care must be taken in cutting them off so that the tree trunk will not be torn. If the limb is sawed off in the ordinary manner, the result will be somewhat similar to that



limb until the weight of the limb pinches the tool. Then the upper cut is made,

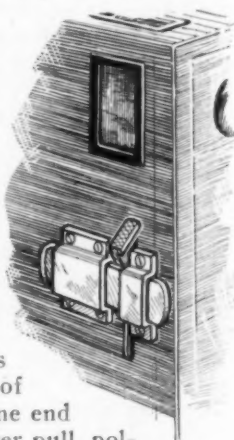
deep enough to cause the limb to break off and fall. The remaining stub may then be cut off close to the trunk so that the wound will heal over without decay.—G. E. Hendrickson, Argyle, Wis.

Guide for Tapping Holes

When tapping a hole in a steel or metal block, it is difficult to keep the tap vertical while cutting the first few threads. Unless started right the threads will have the wrong pitch and make a poor fit for the screw or bolt. One way to overcome this trouble is to bore several hardwood blocks with exactly vertical holes of sizes to fit the taps. One of the wood blocks is placed over the hole to be tapped and the tap is started through the hole in the block. This will keep it plumb or at right angles to the work and insure a good job without breaking the tap.

Lock for Box-Camera Shutter

Nearly everyone owning a box camera has at some time or other found that the shutter was accidentally snapped and a section of film spoiled. This can be prevented by means of a simple lock as shown in the drawing. It costs practically nothing for material. First cut out a bar of stiff brass, 1 in. long and as wide as the space crossed by the shutter when it is pushed to each end of the slot. Turn up one end of the bar for a finger pull, polish it and smooth off the edges. Make a pair of slides from the same material. One is $\frac{1}{2}$ in. square and the other $\frac{1}{2}$ in. long and $\frac{1}{4}$ in. wide. Bend them so that the bar will slide under them. Drill small holes in the flanges for fastening, and polish them. The lock is assembled as indicated. The bar crosses the slot in the middle and the slides are screwed to the camera box, the large slide to the left and the small one to the right. Be sure that the finger pull



is to the left. To lock the shutter, push the bar across the slot. To snap a picture, pull the bar back across the slot until the finger pull hits a stop pin placed behind it at the left. This pin can be made from a phonograph needle driven into the wood and snipped off where desired.—L. B. Robbins, Harwich, Mass.

How to Wash the Car

Cold or luke-warm water should always be used for washing a car. Hot water is injurious. If you use a hose, let the water run out slowly. If it comes out with force, the finish of the car will be ruined as the dirt will be driven into the varnish. Grease and oil should be removed with gasoline. After most of the dirt has been washed off, clean the surface with luke-warm water and a mild grade of laundry soap or linseed-oil soap. Rinse with cold water, rub dry and polish with chamois skin. To add to the luster of the finish you can use a good grade of automobile or furniture polish. The nickel parts of the car can be polished with any good metal polish, which does not contain too much abrasive matter, and a soft cloth, which will not scratch, should be used for this purpose.

Cleaning Straw Hats

In cleaning straw or panama hats, considerable inconvenience is usually experienced on account of the necessity of removing the band and bow to prevent the cleaning and bleaching liquid from staining them. This difficulty can readily be overcome by placing two wide rubber bands around the hat, as shown, one to cover the upper edge of the ribbon and one the lower, and the cleaning can then be done without soiling them.



RUBBER BANDS

Clothes Hangers Keep Children's Room Tidy

Clothes hangers of the kind shown in the drawing are quite novel and aid in teaching children to hang their clothes neatly when going to bed. The figure can be



Ornamental Figures in Child's Bedroom Hold Clothes Neatly at Night

made of wood, painted in appropriate colors. The desired pattern, which may represent a French maid, a brownie, an elf, clown, pierrot, dancing Indian warrior, or any other thing interesting to a child, is first drawn on a large sheet of paper. It should be from 30 to 36 in. high. After cutting it out, it is traced on a 1/2-in. board and the outer parts of the wood sawed off with a band or jigsaw. The arms, which are separate pieces, are nailed on and the figure is mounted on a base.—Mrs. E. W. DeHuff, Santa Fe, N. Mex.

Bath-Spray Nozzle Made from Oilcan

Desiring to have a spray attachment for his bathtub, one man punched holes in the bottom of a cheap oilcan, cut off most of the spout and stuck the remainder into the end of a rubber gas tube. This outfit was connected to the hot-and-cold combination faucet provided on the tub and made an excellent spray nozzle.



Toy Flipper Easily Made of Thermostatic Metal
Amuses Everyone

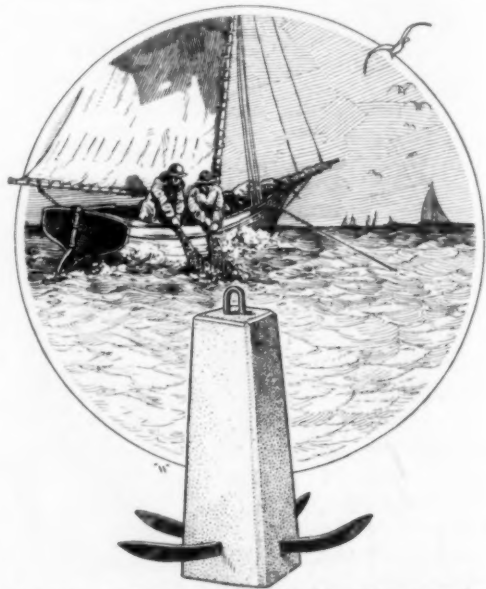
Jumping Disk Proves Amusing

There are available on the market several so-called thermostatic metals, consisting of two layers of different kinds welded together. From this material an amusing toy can be made. It is simply a $1\frac{1}{4}$ -in. disk, dished in the center by means of a ball-peen hammer. If the disk is heated and placed on a table, it will jump suddenly upon cooling. In making the disk, carefully notice the difference of the two sides. One is usually yellowish in color and the other bluish-white. The former is the one to be dished until its center is about $\frac{1}{16}$ in. below the edge. File the edge smooth. To use the toy, heat the disk carefully until the yellow side bulges outward, making the disk the reverse of what it was before heating. Then place the disk with the yellow side on a cool surface, so that it will contract. When the contraction reaches a certain point, the disk will reverse again and jump up suddenly, perhaps about 6 ft. or more. Other ways to make such a toy are to cut two strips of the same material, dishing both and riveting them together to form a cross, as shown in Fig. 3, or fastening the ends to a ring, as shown in Fig. 4. These do not require the careful dishing that is necessary in the case of the disk, and will not jump so suddenly nor so high.

The explanation of the action lies in the fact that the two layers of metal expand and contract at different rates, when being heated or cooled, the yellow one usually having the higher rate.—James G. Zimmerman, Madison, Wis.

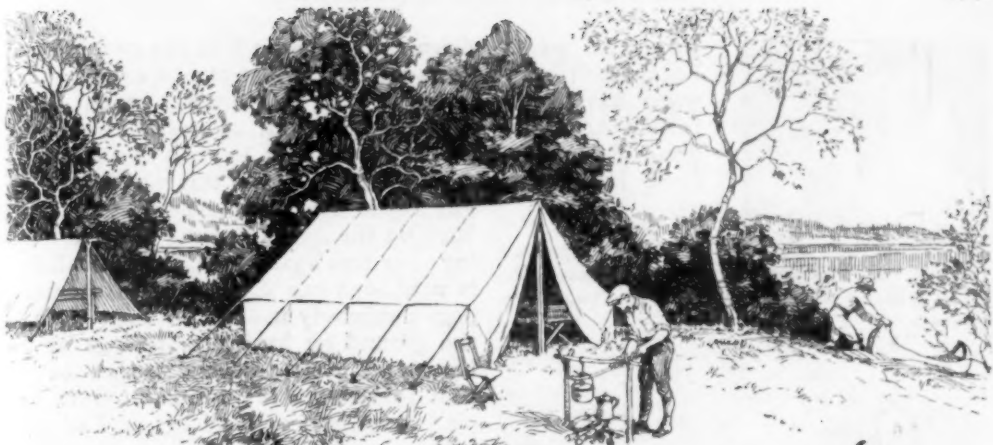
Anchor Made of Concrete

A traveler recently returned from Europe brought an interesting picture of concrete anchors used extensively by the fishermen along the Danish coast and also, to some extent, for mooring yachts and other pleasure and commercial craft. The concrete block is 18 in. square at the bottom, 12 in. square at the top and about 5 ft. high. To increase the holding power protruding arms of 3-in. T-irons, bent up to form hooks, are imbedded in the concrete. A simple square wooden box form is used for molding the anchors, Fillet strips are used to cut off the corners, the sides being mortised so that the T-irons can project. The top form is similarly mortised to accommodate the lifting hook, which is a length of $\frac{1}{2}$ -in. round steel bar, bent to a U-shape and extend-



Concrete Anchors, Used by Danish Fishermen, Are Cheap and Have Great Holding Power

ing into the concrete about 10 or 12 in. The anchors cost very little to make.—A. J. R. Curtis, Chicago, Ill.



The TRICKS of CAMPING OUT *by* Bob Becker

WHEN summer comes thousands of city dwellers feel the call of the outdoors and the lure of camp life, which means a restful, gypsylike existence far from crowds and noisy streets. To the man who knows the tricks or the "art" of camping, several weeks in a tent is a restful, carefree experience, as a knowledge of how to live in the woods means the difference between comfort and discomfort after leaving behind the world of gas stoves, spring beds and refrigerators.

The outdoor fan who chooses to put a canvas roof over his head on the bank of a stream or lake is on "his own." He must know a few things about choosing a camp site. He should know how to fix up his camp for comfort, keep perishable foods, make a bough bed and other things which contribute to the success of his "back-to-nature" existence.

The first problem that confronts the tent dweller when he arrives in vacationland is the choice of a camp site. Where the tent shall be pitched is an important matter. Briefly, the trick of "getting set" in a tent home involves the following:

Pure drinking water, a fairly level spot for the tent, an ample supply of firewood, exposure that insures sunlight part of the day, and drainage. The inexperienced camper may dream about his ideal camp

buried in the heart of the forest primeval, but the experienced outdoorsman shuns such a site in the summertime, as he wants his camp to be bathed with sunshine part of the day and also swept by breezes. Therefore, a high, well-drained spot on a river or one jutting out in a lake or stream and not too densely covered with trees is an ideal location for the permanent camp.

And which way shall the tent be faced? As a rule an easterly exposure is best. Next comes the southeasterly exposure. In any event, face your tent away from that point of the compass which is apt to produce heavy blows and squalls. After the camper has scanned the landscape for the best site, found the high ground and is ready to make his decision, the common blunder usually made is to pitch the tent under a big tree. The big tree may be all right when there's blue sky overhead but during a storm it's another story. Avoid the big ones, especially those with dead limbs which may come hurtling down upon you some night.

If you are in a country that offers few fairly level spots, smooth off the floor area of your future outdoor home and cut a narrow trench around the outside of it. This should be close to the wall of the tent, about 3 in. deep and 3 or 4 in. wide.



In case of a heavy rain any water having an inclination to drain down the slope into your

drive the tent pegs into the ground, presents a problem that can be solved by using large logs over the guy ropes. Drive in the pegs as far as possible and then swing the ax on a log to cut a chunk to fit your needs. Roll this wood over the guy ropes next to the pegs, and it will back up the stakes in their work of holding your tent against wind. If a wall tent is used, one can dispense with the small pegs commonly used to hold the walls to the ground by having more logs or big boulders. Allow several inches of the wall to rest on the ground. Over this place your logs or boulders, and no pegs will be needed.

The camper needs a tool kit in order to make himself comfortable in the woods. To make rough camp furniture, cut wood, and repair equipment the following items should be taken into the woods: a good ax, hatchet, a spade (for trenching the tent, digging a refuse pit, etc.), a hammer, an assortment of nails, a ball of heavy twine, about 20 ft. of heavy wire for hooks, 1 spool of annealed wire, a small saw (if you wish to make your camp table and other furniture) and a coil of heavy sash cord or $\frac{1}{4}$ -in. rope. With these tools one can play carpenter and in a

quarters will be caught by this "trough" and diverted.

For a permanent camp a site in dense timber into which the sunlight can hardly penetrate is to be avoided. The average city dweller who goes into the woods for his first camping experience is apt to think of shade first of all as he selects a spot for his tent.

All shade and no sunlight means damp food, damp blankets or sleeping bag, unhealthy sleeping conditions and eventually mildewed equipment. Unobstructed sunlight upon your tent for several hours every day is almost a necessity if one is to be comfortable and healthy during the period spent in the woods.

Anchoring a tent in a country that has little top soil, thus making it difficult to

FACE TENT AWAY FROM WIND



TRENCHING



KEEP AWAY FROM EXCESSIVE SHADE

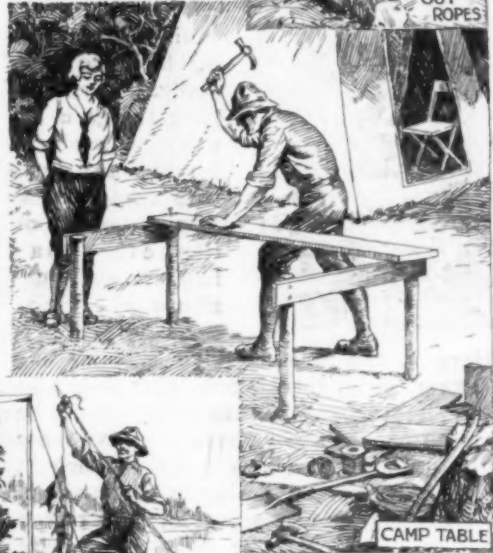
few hours have an array of equipment that will make for orderliness, comfort and health. For example, it is uncomfortable to eat while sitting on the ground, so the first job is to build a table if a folding dining table is not included in the camp equipment. Here is where the man handy with tools earns his salt the very first day in camp. He can drive four stakes into the ground for legs, nail cleats across the ends and then proceed with the top. If one has a few packing cases in camp, the top of the table can be made from them. If boards are not available, straight sticks will do. When finished the table should be about 30 in. high. Benches for it can be made in the same manner. A tent fly, tarpaulin or other fabric spread over this table completes the job.

The disorderly camper strews his equipment around, can never find anything, ignores his food supplies and then wonders why camping is more work than play. The orderly tent dweller spends several hours the first day getting things shipshape and making some of the following things for his outdoor home. First, a rack for the cooking utensils which can be made as follows: Drive two forked sticks into the ground until they are about 30 in. high. Lay a pole, 4 or 5 ft. long and 2 or 3 in. in diameter, across these. Wire or nail the ends of the pole

coffee pot and other cooking utensils. If there is a tree close to the "kitchen," it can be converted into a rack by nailing to the trunk inverted crotches. In the commissary tent (and every camp-



SECURING GUY ROPES



CAMP TABLE



UTENSIL RACK



TOWEL RACK

to the supports. Then dig up that coil of heavy wire and make five or six S-hooks to be hung on the pole. With these in place you have a rack for the skillets, cooking pots,

your ax, go into the woods, find a bush with a number of branches and cut it down. Then trim it so that the stubs of the branches will remain. Drive this skeleton into the ground where you want it, and you have an excellent rack for the dish towels.

A camping party that stays more than one or two nights in one place should fit up the sleeping tent with a little rustic

ing party should have a small tent for this purpose, with an awning to work and cook under in wet weather) we used a trimmed bush as a rack for the dish towels, etc. Ten minutes do the trick. Take



CLOTHES RACK



CANDLESTICK

equipment which can be made quite easily. Where to hang things is always a problem for the city man who comes fresh from a world of closets, coat hangers and furniture with capacious drawers.

Here is the way to take care of the clothes, guns, tackle and other things in the sleeping tent so that they won't be cluttering up the quarters: If you are using a wall tent, sink a forked stick in each corner and then lay poles on them. Drive nails in these poles six, eight or ten inches apart or make some more wire hooks for them, and you have hooks aplenty on which to hang things. The advantage of this arrangement is apparent when bedtime comes around. One can undress, hang his clothes high and dry and in the morning simply reach up for his outfit, which has been kept out of the dirt and dampness. Guns and fishing rods can be cared for in much the same manner by forked sticks and poles placed closer to the ground. These articles may be ruined if left to lie on the floor of the tent. A rack built outside of the tent is a handy thing for fishing rods during the day, but these delicate accessories should not be left out overnight.

Although manufacturers have devised many ingenious types of lanterns and other lighting equipment for the camper, usually there comes a time when the old candle must serve after the sun goes down. They are a nuisance and a menace



KEEPING FOOD COOL

unless fitted into a candle holder which keeps them standing straight up. A tin can makes a serviceable candle holder if it is filled with moist earth. Tamp it down around the candle and you will have

a lighting equipment fit to be used.

Although it is thrilling to read about the woodsman who rises with the sun, strides down to the crystal brook and plunges his face into the water to perform his morning ablutions, the average camper prefers a more convenient set-up, which involves a wash stand. If two trees are standing fairly close together, one can make a shelf out of sticks and a few nails on which the wash basin can be placed; if a small box is available this is still better. If the back-to-nature method of washing in the lake or stream is preferred, better give the bar of soap a fair shake by at least making a soap container as follows: Drive a stake into the ground near the water and nail into its top a small piece of birch bark, the top of a tin box or a flattened tin can which will serve as a soap dish.

In tackling the problems of keeping perishable food fresh in camp or sleeping comfortably, the city dweller camping for the first time is apt to be stumped. Food especially is a stickler. Here are some tricks that can be worked to keep such articles as butter, milk or fresh meat cool without the use of ice. In the first place use friction-top tins for butter, lard and





similar food articles. These can be purchased at any sporting-goods store. Secondly, make a sort of an "icebox" for your perishables. If you have a spring near camp your cooling box can be placed in it. Take an ordinary packing box such as the grocer will use to pack your supplies and put it down two, three or four inches in the spring or in the rivulet which flows from a spring. There should be two or more holes in each end of the box near the bottom of it so that the cool water can flow through. Place the tin of butter, the can of lard or other foodstuffs on flat rocks inside of the box, and even in the warmest weather things will keep cool. This back-to-nature type of icebox has only one drawback. It may be a lure for prowling mammals, so it is well to keep the top fastened down. A big rock will do the trick. Although this spring box will keep milk, butter and other things cool and sweet, it won't keep them from being tainted if you put fish in the cooler as the former pick up odors from other foods. If you are not near a spring, dig a hole in the moist earth for the box.

If you should be one of those fortunate campers in a not too remote area where ice can be had, you'll have to go to the nearest town for a barrel before you start to work on your icebox. A good-sized barrel is the simplest ice chest that can be devised for camp. Provide a couple of holes in the bottom of it for drainage, put the ice in the bottom and you're prepared for any temperature.

To hold such foodstuffs as beans, rice, flour, sugar, salt and similar items there is nothing like the waterproofed bags which can be purchased in nearly any sporting-goods store. They are tough, will



stand punishment, do not absorb moisture and can be obtained in any size. When labeled they are ideal for carrying foodstuffs.

At least one-third of a camper's time is spent in bed, so the matter of sleeping arrangements in camp cannot be overlooked. One can stand most any kind of a hardship during the day, but when night comes there is just one thing that will keep a man going and that is restful sleep on a good bed. The camper has a wide range of bedding materials and outfits to choose from, including folding camp cots, sleeping bags, bough beds and air mattresses, all of which are recommended. The trick of keeping warm on a camp cot is in having more blankets under you than over you, as there is a big circulating air space between you and the floor of the tent which "draws" the body heat. Air mattresses make soft beds, but they need several layers of woolen-blanket insulation. While on an Alaskan big-game hunt we carried air mattresses on the entire trip, but with plenty of spruce boughs available for beds, we stuck to the latter and with a sleeping bag for warmth our sleeping facilities were top-notch.

Every camper should know how to make a browse bed even though he is in a permanent camp with cots, springs or other appurtenances of civilization. Here is



the method and, if followed, it will produce a springy, fragrant bed. First the material. Let the poet sing of his "bed of pine boughs," but when you select material for your browse bed look for hemlock or balsam trees as your sources of material. Cedar and spruce will serve very well, but pine-tree branches are quite hopeless as they haven't the bulk. With an ample supply of short twigs start at the foot or the head of your bed where short logs staked down will help to keep the boughs in place. Stick the twigs in the ground so that the tips will be exposed and lay a row across the bed. Then lay down row after row of the boughs so that only the tips will be in the air while the hard stems will be burrowing underneath. After covering the ground with a mat of this sort you're ready for the second operation. With the hatchet cut a plentiful supply of smaller branches, just long enough to keep their heads above the first layer when stuck through it. Pad the bed from one end to the other with these. If time permits, go over the bed with another layer of small twigs as a browse bed is soft and springy in proportion to the time and material used on it. Throw your blankets on this mattress, or your sleeping bag, and you needn't worry about a restful night's sleep. Another good kink is to make up mattresses from ticking; just a simple bag that will fit a camp cot. Fold them up and pack them among the

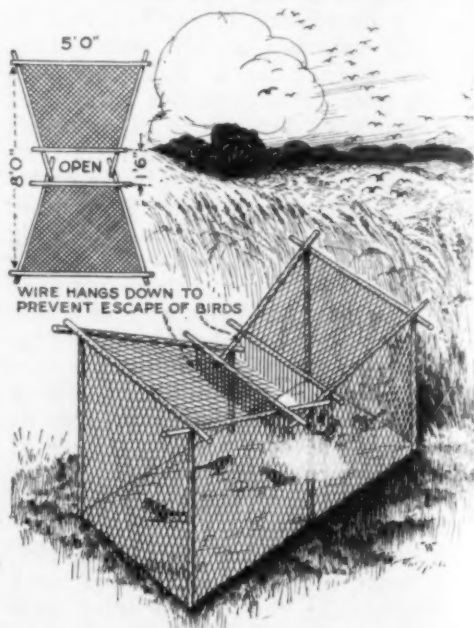
dunnage. When camped, fill the mattresses with hay, straw, or even dry long grass, and you will have comfortable, warm beds.

A Wallpapering Kink

Amateurs who do small jobs of papering in their homes will find the labor simplified considerably if the paste is applied to the wall instead of the paper. This makes the handling and trimming of the strips on the table much easier, and there is less danger of soiling or tearing.

Effective Crow Trap

Traps of the kind shown in the drawing have been found very effective for catching crows. It is an easy matter for the bird to get inside from the top but impossible for it to get out again. Four light wooden posts, about 6 ft. long; two stakes, about 3½ ft.; eight poles, varying in length from 4 to 5½ ft., and some wire poultry mesh are all the materials required. The trap is located at any desirable spot, which is usually along marshes or lakes, near woods or around outlying buildings. The posts are driven into the ground, and the crosspieces and

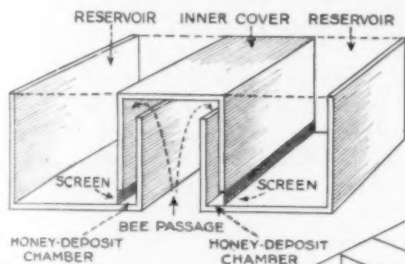


An Effective Crow Trap Which Can Be Made of Old Poles and Poultry Mesh

wire mesh are attached as shown in the illustration. Old weather-beaten material is preferable to new, and chipping marks on the surfaces of the poles should be avoided, as the crow is a wary bird. Do not go near the trap during the day, but visit it after dark.

Efficient Honey Reservoirs

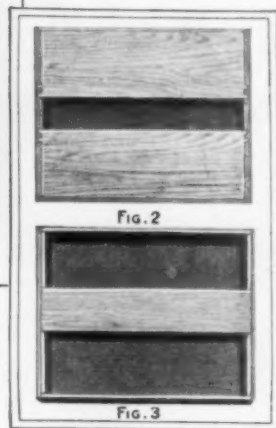
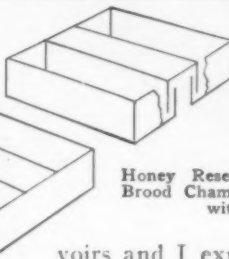
Liquid honey is usually obtained by separating it from the wax comb, either by the modern centrifugal extractor or by the older method of crushing the comb and straining out



the honey. I tried to have bees store honey directly in a reservoir instead of in combs and found this method highly successful. The construction of the reservoir is shown in the drawing. It is made of $\frac{3}{8}$ -in. dressed boards, leak-proofed at the joints with beeswax or paraffin wax. The reservoir does not interfere with the brood nest at all. The brood is reared as usual. Small quantities of honey and pollen are carried up and deposited in the reservoirs at either side

of the hive. During the gathering season the bee master may go each evening and dip the honey, without interference from flying bees, into pails for marketing. I

have 34 colonies of bees and, at present, 15 colonies are using these reser-



Honey Reservoir Which Is Placed on the Brood Chamber. Bees Deposit Honey in It without Making Combs

voirs and I expect to equip all my colonies with them.—L. Wilson, Ottawa, Canada.

Reassembling Furnace-Pipe Sections

When long runs of furnace pipes are dismantled it is often difficult to get the sections together again in their proper places. This is important in order to have the joints tight, and applies particularly to sections that have been keyed together to prevent sagging. The trouble may be overcome by numbering each section with black stovepipe paint and drawing a line across the union of adjoining sections. When the pipe line was to be reassembled the sections were joined in numerical order with the marks meeting, and then the keys or pins could be inserted without difficulty or loss of time.

¶To avoid brush marks when painting glass, clean the glass with alcohol; use thin colors ground in japan, with flattening oil to which a small amount of varnish is added, then stipple the colors on the glass.

Grass Catcher for the Lawn Mower

When you need a new grass catcher on the lawn mower, try using an ordinary basket, attached as shown in the drawing,



Homemade Grass Catcher for the Lawn Mower

and you may find this improvised catcher just as good as the commercial kind. Cut out one side of the basket and the handle, and tack short lengths of lath on the cut edges. Run two lengths of wire from the handle to the corners of the basket. The handle is fastened to the lawn mower as indicated in the lower insert.—Wilson G. Walters, Rochester, N. Y.

Improving Appearance of Bell Wiring

Wires leading to electric bells in houses are usually allowed to look untidy by sagging and collecting dust. In most cases the wires are coiled about a pencil and attached to the bell in a careless manner, and the insulation at the ends is allowed to fray. A couple of lengths of spaghetti tubing, such as is used in radio work, will make a much neater-appearing job. Scrape the insulation from the wire clear down to the wall. Then slip a length of spaghetti over the bared wire so that it is completely covered and the spaghetti enters the hole in the plaster. If the spaghetti is selected to match the walls, neatness is even more assured. Wrap the bot-

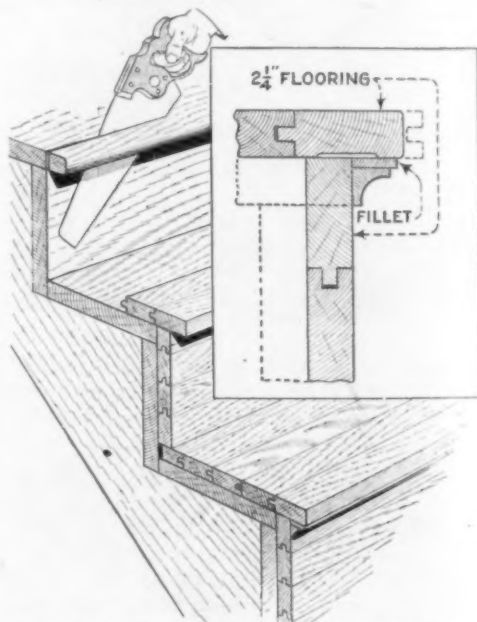
tom ends of the spaghetti with a short strip of friction or adhesive tape and stick the torn wallpaper down, and you will be surprised at the improvement.—L. B. Robbins, Harwich, Mass.

Veneering Old Steps

Not so long ago my attention was called to a simple method of veneering old stair steps. At first, I was a little skeptical, but after the method had been thoroughly explained I was satisfied that it was really a successful method of repair.

The veneering used in the case illustrated in the drawing is $2\frac{1}{4}$ -in. oak flooring. The nosing of the old treads is to be cut off before the veneering is put in place. The last board of the riser is ripped off in such a manner that the nosing piece will rest tightly onto it, as shown by the drawing. Then the nosing piece is nailed into place and the tread covered with flooring.

The inset detail shows how the nosing can be made out of a piece of flooring, by placing a fillet between the nosing board and the cove. It is shown with square corners, but if round ones are desired, they can easily be cut down.—H. H. Siegele, Emporia, Kans.



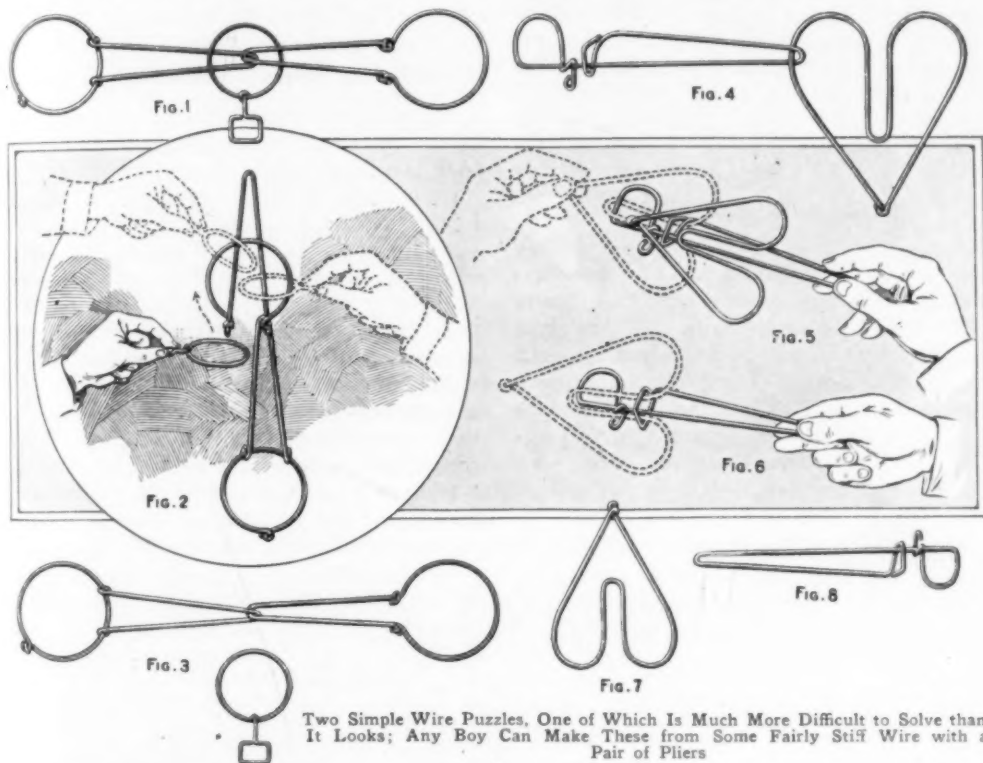
Simple Method of Veneering Old Steps, Using Common Oak Flooring

These Will Puzzle Your Friends

WIRE puzzles, while they are very easy to make, and very easy to solve (when you know how), may be made to provide a lot of amusement. Any boy, with the aid of a pair of pliers, can make

out of joint; on the other hand, it need not be too heavy and stiff, or it will be difficult to form.

The solution is simplicity itself. The open ring is folded back against its hair-



Two Simple Wire Puzzles, One of Which Is Much More Difficult to Solve than It Looks; Any Boy Can Make These from Some Fairly Stiff Wire with a Pair of Pliers

the two shown in the illustration, which, simple as they seem, will make even his elders spend many minutes in trying to solve them.

The puzzle shown in Fig. 1, while it looks the simpler of the two, has been found the more difficult. It consists of two hairpin-shaped pieces of wire linked together and to two rings, one of which is open and the other closed. The hairpins are each $1\frac{1}{2}$ in. long and the rings at each end are 1 in. in diameter. Assembled, the puzzle looks as in Fig. 1, the central ring being about $\frac{3}{4}$ in. in diameter. The problem is to get the central ring off. The wire chosen to make puzzles of this character should be so stiff that it cannot be sprung or forced easily when the puzzle is made up, otherwise too enthusiastic solvers will quickly knock it

pin, as shown in Fig. 2, when the loose ring can be passed around both and off. This may seem almost too simple, but that is the beauty of this puzzle. It is the exception rather than the rule to find anyone who can take the ring off in less than twenty minutes, and many give it up entirely. With a little practice, the owner of the puzzle can hold it behind his back for a second and—presto!—the ring is off, thus adding to the mystification of the person who gave it up.

The second puzzle, shown in Figs. 4 to 8, is simpler to solve, but even this keeps many people occupied for a considerable time. The left-hand piece in Fig. 4 is sword-shaped, and is 3 in. long over all. The handle of the "sword" is about $\frac{1}{2}$ in. long and $\frac{5}{8}$ in. wide, and the lower loop is $2\frac{1}{4}$ in. long. The heart is $2\frac{1}{2}$ in. long and

1¾ in. wide at the top. The loop in the center of the heart must be narrow enough to pass through the closed hook at the top of the lower loop of the sword. The solution is shown in Figs. 5 and 6. The point of the heart is grasped and the loop in its center drawn through the hook in the sword, then over the handle and down through the hook again, the hook being sprung inward slightly to enable this last operation to be performed easily. The whole thing can be done quicker than it can be described, and a minute's practice with the puzzle will show the method.

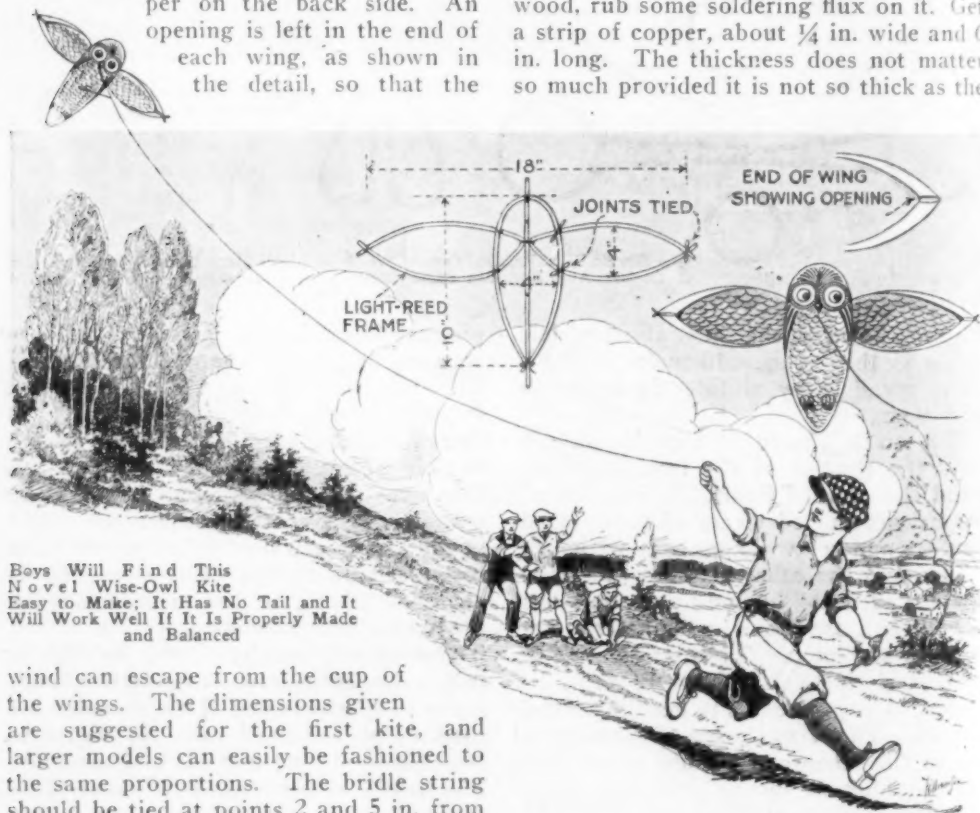
Tailless "Wise-Owl" Kite

Boys who are looking for something new in kite construction will find the wise-owl kite an easy one to make and quite novel. The frame is made of lightweight reed or bamboo and is covered with light but stiff paper. The paper is cupped, lapped over and pasted, and attached to the frame by several narrow strips of paper on the back side. An opening is left in the end of each wing, as shown in the detail, so that the

the top, and experiment will show the correct place at which the flying string should be permanently fastened to the bridle. Starting at the lines where they join the body, the wings slope back in the cupped surface mentioned above until at the tip they have receded a distance of 1¼ in. If properly made and balanced this kite will need no tail.

Removing Broken Transmission Key

Several manufacturers of automobiles equip them with transmission locks. This lock is an excellent feature, but it has the disadvantage that the key is easily broken in the lock by someone striking against it with the foot. In several makes, it is necessary to saw the lock off the transmission in order to remove the broken key. However, it is sometimes possible to get the key out in the following way: Scrape the visible portion of the key near the top of the slot with the tang of a small file, and, with a toothpick or other small piece of wood, rub some soldering flux on it. Get a strip of copper, about ¼ in. wide and 6 in. long. The thickness does not matter so much provided it is not so thick as the



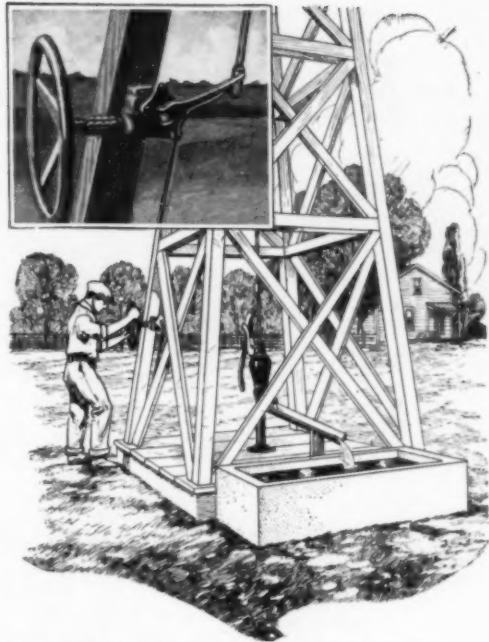
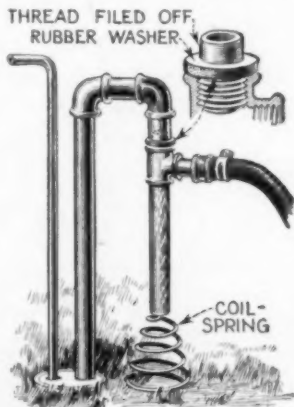
Boys Will Find This Novel Wise-Owl Kite Easy to Make; It Has No Tail and It Will Work Well If It Is Properly Made and Balanced

wind can escape from the cup of the wings. The dimensions given are suggested for the first kite, and larger models can easily be fashioned to the same proportions. The bridle string should be tied at points 2 and 5 in. from

broken key in the lock. Clean the end of this strip, put soldering flux on it and heat it sufficiently to pick up a small drop of solder. Now set the strip above the broken key with the soldered end touching the end of the key. With a small portable blowtorch, or blowpipe of some sort, heat the copper strip as close to the end as is possible without setting anything on fire. As soon as the drop of solder starts to melt and run onto the key, remove the torch, taking care not to jar the copper strip, and when the solder is cooled, it should have made a joint between the copper strip and the broken key; then, all that remains to be done is to put a few drops of oil around the key and carefully pull it out with the copper strip.

Quickly Detachable Lawn Hose

To add to the convenience of the lawn hose and the outdoor hydrant, the method of attaching the hose can be simplified so that it can be done almost instantly. Two gaspipe nipples, a tee, a suitable length of discarded shovel handle and a stout coil spring are assembled as shown in the drawing. The upper threads of the top nipple are filed down so that it can be easily inserted into the outlet of the hydrant. When the assembly is completed, the hose is permanently attached to the nipple, screwed into the tee and the device is ready for use. To attach it to the hydrant, a rubber washer is slipped over the smooth nipple, and the supporting spring at the lower end of the device is pressed down against the ground so that the nipple may be inserted into the hydrant opening. The tension of the spring compresses the rubber washer between the mouth of the hydrant and the shoulder of the tee so that a watertight connection is made.



Old Auto Steering Device Attached to Windmill Frame for Controlling the Fan

Control for Windmill Rotor

Frequently the lever used to control the rotor on a windmill becomes loose so that the mill runs wild if no one is around, and besides, the usual lever is rather hard to operate. A decided improvement in the fan control is shown in the accompanying illustration. It consists of the steering device of a discarded auto. The arm is turned by the worm gear and will stay where it is set, no matter how hard the wind blows.

High-Speed Commutator Needs Plenty of Oil

Due to its high speed, the Ford commutator will soon become badly worn unless its parts are lubricated sufficiently, which most owners forget to do. Keeping the commutator in good condition by oiling it properly is necessary to keep the engine in good firing condition. If the contact points do not make perfect contact with the roller, the engine will misfire at fair speed. Put a little good, light oil into the commutator every day if you use the car considerably, or after every 200 miles of driving.

Outboard Motor Doubles as Wash Machine

Not feeling inclined at the time, to spend the money for a washing machine, and facing an accumulation of soiled clothing that would have cost at least \$10 if done



Outboard Motor Fitted on Barrel Is a Good Substitute for Washing Machine

at the laundry, I decided to do a little experimenting. I had a perfectly good outboard boat motor, and reasoned that it could be made to wash clothes quite as effectively as it drives a boat. The whole principle of a power washing machine seems to be that of stirring the clothes around in the water and suds until the dirt is worked out of them, and it seemed that an outboard motor could be made to do the job. I mounted the motor in a barrel as indicated in the drawing, and built a grating of slats and wire screen to keep the clothing away from the propeller. After the clothes, water and soap were placed in the barrel, I started the motor, and soon discovered that I had all the motion that any washing machine could produce. The clothes, suds and water tumbled around at a lively clip. Thirty minutes later I drained off the water and removed the clothes and found them just as clean as if washed in a regular washing machine. By draining the water off and refilling the barrel with a hose, I also made the motor supply the power for rinsing. This use of an outboard motor will not injure it in any way. The same water in which the washing is



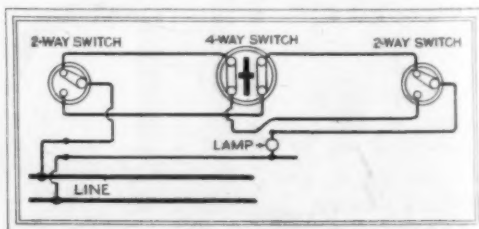
done is, of course, pumped through the cylinder jackets to cool the motor, but the soap that is in it is in no way injurious to the motor. Any owner of an outboard motor can rig up a washing machine in this way at almost no expense whatever. It will do the family washing every week for about ten cents, and give just the same service as before when its use is desired for driving a boat.—John Edwin Hoag, Los Angeles, Calif.

Stopping Crankcase Leaks

Frequently leaks around the flange of the auto crankcase, where it is bolted to the engine block or transmission cover, are hard to repair. This is especially true of Fords. The transmission cover may have to be lifted and additional gaskets inserted before the leak can be stopped. However, if it occurs between two bolts or capscrews holding the pan, it can easily be stopped by simply driving upward on the crankcase flange at the point it is leaking with light blows of a hammer and a blunt punch. The operator should not hammer on the lip of the flange but between the two bolts on its flat part. These leaks are usually caused by the crankcase flange being drawn out of line through frequent removal and replacement of the crankcase, the drawing down of the bolts being responsible for the uneven flange.

Corrected Wiring Diagram

In the June, 1926, issue of Popular Mechanics Magazine, on page 1025, was published a wiring diagram for a lamp to be



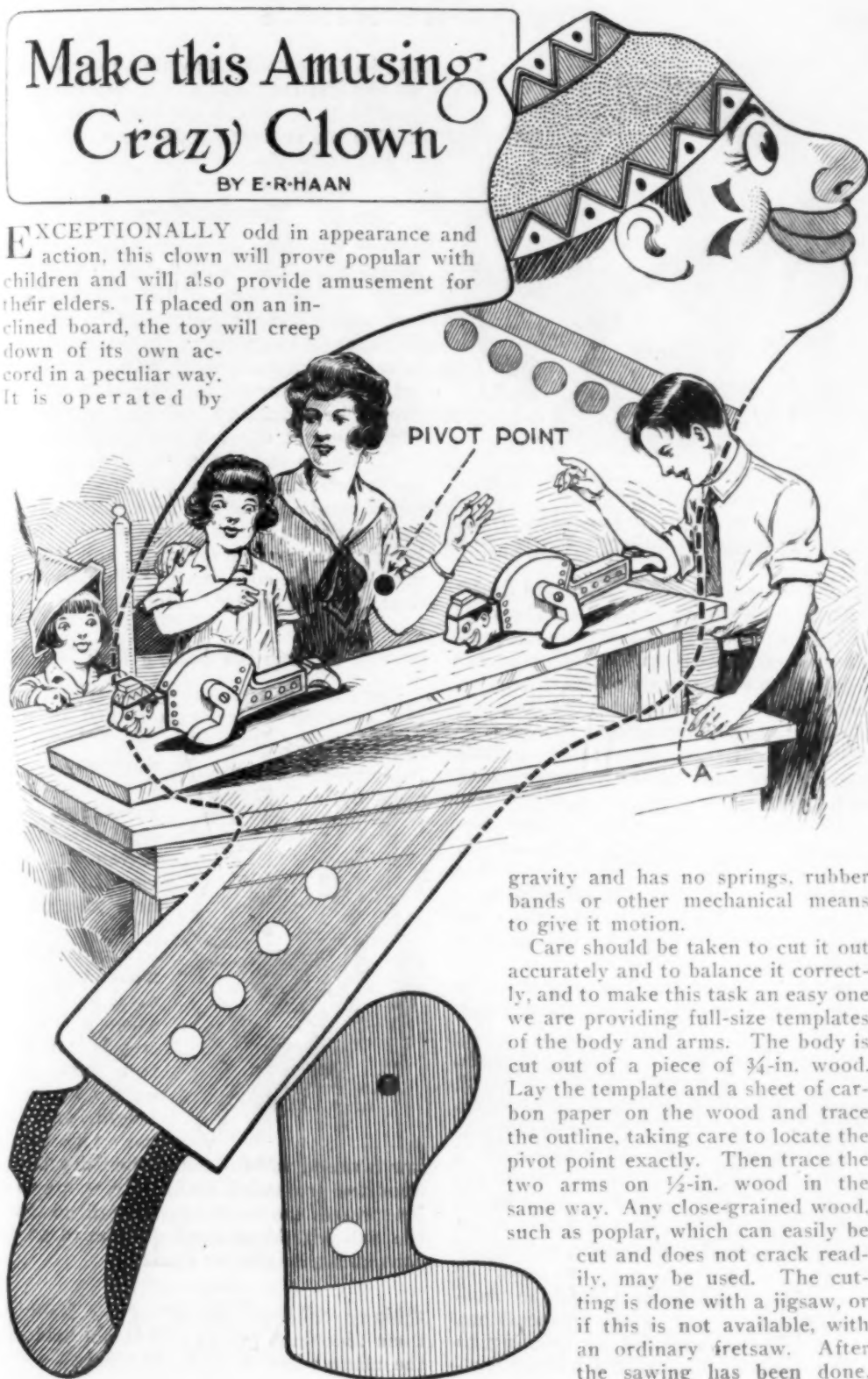
controlled from three points. Unfortunately an error was discovered in it and a corrected diagram therefore is given here.

☛ Broody hens which are not wanted for hatching purposes should be broken up as soon as detected.

Make this Amusing Crazy Clown

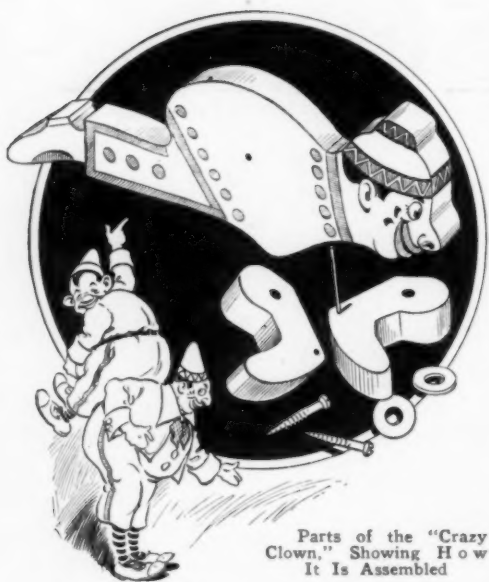
BY E·R·HAAN

EXCEPTIONALLY odd in appearance and action, this clown will prove popular with children and will also provide amusement for their elders. If placed on an inclined board, the toy will creep down of its own accord in a peculiar way. It is operated by



gravity and has no springs, rubber bands or other mechanical means to give it motion.

Care should be taken to cut it out accurately and to balance it correctly, and to make this task an easy one we are providing full-size templates of the body and arms. The body is cut out of a piece of $\frac{3}{4}$ -in. wood. Lay the template and a sheet of carbon paper on the wood and trace the outline, taking care to locate the pivot point exactly. Then trace the two arms on $\frac{1}{2}$ -in. wood in the same way. Any close-grained wood, such as poplar, which can easily be cut and does not crack readily, may be used. The cutting is done with a jigsaw, or if this is not available, with an ordinary fretsaw. After the sawing has been done,



Parts of the "Crazy Clown," Showing How It Is Assembled

sandpaper the edges and sides and drill a hole through the pivot point on the arms to take a 1-in. round-head wood screw loosely. Drill two smaller holes in the "elbows" to receive a short length of wire. This connects the arms so that they move together and also limits their swing. The holes should not be drilled entirely through the arms but only deep enough to hold the wire snugly.

After boring a small hole at the pivot point screw the arms to the body and slip a washer over the end of the screw before driving it in, to reduce friction between the arms and the body. Allow the arms to swing freely. The toy is then ready to be tested.

Hold the figure down so that the chin and the point A touch the inclined board. In this position, the arms should swing freely and just clear the board underneath. In some cases there may be too much space between the legs and the board so that it is necessary to reduce the bulge at A by sandpapering slightly. However, if the body and legs are exactly made according to the template there will be no trouble. After the test the toy is taken apart and painted, care being observed not to get paint in the holes in the arms. If this happens the holes should be thoroughly cleaned out before reassembling. Lacquer is recommended for painting, as it dries quickly. The toy, due to irregulari-

ties in the cutting, may not operate well on the first trial, but a little experimental work with sandpaper on the bulge A, or the bottom surfaces of the arms, will usually remedy this.

Watering Bees

Few bee keepers who have a small apiary know that it is essential to keep water for their bees. A bee will hunt the well and the watering trough to quench its thirst just as a dog or cat, but the bee is not so lucky when it falls in. It cannot get out of water easily. Therefore, a way should be provided for the bee to get its drink without effort or danger of drowning. To do this, keep fresh water in a pail or other vessel and put ground cork, which can be had at any fruit store, on the surface of the water. Keep quite a thick layer of the cork on the water and change it to keep the cork fresh. The cork will float the bees so they cannot fall in.

Rattrap for Scaling Fish

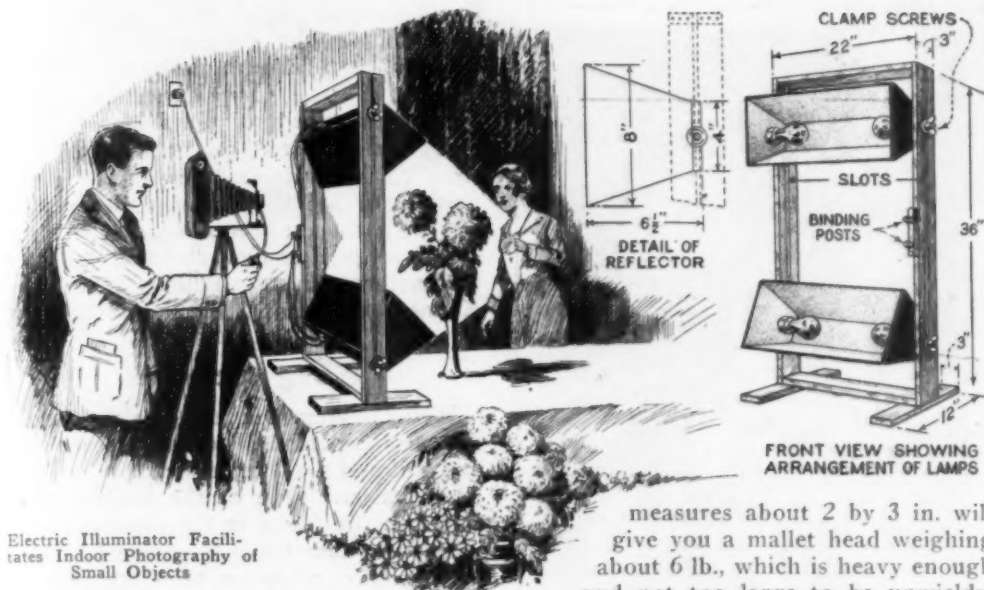
For cleaning and scaling of fish a novel and convenient device is shown in the accompanying illustration. It consists of



a rattrap with the bait pan removed and several steel nails driven into the wooden base near the edge. The points are left projecting about $\frac{1}{2}$ in. and are filed sharp. The trap is fastened to a post at a convenient height, and in use, the trap

jaw is raised and the tail of the fish placed upon the projecting brads. Releasing the jaw presses the brads into the tail, so that the fish will hang head downward at a convenient height for scaling.

Many chickens are killed by feeding them too much grain; this is not seldom the cause when they die suddenly.



Electric Illuminator Facilitates Indoor Photography of Small Objects

Illuminator for the Amateur Photographer

This simple, homemade illuminator comes in very handy for photographing small objects indoors. Copying and photographing objects, such as flowers, that might be moved by the slightest breeze if taken outdoors, may be done with this outfit indoors under absolute time and light control. The arrangement of the four lamps insures the additional advantage of eliminating all shadows on the object if desired. Two reflectors are attached on a wooden frame and these can be moved up or down and adjusted to any angle desired to suit the work at hand. The bottom and narrow sides of the reflectors are made of wood, while the long sides are of thin sheet metal. The inner sides of the reflectors are painted white. Four 75-watt lamps, connected in parallel, furnish the illumination.—Ernst Keil, Dayton, Ohio.

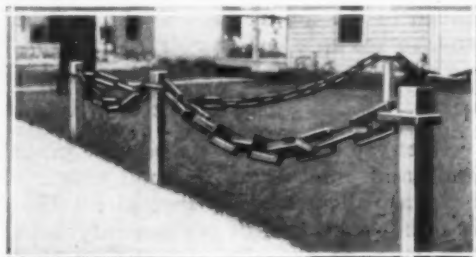
How to Make a Lead Mallet

One of the handiest tools for the man who works around his car is a lead mallet. With it he can drive out the most obstinate bolts, without injury to the threads, or do almost any job that requires a heavy, solid hammer. A mallet of this kind is very easily made. First, get a small tin can, without wrinkles or dents; one that

measures about 2 by 3 in. will give you a mallet head weighing about 6 lb., which is heavy enough and not too large to be unwieldy. Cut a round hole in the center of the side of the can and insert a piece of $\frac{1}{2}$ -in. pipe for a handle, allowing it to project almost through the can. After warming the tin so that it is perfectly dry, quickly fill it with molten lead. Let the job cool and then tear off the can with a pair of pliers. When, after long usage, the mallet becomes too battered and rough for service, repeat the process.

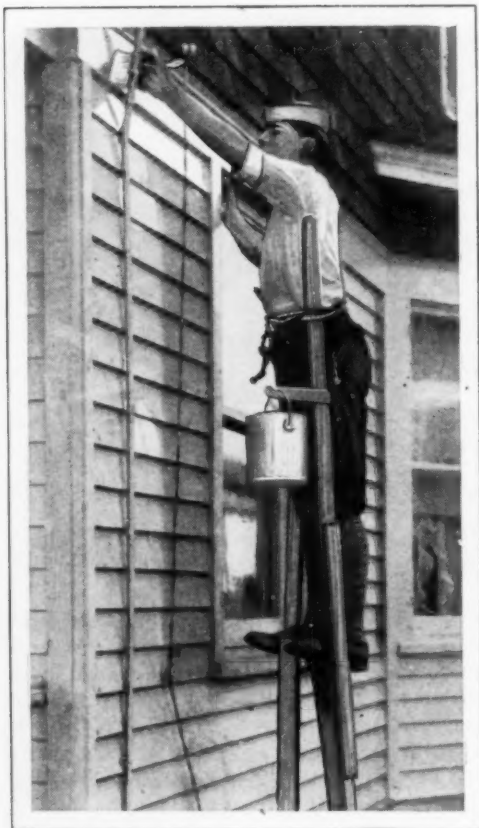
Wooden Lawn Chain

Ornamental wooden chains for the garden or yard can be made by nailing together 1-in. strips to form links. The usual way is to cut some of the strips 6 in. and an equal number $1\frac{1}{2}$ in. long, assembling them as shown in the photo.



Ornamental Wooden Chain Improves Appearance of Yards and Gardens

This gives a symmetry that is pleasing to the eye and prevents stiffness in the chain.



Stilts Help Home Owner to Paint House When Only a Short Ladder Is Available

He Paints on Stilts

Finding that his stepladder was too short to paint the siding of the house up to the top of the first-floor windows, one house owner made a pair of stilts which he used for the work and found them very convenient for this purpose. A short length of wood, notched at one end and nailed to the top of one stilt at the other end, serves as a pail hanger.

Cut Filler for Tires

Tires rapidly deteriorate because gravel and sand enter them if small cuts and holes are allowed to go unrepaired. Here is a simple method of permanently filling tire cuts or actually vulcanizing them without heat. Make a thick paste of live rubber, such as scrap rubber or rubber bands, dissolving it in acetone or other solvent. Then clean the cut with gaso-

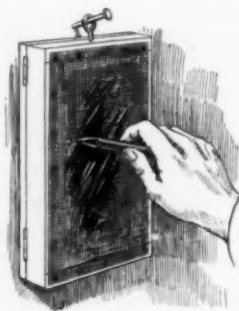
line, and apply the paste. Mold the composition over the outside of the tire for an inch around the cut and allow it to dry overnight. The composition becomes a part of the tire and wears equally well. The same compound can be used to repair worn places in tires. Spread the composition over the worn places and smooth out with the moistened hand. A tread nearly as good as new, and that will give satisfactory service, will be the result.—Kenneth B. Murray, Sturgis, Mich.

Sawing Soft Metals

When sawing soft metals with a hacksaw, use two blades instead of one, and you will find that the cutting can be done much easier. One of the blades is inserted in the frame in the usual manner, while the other blade is reversed so that cutting takes place on both the forward and backward stroke. The sliding movement of one of the blades at all times will prevent the other blade from making too deep a cut.—W. Edmonds, Whitehall, N. Y.

Screen-Wire Crayon Sharpener

Woodworkers, shipping clerks and others who use marking crayons in their work are often inconvenienced by the necessity of sharpening them with a pocket-knife so that they will serve for finer marking or lettering. However, a simple sharpener that will do the work very quickly and efficiently is shown in the illustration. Just above the workbench next to the receptacle containing the crayons, an 8 by 10-in. wood frame is hung, the front of which is covered with screen wire and the back with a door, hinged to the frame.



A dull crayon needs merely to be drawn across the screen a few times to be sharpened. The shavings are caught and retained between the screen and the door of the frame and are easily removed at any time.—G. E. Hendrickson, Argyle, Wis.



All Shop Notes published in 1925, in book form—Fifty Cents—from our Book Department

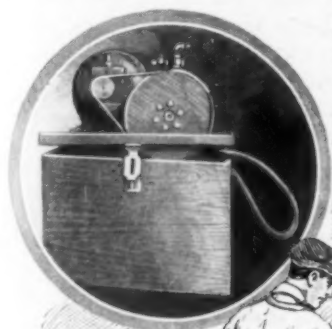
Shop Power Plant Has Many Uses

By D. R. VAN HORN

THERE are many small garages and repair shops where the volume of work does not warrant the installation of a regular automatic air-compressor system, but where the necessity for pumping up heavy tires arises often enough to make the hand-pump method a nuisance. One small shop, where this was the case, solved the problem in the manner shown in the illustration. A $\frac{1}{4}$ -hp. electric motor was

obtained and attached to the top of a tool box.

tor, of course, is belted to the compressor. The box, being full of tools, is heavy enough to permit the motor to be belted to any other small machine within its capacity and to serve as a power plant. The upper left-hand photo shows the compressor belted to the motor, and also the large pulley on the former. This was made of wood, and is necessary to reduce the speed of the motor to one suitable for the compressor. A slot is cut in the top of the tool box to accommodate the pulley and belt. The other photo shows the compressor pumping up a truck tire 8 in. in diameter; it will inflate these tires to a pressure of 105 lb. per sq. in. without any difficulty, and those who have attempted



For All-Around Use in the Small Shop with No Power, This Portable Unit Will Pay for Itself in a Day

In line with it, on the box top, was bolted a small air compressor or tire pump of the type fitted to many automobiles several years ago, and which can often be picked up at a wrecker's for next to nothing. The mo-

tor, of course, is belted to the compressor. The box, being full of tools, is heavy enough to permit the motor to be belted to any other small machine within its capacity and to serve as a power plant. The upper left-hand photo shows the compressor belted to the motor, and also the large pulley on the former. This was made of wood, and is necessary to reduce the speed of the motor to one suitable for the compressor. A slot is cut in the top of the tool box to accommodate the pulley and belt. The other photo shows the compressor pumping up a truck tire 8 in. in diameter; it will inflate these tires to a pressure of 105 lb. per sq. in. without any difficulty, and those who have attempted

Besides doing the chores of pumping tires, the motor is pressed

into service for doing other work around the shop. One use to which it is adapted is shown in the sketch. The forge in the shop is of the hand-drive type, but the

motor is now used, permitting the workmen to handle the work to better advantage. To reduce the excessive draft caused by the motor drive, pieces of cardboard are set on each side of the forge air inlet to restrict the opening. The motor may also be used for driving scratch

brushes and tire buffers by means of a flexible shaft, or operate a small sensitive drill or a bench grinder. In fact, any tool in the shop that is within the capacity of the motor can be made into a power tool by simply setting the motor and box in position and belting it to the drive pulley.

Rig for Rolling Veneer Blocks

Rolling huge veneer blocks, by means of a cleverly contrived rig, is the novel method used by a western factory to get

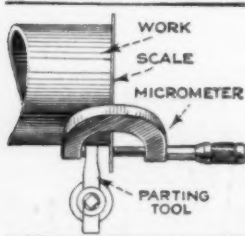


Rolling Huge Blocks from Forest to Mill with a Tractor Linked to Their Centers

its raw material from forest to plant. Although logs of great diameter are well suited for conversion into veneer, they are difficult to load onto flat cars, motor trucks or wagons. But by driving axles into the big blocks at their centers, the cut logs, like mammoth cheeses, are readily rolled to the mill with a tractor. The system operates independently of roads and one man and one tractor have demonstrated ability to transport more veneer blocks than two men and two teams of horses.

Cutting Off Piston Rings

After turning and boring a piece of cast iron to make a few piston rings for a repair job, I found that I did not



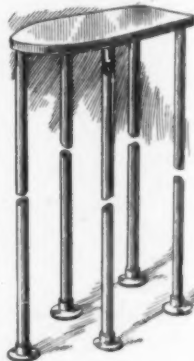
have the proper tool to measure the width before cutting them off. However, the following plan proved very successful: The width of the parting tool and the thickness of the scale were first measured care-

fully, and the parting tool was then set approximately in the position for cutting, with the scale held across the open end of the work in line with the parting tool. The micrometer was placed in the position indicated, over the tool and the scale, and the parting tool shifted around until the micrometer reading corresponded to the total width of the parting tool and the thickness of the scale. The parting tool was then tightened and the ring cut off.

—L. Christensen, Hoboken, N. J.

Stand for Tailors' Goose

In most tailor shops where pressing is done by hand considerable space is taken up on the work table by the pressing iron or goose. To make



the handling of the heavy iron more convenient and at the same time keep the pressing board free of the iron, one tailor devised the holder shown in the drawing, which is set up a short distance from the end of the board. The legs of the holder are lengths of pipe of the proper height, so spaced that the feet on the cast-iron plate, furnished with the iron, can be inserted in their upper ends. The lower ends are fitted with flanges screwed to the floor.

Quick Way of Lapping Bushings

A few days ago I made a bushing for a boring-bar guide that had to be a running fit without shake, to avoid chatter. In taking my measurements I found that I had a tight fit when the bushing was tried. I was going to chuck it over and scrape it slightly, but my foreman said he would

take care of it. He took a piece of emery cloth, wrapped it around a length of broom handle, slipped the bushing over the emery cloth and forced the bushing against a belt running perpendicularly so that the bushing would revolve several hundred times faster per minute than any lathe spindle in the shop. The bushing was lapped out in a few moments, with a high polish, and it was more accurate than could be done in a lathe. The closer the polishing stick fits the hole, the better the work will be.—F. W. Schrader, Woodstock, Ont., Can.

Electroplating Lead

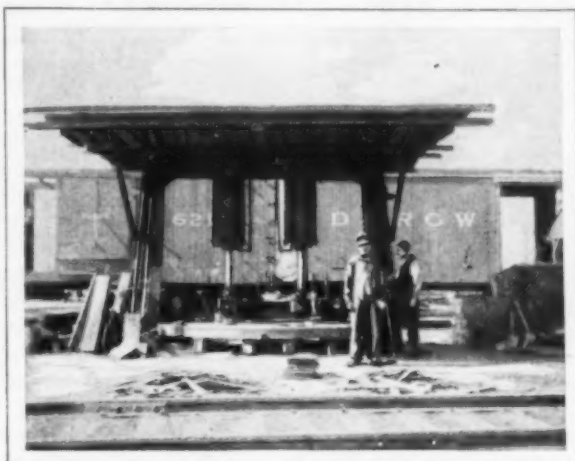
Before plating lead, it is advisable to give it a coating of copper as other metals adhere more readily to the copper. The surface of the lead is scrubbed thoroughly with a hot solution of potash and water, using a coarse brush, then rinsed and dried with a clean rag. It will then take a coating of copper by electroplating, and another metal can be applied later.

Knob Makes Acetylene-Tank Wrench

It seems that no matter how many acetylene-tank wrenches are around the welding plant, there will be some operator who cannot find his wrench. Recently we missed a door knob from one of the inner doors of the welding room; the knob was replaced, but disappeared again in the course of a few days. This occurred several times and finally the foreman saw one of the missing knobs lying on the top of an acetylene tank. He picked it up, and in doing so noticed that the square hole in the knob was just about the size of the stem on the acetylene tank. He tried it—it was a perfect fit. All the operators are now equipped with "wrenches" of this type.—A. S. Jamieson, Springfield, Mass.

Roof Protects Outdoor Air Press

This 15-ton air press, used to shape steel of various sizes and contours, was con-

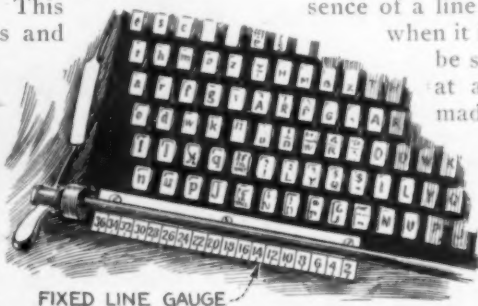


Roof Attached to Framework of 15-Ton Press Protects It from Elements and Reduces Repairs

tinually getting out of order, because snow penetrated into its moving parts and froze. To house it would have caused serious difficulty in getting long and heavy steel to the press and was, therefore, out of the question. The problem was solved by bolting the framework for a shed to the upper portion of the heavy steel columns of the press, so that nothing would be in the way of the workmen on the ground.

Fixed Line Gauge

One inconvenience frequently experienced when operating a linotype is the absence of a line gauge at the moment when it is urgently needed. To be sure to have one handy at all times, one may be made of brass and graduated in picas and half picas along one edge, the opposite edge being drilled for screws, which hold the strip on the keyboard, as shown in the illustration. A small stop should be fixed at the zero graduation in order to facilitate the measurement of the slugs still further.

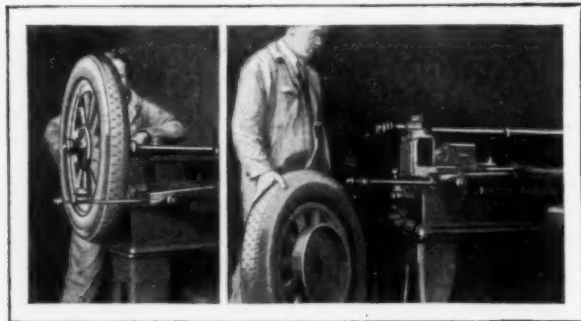


FIXED LINE GAUGE

Line Gauge for the Linotype Operator Is Handier When Fixed on Keyboard

Fixture for Lathe Refaces Brake Drums

In a western auto-repair shop the foreman has rigged up a lathe attachment for



Lathe Attachment Trues Up Automobile Brake Drums without Removing from Wheels

truing up and refacing brake drums on auto wheels, which does the work as well as a special machine made for this purpose. There are three attachments for different models of cars, consisting of duplicates of the axle shafts of the cars, on one end of which the wheel may be mounted, while the other is held in the lathe chuck. The axle is supported at the outward end by a special bearing on the lathe ways. The auto wheel is fastened to the end of the attachment as shown in the left-hand photo, and the machinist then refaces the brake drum. The right-hand photo shows the attachment, the bearing and a brake drum which has just been refaced.—Charles W. Geiger, San Francisco, Calif.

Tile Trenches Dug with Tractor and Plow

We were tiling 40 acres this spring and instead of digging the trenches by hand we used a tractor to remove most of the dirt. First a walking plow was run just as deep as possible, that is about 10 in., and with it a furrow was thrown each way. A lister with long-extension moldboards on each side was hitched to the tractor. The latter straddled the trench and the lister was run about 12 in. deep. A long hitch was made with a chain and a guide wheel was attached to the front end of the beam. As the soil was heavy and wet at this depth, it was pushed out along the extensions of the moldboards far enough

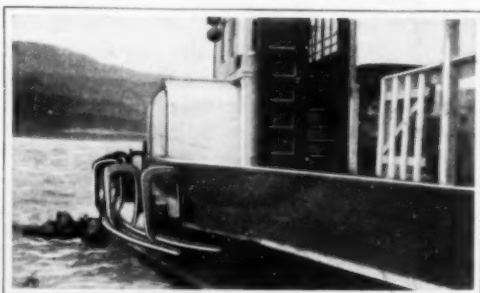
so that it would not roll back into the trench. The rest of the depth and the leveling were done by hand, which was not more than one-fourth of the digging. Where the trenches are to be extra-wide, the plow is again run along one side, throwing the dirt into the trench made by the lister. This leaves it loose and it can then be easily thrown out by hand.—Geo. G. McVicker, North Bend, Nebr.

Saving Cement

When a bag of cement is dumped out, a good deal of the material is left in the bag fibers. A simple and effective method of removing this is to put a few stones in the bag and then shake it vigorously. The amount of cement thus shaken loose from the fibers is surprising. This method is better than beating the bags, as, in the latter case, the wind carries off a good deal of the cement.

Attachment on Ferryboat Holds It to Dock

Designed to hold the boat to the dock without the aid of ropes, the ferry attachment shown in the photo has been found extremely satisfactory. One man can run the boat and make a landing, whereas otherwise two men would be required, one



Attachment on Ferryboat Permits It to Be Moored to Dock without Ropes

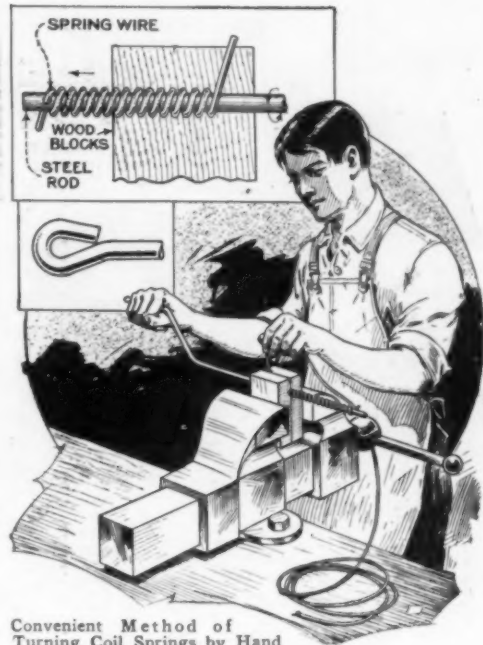
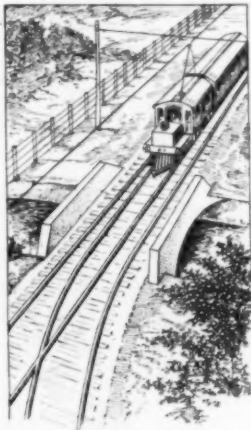
to steer and the other to tie it to the dock. The attachment consists of two iron rails fastened to the side of the boat by means of heavy supports, as shown. The boat is steered so that the rails catch the mooring post on the dock.—Carlton Groat, The Dalles, Oreg.

Shortening Ford Valve Stems

After grinding Ford valves or installing new ones, one is usually found too long, and it is then necessary to file it down or shorten it in some other way to get the required minimum of $\frac{1}{4}$ -in. clearance between the end of the stem and the top of the push rod at its lowest point. But filing the end of the stem by hand, even when the valve is held in a vise, is a somewhat troublesome process. An easier method is to place a sharp file, flat side down, on the top of the push rod and insert the valve in its correct position in the cylinder block, allowing the end of the valve stem to come in contact with the file as it rests on the push rod. The end of the stem is rotated on the file by turning it with a valve grinder and the stem will be shortened as desired, the speed depending on the pressure exerted upon it and the number of revolutions given to the stem. Removing the file from the push-rod top allows measurement of the clearance without the necessity of withdrawing the valve stem. After grinding the stem in this manner, care should be taken to wipe away all the filings that have dropped into the valve chamber.

Double Track for Narrow Bridge

On a two-track electric line there are a number of viaducts which it was not deemed advisable to build to double-track width. Instead the two tracks were run over the bridge in the manner shown in the illustration. With this arrangement one track forms the guard rail for the train on the opposite track. Automatic signals on each side of the bridge were provided. In addition to saving in first cost, this construction permits the trains to cross without stopping while a switch is thrown, which could not be done if a single track were used to cross the bridge.



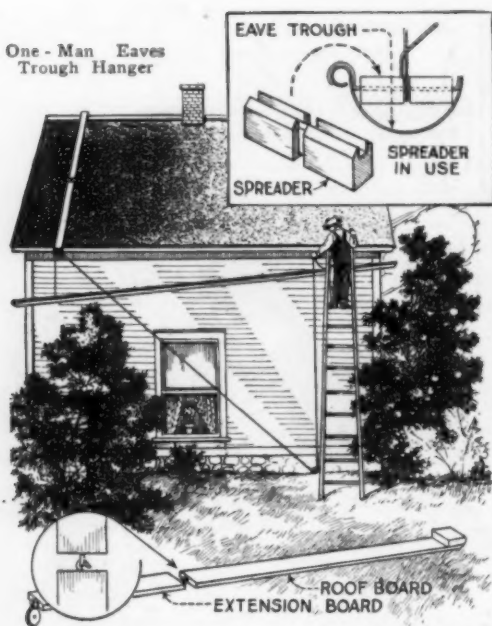
Convenient Method of Turning Coil Springs by Hand

Spring-Wire Coils Wound by Hand

An easy method of winding a coil spring is shown in the drawing. Bend a length of steel rod, equal in diameter to the inside diameter of the coil spring, to a crank shape and drill a hole through it for the end of the wire. Take two blocks of wood and set them up in the vise with the crank between as indicated. Set the wire so that it will make a thread in the wood when you start winding. The wire will then follow this thread as it is fed from the top. A little oil may be used to avoid excessive friction.—C. D. Fredericksen, Detroit, Mich.

New Use for Large Clips

A large office that sends a number of telegrams every day has worked out a new use for large 2-in. clips. Just to one side of the door that leads into this office from the corridor, one of these large clips is attached to the wall, the flat piece at the top of the clip being fastened to the jamb. Whenever a telegram is ready the telegraph signal is rung and the message put in the clip. There it is safe until the boy comes around, and he knows just where to look for it.—Russell Raymond Voorhees, Jacksonville, Fla.

One-Man Eaves
Trough Hanger

Hanging Eaves Troughs

Hanging eaves troughs is generally considered a two-man job, but with the arrangement shown in the drawing one man can easily do the work. In addition to a ladder, a $\frac{3}{4}$ by 6-in. board of convenient length is used. It is rounded at the top edge so that it can be pushed over the shingles easily, and has a 2 by 4-in. cleat nailed on one end, which is hooked over the ridge, and a screweye in the other. If a board of sufficient length to reach from ridge to eave is not available, an extension board can be hooked to the first, as shown, and a screweye driven into its lower end. The little wooden spreader shown in the insert is also required. The device is used in the following way: The board is hooked over the ridge of the roof so as to project a little over the drip edge. A pulley is attached to the screweye for a rope, as shown. The spreader is placed in position under a trough hanger, and one end of the rope is attached to it. The rope is threaded through the pulley, then through another pulley at the side of the ladder, which is then set up at the other end of the house. The worker now attaches the free end of the rope to the trough and climbs the ladder, taking the trough with him, and, in doing so, also lifts its other end. After fixing a hanger

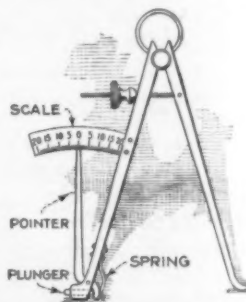
at his end, he raises the trough to the proper slope and sets the remaining hangers.—H. A. Freeman, Willimantic, Conn.

Stamp for Dimension-Line Points

When inking in a drawing, I found that much time could be saved and a neater job done, if the dimension-line arrow-heads were put in at one time with a rubber stamp. I cut it on the end of an eraser with a very sharp knife. The inside of the V was cut out first, and then the outsides. For an ink pad I used a small piece of blotter saturated with ink. After I had marked all the ends of the pencil lines, the latter were inked in.—Dexter W. Allis, Everett, Mass.

Attachment for Calipers Makes Precision Tool

Any mechanic can make a precision tool of his inside caliper by fitting it with the attachment illustrated. The indicating arm can be long enough so that accurate measurements can be obtained. The leg of the caliper is upset to make it thick enough for a slot to be cut in it for the indicator arm. The plunger comes in contact with the work and exerts pressure on this arm, and the spring keeps it tight against the plunger. For making shrink and forced fits the caliper is set at zero and the allowance can then be read on the scale. As this tool does not depend on the sense of touch of the operator, the human element is eliminated and accurate results are assured. The scale should be made accurately, which can readily be done with a dividing head.—Charles Kugler, Philadelphia, Pa.



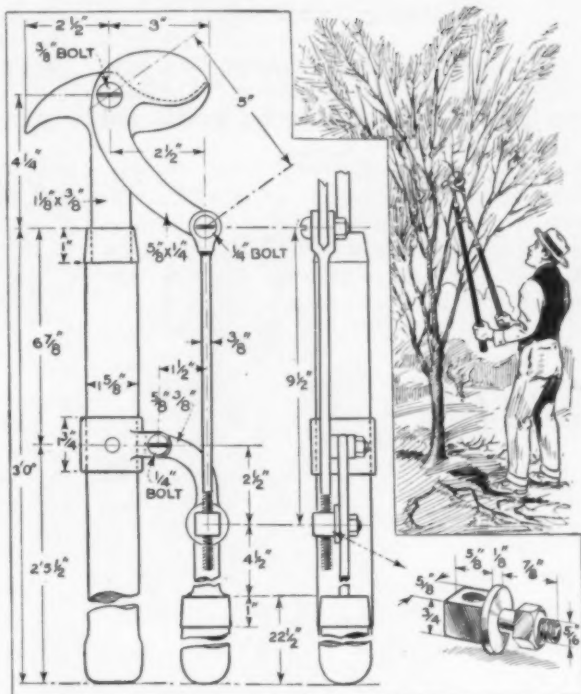
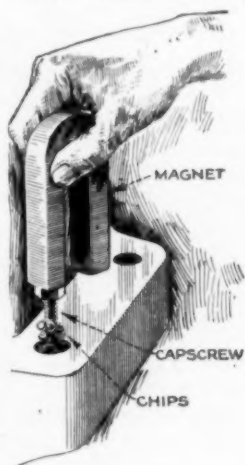
Using Lacquer

Never apply lacquer over a coat of ordinary paint as the ingredients of the two are so different that the finish may be ruined due to chemical interaction. The

solvent in the lacquer attacks the paint and causes bad checks which make the surface very rough, necessitating the removal of the paint, and resanding. If the lacquer is too thick to use, and no thinner is available, use wood alcohol. This should also be used to clean the brushes. Lacquers made by different concerns can sometimes be mixed if they have similar solvents, but ordinary paint and lacquer cannot be mixed. Turpentine should never be used to thin lacquer. After lacquer has dried thoroughly a coat of varnish can be applied if necessary, but usually lacquer has a gloss finish and the more it is rubbed the more it will shine. It is unnecessary to use a wood filler before applying lacquer as it fills the wood and gives a nice, even finish if put on properly. Do not use too much lacquer or the surface will be uneven and it will run. Apply it quickly and evenly and do not attempt to brush it out for the reason that it sets in a very few moments and gets tacky at once.—E. R. Haan, Chicago, Ill.

Magnet for Removing Chips

Having a number of holes to drill and tap in a solid block, which could not be turned over easily to remove the chips, I found the magnet a very handy tool. After drilling the hole to the required depth I took the magnet and a capscREW that would slip into the hole easily. After letting the screw to the bottom of the hole, I applied the magnet to the head, which caused the chips to cling to the end of the screw so that they could be removed easily.—Ralph Hanenkratt, Albany, N. Y.



Handy Pruning Shears for the Gardener and Orchardist Can Be Made by Any Blacksmith

Effective Pruning Shears

An almost indispensable tool for horticulturists and gardeners, is a pair of pruning shears. A good one, which can be made in any blacksmith shop, is shown in the illustration. The constructional details of the shears and the dimensions are clearly given. One particular advantage of this style is the hook part of the shear blade, which enables the user to pull the pruned limb or vine down without touching it with his hands. The shearing blades are forged from 60-point carbon steel, hardened in water and drawn to a dark blue, while the other parts are forged of ordinary machine steel. The handles are turned of ash.

Cleaning Files

One of the best methods of cleaning files, whether fine or coarse, is to rub them with a piece of coke. If the coke becomes full of grease when used on fine files, rub it on a rough file. This will make the coke clean again and the file will be cleaned at the same time.

Forming Corn Stacks

One man can stack corn with the simple "horse" shown in the drawing. The center pole is light enough to be dragged



With This Wooden "Horse" One Man Can Stack Corn Easily and Quickly

around with ease. It has two legs, preferably braced, near one end. A hole, large enough to allow a broom handle to pass in and out freely, is drilled at the point indicated. The stack is built up, tepee-fashion, by standing the stalks in the four corners of the crosspiece. When the stack is finished the broom handle is pulled out, which permits the horse to be removed easily.—H. Faller, New York City.

Removing Steel-Wool Shreds from Crevices

Steel wool is an excellent substitute for sandpaper in many cases, particularly on paint jobs between coats. It has the disadvantage, however, that small shreds of the wool break off and lodge in cracks, corners and crevices, from which it is hard to remove them with the dust brush, yet they will often be dragged out of these places by the bristles of the paint brush and disfigure the work, especially on white or other light-colored jobs. As a help to the dust brush, a horseshoe magnet, such as a magneto magnet, solves the difficulty, for it pulls out the bits of wool easily. As the shreds are so light in relation to the strength of the ordinary horseshoe mag-

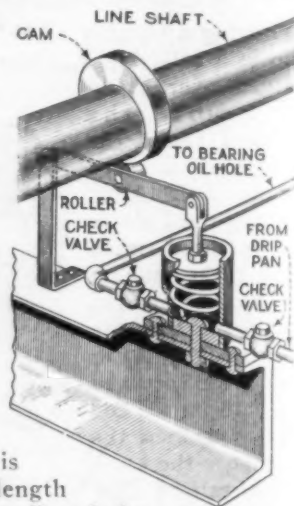
net, just a sweep along the cracks and in the corners will remove all the steel-wool shreds.—L. I. Thomas, Oak Park, Ill.

Rotary Punch for Felt

In an attempt to punch 2-in. blanks from ½-in. felt, I found that an ordinary arch punch had a tendency to cut through the felt obliquely, even though the punch was held vertically. There being a large number of punchings to do, I turned down the shank of the punch to fit the chuck of a drill press, and used it in the press in the manner of a drill, bringing it down onto the felt while revolving at moderate speed. A board was first placed on the drill table to save the edge of the punch. I found there was now no spoilage, and the work could be done faster than when using the punch with a mallet.—Dexter W. Allis, Everett, Mass.

Automatic Oiler for Line Shaft

Frequently an engineer or oiler will come across a bearing that never gets enough oil. This trouble can be remedied by providing an oil pump that will take care of three or four bearings. A cam is made with a 1 or 1½-in. throw, depending on the stroke one wants to give the pump. A lever, having a small roller in contact with the cam, is pivoted to a bracket at one end, and the other end is attached to the pump piston. A strong compression spring is placed under the piston to make the return stroke. The cylinder is made from a length of brass tubing. Two holes are provided for the inlet and outlet, and check valves placed in the pipe run to the bearings and from the source of supply.

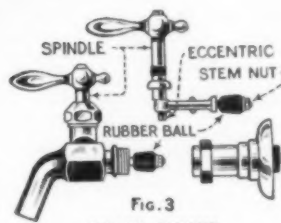
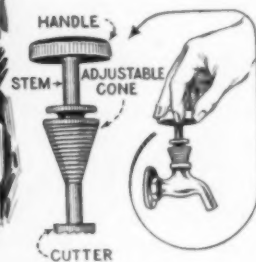
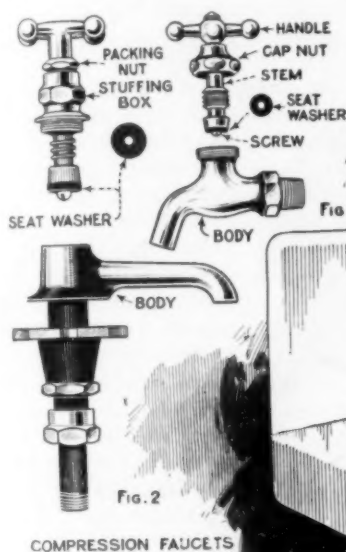


You Can Fix That Dripping Faucet

Worn-Out Washers and Fuller Balls Can Be Replaced in Five Minutes When You Know How the Faucet Comes Apart

THERE is nothing more annoying around the home than a dripping faucet, and yet the trouble can be cured in five minutes with the aid of a monkey wrench and a new washer or ball, which costs about a cent. Faucets are common-

will be found fastened to the bottom of the spindle by means of a round-head screw, and it is only necessary to remove this screw and the small iron washer under it to replace the seat washer. Be sure to use the proper size of seat washer for the faucet. If the screw has rusted in place and is difficult to start with the screwdriver, place a drop or two of kerosene on it and allow the liquid to soak in for a few minutes before trying again. The screwdriver blade should be square across and a



How Common Compression and Fuller Faucets Are Taken Apart for Renewal of Balls and Washers or Redressing the Seat

ly of two kinds, the compression and the fuller type. In the first the stem of the faucet, carrying a composition washer at the bottom, is screwed down against a seat in the body of the faucet to stop the flow of water. In the fuller type the seat is horizontal, and the flow of water is controlled by a rubber "ball" which is moved toward and away from the seat by a small crank or eccentric on the end of the spindle.

To replace the seat washer on a compression faucet, shut off the water in the basement, or under the sink if there is a cock or valve there, then unscrew the cap nut on the faucet (see Fig. 1). A piece of heavy paper between the jaws of the wrench and the nut will prevent scoring or otherwise marring the nut. The washer

good fit in the slot of the screw head. If no regular composition washer is at hand, cut a new one of the same size and thickness as the old, from rubber, if the faucet is used for hot water, and from leather if it is for cold water. When replacing the spindle, be sure that it has not been screwed down hard on the seat before the cap nut is tightened. Screw the spindle in, down to the seat, then back it off the seat a full turn and screw down the cap nut.

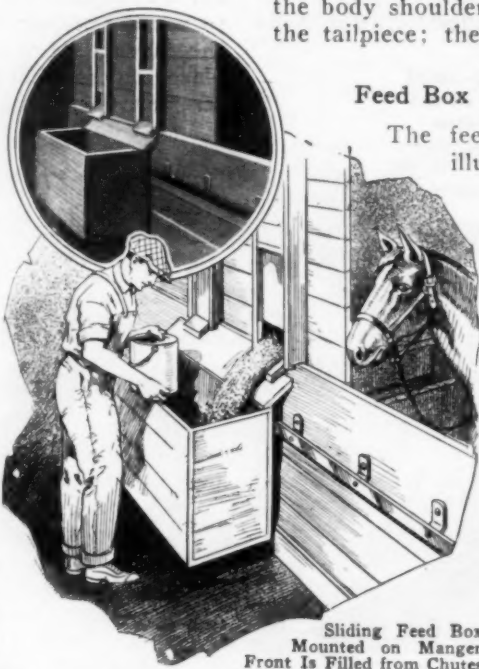
Compression faucets used on washstands are often slightly different in construction from the regular sink compression faucets, although the mechanism is the same. If the top of the spindle looks

as shown in Fig. 2, and there seems to be two cap nuts, then the upper, smaller one is a packing nut, and the lower one (marked stuffing box) is the one that must be turned with the wrench to remove the faucet. If, in a faucet of this type, any leakage is found to occur around the upper small nut, tightening this will usually remedy the trouble. If it persists, unscrew the packing nut and wrap a turn or two of asbestos cord, candle wicking or even common string rubbed with soap, around the spindle, then screw down the packing nut again.

The seat of a compression faucet often becomes nicked, scored or worn, and new washers will not stop the leakage. When this happens, the seat can be made as good as new again by means of a seat-dressing tool, shown in Fig. 3. To use this, the stem of the faucet is removed as described before, and the threaded cone of the tool screwed down into the body of the faucet to center it. The handle at the top of the tool is then revolved several times and the cutter on the bottom of the tool spindle squares the seat. The cuttings are then washed out of the faucet and the stem replaced. These tools come with several cutters for faucets of different sizes.

The method of removing a fuller faucet for renewal of the ball is shown in Fig. 3, the wrench being applied to the hexagonal part of the faucet body. It is not necessary to remove the spindle, as the ball is exposed when the front part of the faucet is unscrewed. Use one wrench on the body of the faucet and another, pressing in the opposite direction, on the tailpiece of the faucet, to prevent unscrewing the latter. The ball is held on the stem by a nut and cup-shaped washer. Re-

move the nut and washer, replace the ball, put back the nut and washer, screw the faucet body back into the tailpiece, and the job is done. Be sure to use the same size ball as the one removed. If, when tightening the faucet back into place, it turns over too far, or if the joint leaks when the water is turned on, screw the body back half a turn and wrap one turn of string around the joint, between the body shoulder and the shoulder on the tailpiece; then tighten.



Sliding Feed Box Mounted on Manger Front Is Filled from Chutes

Feed Box on Manger Front

The feed box shown in the illustration is mounted on a barn-door carrier track in front of the horse mangers. The carrier cars are bolted to the back side of the box, while two flat-faced wheels are mounted on the same side but below, to take the side draft of the box. They roll along the front of the mangers. The box is shown in position receiving grain from one of the two overhead chutes, sliding doors being provided on

the spouts to control the flow. The wooden flange on the top of the box prevents wasting any of the grain.—Dale R. Van Horn, Walton, Nebr.

Ball Punches Spring Steel

I often have occasion to punch strips of $\frac{1}{16}$ -in. Swedish blue-tempered steel with a $\frac{1}{8}$ -in. hole in each. These holes must be absolutely uniform in size, and must be put through with little expense as to time and tools. After unsuccessfully trying all ordinary methods, including use of the mercury-hardened drill, I hit upon the following plan which proved successful: On an anvil I placed a flat piece of steel having a $\frac{1}{4}$ -in. hole through it. Over this I placed the strip to be punched, and with a round-end prick punch made a depres-

sion in the strip directly over the hole, using a heavy hammer. Then I dropped a $\frac{1}{8}$ -in. bicycle ball into the depression, and over that placed a strip of soft steel, that held it in place while I pounded on top of the soft strip. Three or four blows forced the ball through, making a clean hole.—D. W. Allis, Everett, Mass.

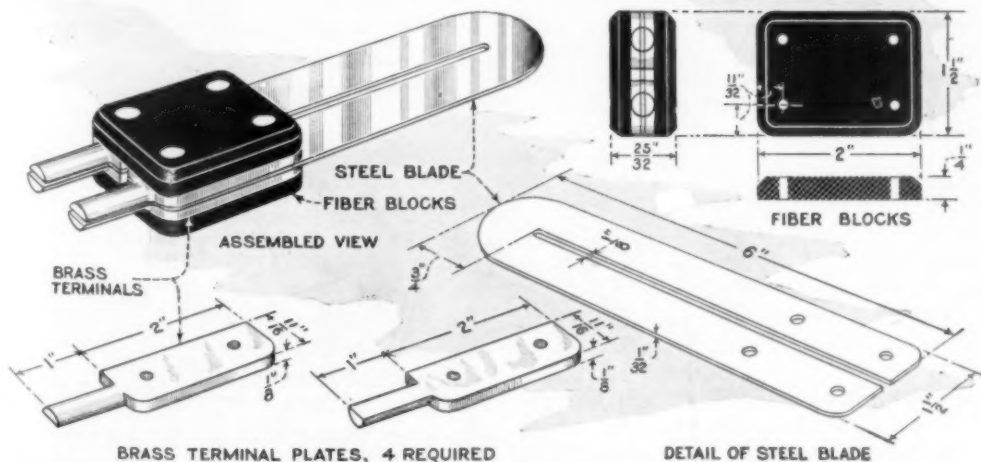
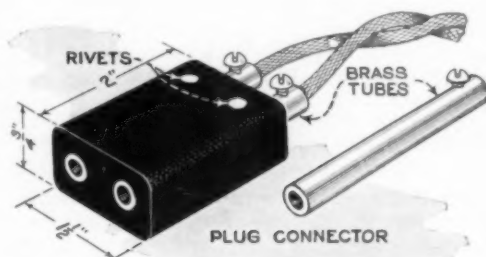
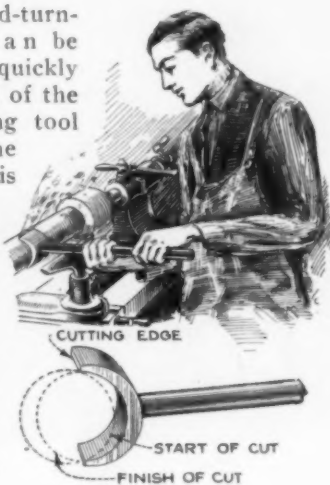
Electric Knife for Opening Storage Batteries

The novel electric knife described in this article consists essentially of an old spatula blade slotted to within $\frac{3}{4}$ in. of the end, as shown in the drawing, the slot being $\frac{1}{8}$ in. wide. The blade is fitted with a fiber handle, made in two pieces. Between the blade and the fiber block on each side, are four brass terminal plates, made as shown in the lower detail and rounded on the projecting portions to fit in the tubes of the plug connector. The latter consists simply of a fiber block drilled for two brass tubes, which should be a tight fit in the block and are drilled and tapped for small round-head screws to fasten the ends of the line wires.

About 2 volts are sufficient for most purposes, although for very rapid heating from 4 to 6 volts may be employed. Number 10 wire, rubber-covered, is used for the leads. The knife can also be used on a.c. current by using a step-down transformer, 3 volts being about right.—Arthman C. Capron, Athelstan, Can.

Self-Measuring Wood-Turning Tool

Many wood-turning jobs can be done more quickly with the aid of the novel turning tool shown in the drawing. It is used for finishing wood plugs and, by its shape, renders unnecessary any measuring tools. To make it, a steel ring is bored to the finished size of the work. The ring is split eccentrically and a hole drilled through the center of the smaller part to take a handle. After roughing, the tool is used until it cuts no more.



A Knife for Use in Opening Storage Batteries That May Be Heated from Another Battery or from an A.C. Line; About Two Volts' Pressure Is Sufficient

Knurling in the Vise

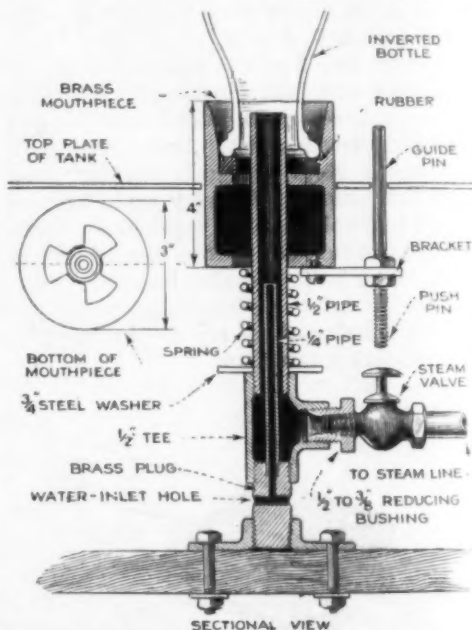


In the home workshop or garage, where one has only a few hand tools and a vise, a good knurling job can be done the following way: The work is pinched between two mill files, placed in the jaws of the vise as shown in the illustration. The files must be parallel and the work set perfectly vertical. A moderate pressure should be applied, and the end of one of the files is carefully tapped with a hammer so that the work rolls between them.—Allan B. Shaw, Prescott, Ariz.

Homemade Milk-Bottle Washer

Washing milk bottles by hand is out of date and the small dairy, which cannot afford a commercial machine, will welcome the washer shown in the illustration. Its construction is simple, only one casting being required and that for the mouthpiece, which should be of some non-corrosive metal, such as brass. This piece is drilled a sliding fit over a $\frac{1}{2}$ -in. pipe and is fitted with a rubber washer, as shown. Use soft rubber, which will conform to the shape of the mouth of the bottles. A push-pin bracket is screwed on the bottom. A piece of $\frac{1}{2}$ -in. pipe is screwed into a $\frac{1}{2}$ -in. tee, and in the bottom of this tee, is screwed a brass plug, made as shown, while into the outgoing hole of this plug is screwed a short length of $\frac{1}{4}$ -in. pipe, connecting with the two small water-inlet holes, drilled into the sides of the plug. A $\frac{3}{8}$ -in. button-head steam valve is fitted into the side branch of the tee and is operated by the push pin, which is carried in alignment by the bracket and a hole drilled in the tank cover. The top

plate is made of $\frac{1}{8}$ -in. sheet metal and should be drilled with small $\frac{1}{4}$ -in. holes to allow the water to drain back into the tank. The whole outfit rests on a $\frac{1}{2}$ -in. flange screwed to the bottom of the tank. A coil spring lifts the mouthpiece and supports its weight when empty. When a bottle is set into the mouthpiece and a weight is put on the bottom of the bottle, the mouthpiece descends and the pin pushes the valve open. Live steam shoots up through the $\frac{1}{2}$ -in. pipe sucking up a quantity of water by its whirling action, which cleanses the bottle. For the first washing a quantity of caustic or cleaning powder is added to the water in the tank, which is heated by the condensing steam. In rinsing, only clean water and steam are used. Control of the steam jet is made possible by placing a shut-off valve in the ascending line against the wall. A washer of this type will pay for



SECTIONAL VIEW
Inexpensive Milk-Bottle Washer Lightens Labor on Small Dairy Farm

its cost in a few days and will speed up the cleaning considerably.

☛ A piece of canvas, cloth or light leather, about 12 by 24 in., with the apron string along the longer edge, makes a good protection for the clothes when leaning against the drafting table for long periods.

Filing Piston Rings

When filing piston rings it is not necessary to use a vise. The rings can be filed more easily and quickly in the following way: A hole is drilled horizontally at a convenient height in the bench or stand close to the work, and the shank of the file is inserted in the hole as far as it will go, which will leave its cutting surface projecting horizontally. The operator should stand in front of this and bear down sufficiently on the projecting end to hold it firmly while filing the ring, which is done with both hands, moving the ring back and forth with the file between its ends. A neater and quicker job of filing can be done in this way and if the motor block is out and lying on its side on the bench, a hole for the file need not be drilled, as it can be stuck in a capscrew hole and, of course, much time will be saved in doing the job, for there will be no running back and forth to the vise, as is necessary with the common method.—Glen F. Stillwell, Collinsville, Ill.

Test Distinguishes Steel from Iron

A few years ago I was employed by a large manufacturing concern that purchased a quantity of surface-rusted large-diameter shafting which was supposed to be cold-rolled steel but later was found to be only iron. If a simple test had been made of this material previous to purchase, this error could have been avoided. Such a test, which can be performed by anyone, is the following: A spot on the material to be tested is ground or filed bright and then brought to a polish. On to this spot diluted nitric acid is placed and allowed to remain until the surface is well etched. The acid solution is then washed off and the surface dried. If iron, the surface will have a fibrous appearance, but if cold-rolled or other ordinary steel, it will appear honeycombed.

If the spot shows a fine, frosted surface, the metal is a high-grade steel.—W. J. Edmonds, Jr., Whitehall, N. Y.



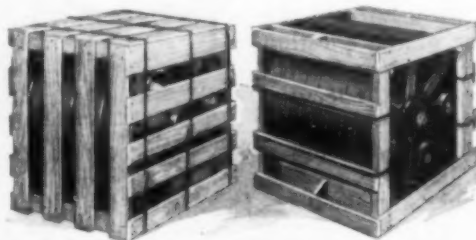
Convenient Method of Carrying Revolver on Gear-Shift Lever of Car

Handy Holster for Revolver in Auto

When a revolver is needed while driving, it will be found very convenient to have the holster attached to the gear-shift lever for quick action. A western fish and game warden carries his revolver here while traveling in his car. The method of mounting it is clearly shown in the photo.

Improved Crates Cost Less

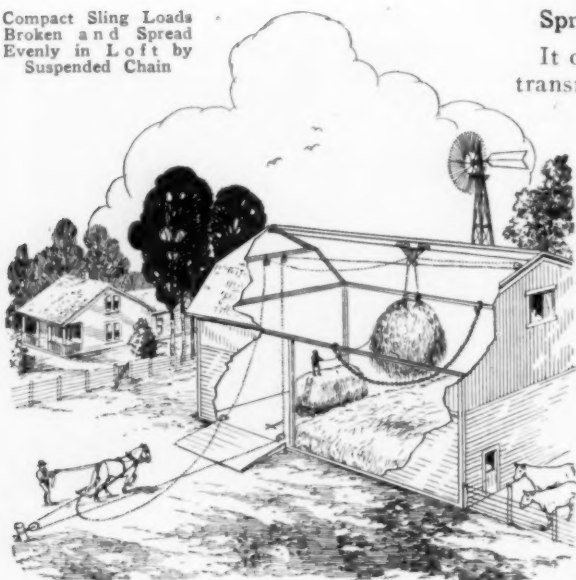
The crate on the left in the accompanying photo was used by a manufacturer of steel pulleys for the export shipment of his product. The crate on the right is an improved type designed for the shipper by the U. S. forest products laboratory. Some crates carry a load of four 36-in. and twelve 8-in. pulleys. The improved crate occupies a trifle less shipping space than the other one. It requires 13.5 per cent less lumber for its construction, 33 1/3 per cent less strapping and weighs 5 per cent less. One drop in the tumbling drum used to test boxes was sufficient



Left, Old Crate for Holding Heavy Iron Castings; Right, Improved Crate

to bring about the failure of the original crate. The improved crate withstood 100 drops before breaking.

Compact Sling Loads
Broken and Spread
Evenly in Loft by
Suspended Chain



Chain Scatters Hay in Mow

An objectionable feature of the ordinary hay carrier is that the fork or sling load is so large that the hay becomes too compact in the mow, which necessitates the use of a hay knife to get the hay out for feeding purposes. This difficulty can be prevented by suspending a chain between plates or studdings in the hayloft, as shown in the drawing. The sling load is tripped over the chain so that the hay is scattered loosely and can later be pitched out with an ordinary fork.—Tud Garver, Huntingdon, Tenn.

Cutting Off Spiral Springs

In an attempt to cut to length a quantity of $\frac{1}{4}$ -in. diameter spiral springs, made of No. 20 gauge piano wire, I found the use of cutting pliers out of the question and the cold-chisel, hammer and anvil method inconvenient, because the lengths of spring would fly away and be lost as I cut them off. I did the job by clamping the cold chisel, edge up, in a vise, placing the spring on the edge and using the hammer to cut it. A gauge was set up on the bench to make the pieces of spring equal in length. With this method of cutting I had one hand free to hold the spiral and prevent the cut-off ends from flying away.—Dexter W. Allis, Everett, Mass.

Spring Compressor for Ford Clutch

It often happens, in overhauling a Ford transmission, that it is necessary to remove the clutch spring. While this is not difficult to do, with the proper equipment, the task may become burdensome with makeshift apparatus. The job can be performed on the arbor press or on the garage press, but the spring compressor shown in the photo makes it still easier. A ring or collar, large enough to clear the spindle of the driving plate, is turned out of $\frac{1}{8}$ -in. stock. Two holes are drilled into the rim, just far enough apart to allow the side members of the puller to pass over the spring and through them. A discarded transmission throw-out collar yoke is used for the grip, which enters the clutch throw-out collar. This is its normal position so that it is a nice fit. The side members of the studs are made from $\frac{1}{16}$ -in. cold-rolled steel. One end of each is heated and forged flat. Holes are drilled in this flat portion to receive the lugs on the collar yoke. With the side members in place, the lugs are then riveted over. The upper ends of the studs should be threaded for a distance of about 5 in. and nuts and washers supplied. The spring is readily compressed and held while the parts are moved about and the pinholes lined and



Spring Compressor for Ford Clutch. Simplifies Task of Removing Spring

the pin driven out or in, as the case may be, without any awkward manipulation of punch and hammer.—Ray F. Kuns, Cincinnati, Ohio.

Leaks—in Walls, Pipes and Purses

By ROBERT TAYLOR JONES

MOST of our home-building efforts are directed toward the prevention of leaks. The walls we build must not leak heat, cold, wind or rain. The roofs we place over our heads—if they leak, then malediction on the roofer! Then there are the pipes that the plumber puts in. He is supposed to do work of such quality that we never again shall be reminded of him, and if the plumbing leaks, it violates our confidence—besides ruining the plas-

a crack so large that through it we could actually read the numbers on the license plates of passing automobiles. No wonder the basement was cold and the cost of heating the house high! The easiest way for the home owner to remedy a condition like that is to get a bucket of damp clay and mix with it a small quantity of hair, which can be obtained from any dealer in sup-
plies for plasterers.

Left, Applying Weather Stripping Is a Simple Method of Saving Heat; Lower Right, an Effective Metal Strip



ter. There are smoke leaks, spark leaks, leaky flues, leaky cellars, leaks in electric wires and heat leaks from uncovered piping, all leading directly to a large leak in the pocketbook. All of these can be stopped, however, with a little work and a little horse sense. Perhaps not everyone can tell what causes a leak, but certainly everyone can find it after it starts. Sometimes they exist from the time the house was built, sometimes they grow up as the house wears down. The other day a friend took me into his basement, and there, between the sill and the foundation wall was

Then fill in the cracks in the walls of the basement and joints with the mixture. Chink up every place where a ray of light can be seen, and then, on the first cold, windy day, see if any cold air can be felt coming in around these places. If so, fill in with some more of the homemade plaster. In many houses, warm air can pass up from the basement between the studs of the walls. If such is the case, it is advisable to close the openings between the joists with old brick, tile or other suitable material. Also, in houses where there is no fire stopping between the studs, cold

air can pass freely from the attic to the basement. In such cases, if the plaster goes down only a little below the top of the baseboards in the rooms, much air enters the rooms under the baseboards, where they do not fit closely. Such cracks should be closed. Basement doors and windows should be examined and made as wind-tight as those in the other parts of the house, as cold air entering the cellar cools off the furnace pipes and the floor above.

The covering of the furnace and the heating pipes in the basement is usually advisable, although a little judgment should be applied here. In one case, where the basement was always comfortably warm, with the furnace and the heating pipes uncovered, it became too cool for the housewife to wash and iron in comfort, when the job was done. This was remedied by

Look to the outside doors. These are often poorly fitted, and cold air can pass easily above and below them. The crack below the door is often so large that cold air sweeps across the floor, keeping the room cold. Good weather stripping, applied all around the door, will remedy this, of course, but a better job, and a permanent one, may be had by the use of metal weather strips on all doors and windows. This is more expensive than the wood-and-felt type, but it pays in the long run. Leaks around window casings and baseboards can be stopped with strips of paper, soaked in water overnight and then driven into the openings tightly. This can be stained, painted or varnished to match the trim, and will stay in place for years. The wallpaper around the casings should be protected while the wet paper is applied.



putting in a ceiling radiator in the basement, which was turned on when wash day came around or when hubby worked at his bench downstairs. In this case, it probably would have been just as well to leave some of the pipes in the laundry part of the basement uncovered. Pipe covering comes in several forms, all of which can be applied easily, and asbestos furnace and boiler covering is also very easy to put on.

Left, See That Radiator-Valve Pack Nuts Are Tight; Right, Covering Boiler and Pipes to Prevent Heat Leaks

There are some things that will save heat that cost no money at all, only a little time. Locking the windows when closed, drawing down shades all the way so as to provide an air space between the shade

linings cost so little that they can scarcely be found in the masonry bill, yet they pay dividends year after year in protection.



Left, a Leak around the Chimney Flashing; Center, Repairing Eaves Trough Leak; Right, What Happened When the Trough Leaked



Then there are roof leaks. These can be prevented only in one way: by using good material, properly applied. See that the flashing around the chimney, for example, is built right into the brick, and that no light shows around the chimney opening from inside the attic. Get after any little leaks that do show up, before rain and snow get a chance to rot the wood in the roof, and perhaps the attic floor and the ceiling plaster. Watch the gutters on the eaves and repair any small holes that develop in them before they make rusty marks on the sides of the house, or allow water to seep in around the window casings.

Learn to fix the small leaks in the plumbing equipment of the house. Faucets and toilet flushes are easy to fix when they go wrong, and many a plumber's bill will be saved by a stitch in time. A can of "smooth-on" cement will fix the majority of piping leaks. If the pipes can be unscrewed and the new joint made up with this cement, the repair will be permanent. If not, one or two applications of the cement to the outside of the joint will make a repair that will last for a long time.

and the glass, turning off heat in an unused room, or at night when the windows are open, periodical care of the heating equipment, all take but a little time, but will save a lot of heat.

Another part of the heating plant, the flue, is a prolific source of leaks. There should be two openings in a flue and no more. The flue should be lined with tile from the point where the furnace or stove-pipe or fireplace throat joins it to the top of the chimney stack. Think what happens in that flue when the soot accumulates and takes fire, as it often does. If there is an opening somewhere along the stack between the bricks, due to mortar falling out, what is to prevent the blazing soot from going through this opening rather than out of the chimney top? Fire starts and the house is ruined. Flue

Plenty of exercise in deep-litter scratching keeps hens in a healthy laying state.

Water-Cooled Meat House

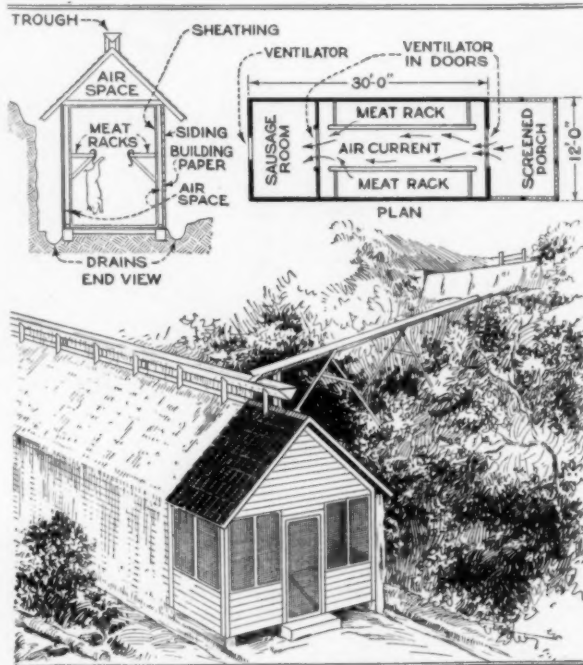
The claim is made by the owner and builder of the water-cooled meat house shown in the illustration that the meat chilled in it will keep from two to three times as long as meat chilled in an ice house. The owner of the house is a cattle trader and butcher of Princeton, B. C., who operates his own slaughterhouse in connection. After being killed and dressed the carcasses are taken to the meat house for chilling, cutting and weighing. They are kept there from 24 to 48 hours and sold. The house consists

of a 30 by 12-ft. frame building with two rooms and a porch. It is built in an excavation in a hillside, placing it partly below the level of the ground, and a V-trough is built over the ridge of the roof as shown. The trough has holes drilled in the sides to allow a steady flow of water to pass over the roof and down off the eaves. The building is shaded by close-growing cottonwoods and alders, although this detail was intentionally omitted in the drawing. Of the two rooms back of the porch, the rear one is used for a sausage room, and the front one for meat storage. The weighing, cutting and wrapping of meat for delivery are done on the porch, which is fitted up with tables, scales, chopping blocks, etc., in true butcher-shop style. Excellent insulation against the heat is obtained by air spaces in the walls and ceiling, as shown in the end view, and a double floor with building paper between the boards. The walls

are built of 1-in. ship-lap lumber nailed to 2 by 4-in. studdings with building paper on the inside. The inner walls are of 1-in. sheathing nailed to the inner face of the studding, leaving an air space for insu-

lation between the inner wall and the building paper. The cross beams between the walls are covered with a ceiling of 1-in. sheathing, making an air space between the roof and the ceiling. The roof rests on 2 by 4-in. rafters over which 1-in. sheathing is nailed; and over this, in turn, red cedar shingles are laid, 4 in. to the weather. Over the peak is a V-trough made of 1-in. fir. A

4-in. insulated door, in which is a small trap window, separates the porch from the chilling room, while an ordinary door of 1-in. lumber separates the two inner rooms. At the back of the building, near the floor level, is another trap window, 12 by 20 in., leading to the space between the building and the earth bank at the rear. Two sets of horizontal bars serve as racks for hanging the meat in the chilling room. The sausage room is fitted up with tables, choppers, sausage machine, etc. Back on the hillside, about 50 ft. distant and about 10 ft. above the level of the roof of the meat house, there rises a small spring of ice-cold water which has an even, year-long flow. This has been dammed and the water led to the roof of the meat house in a V-flume. The flume is directly over the peak of the roof and runs to within 4 ft. of the front. Small holes are drilled about 4 in. apart in the sides of the flume to allow the water to

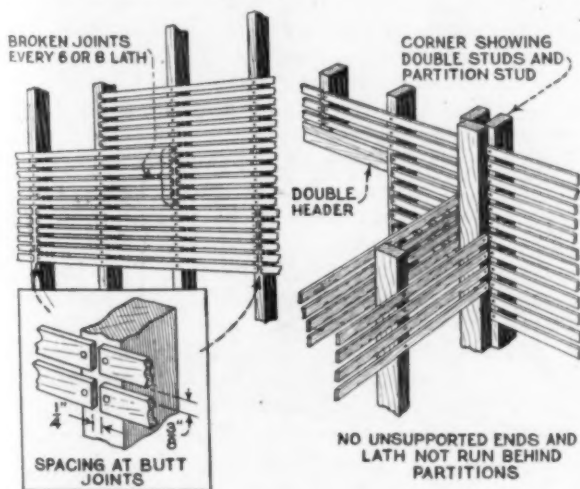


Thin Sheet of Cold Spring Water from Near-By Hillside Flowing over Roof Keeps Meat House Cool

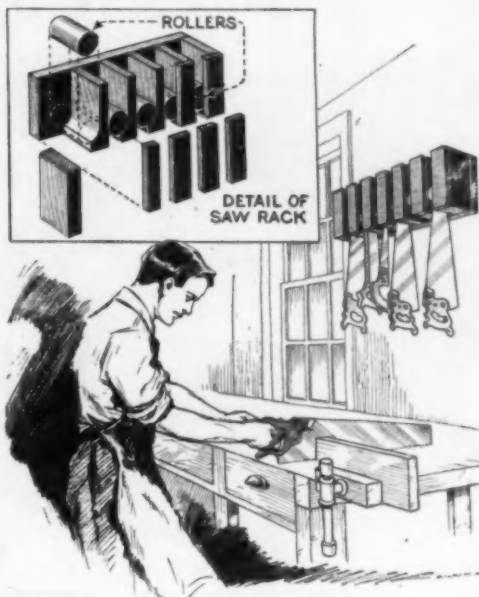
run down over the roof. They are close enough together to make a solid sheet of water over the whole roof. The water drips off the eaves into the space between the building and the earth bank and is carried away in drains. The coolness of the water, as well as its evaporation, keep the building exceptionally cool. The flow of water in the flume is controlled by a slide gate in the dam. Dirt and leaves are kept out by screening in the outlet gate. A current of cool air is arranged for by small trap windows in the front door and rear of the building. This is a very important part of the chilling process.

Lathing Hints

Lath shrink most when they first dry out, and therefore only well-seasoned, clean lath should be used. Less contraction, however, takes place when the lath are wet on installation. Hence, they should be thoroughly soaked before they are nailed on to prevent cracking of the plaster. To make this wetting most effective, the plaster should be put on as soon as possible after the lath are placed. They should be spaced about $\frac{3}{8}$ in. apart and a space of $\frac{1}{4}$ in. left at the joints. Regular lathing nails should be used, and the lath should be nailed to every stud, breaking joints every six or eight laths. It is objectionable practice to allow lath to run in behind partitions, and ends in corners should always be supported.



Proper Method of Applying Lath and Supporting It at Corners



Convenient Rack for Holding Saws on Wall above Workbench

Handy Saw Rack

To have your saws out of the way and handy at all times you will find the illustrated saw rack of considerable convenience. It consists of a 1-in. board, about 6 or 8 in. wide, the length depending on the number of saws. A space of $3\frac{1}{2}$ in. is allowed for each with an inch extra at each end. Shape a number of pieces of 2 by 4-in. stock as shown in the illustration, and nail them to the board on $3\frac{1}{2}$ in. centers. Place a 2-in. roller in each space and nail on a 2-in. strip, as indicated, to prevent the roller from coming out.

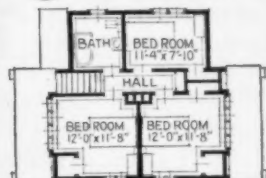
Substitute for Dry Cells for Ignition

Dry cells used on a gasoline engine running a concrete mixer were worn out, and to replace them meant a trip to town, which would delay the work considerably. Electric-light lines were near by and a toy transformer was obtained as a substitute for the dry cells. This was hooked up, and the engine started with a bang and kept on running in a satisfactory manner.

This May Be Your Home



FIRST FLOOR PLAN



SECOND FLOOR PLAN

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Plan No. 6B4

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and endorsed by the United States department of commerce. Inclose 10c and self-addressed envelope. Blueprints, specifications and material list for the house shown here may be obtained at nominal cost. Inclose self-addressed stamped envelope for reply. If further information is desired, send 5c and stamped envelope for a 24-page booklet explaining how the Small House Service Bureau functions and showing 12 sample plans. A new booklet, entitled "Fifty Ways to Lower Home Building Costs," illustrated by ten bureau houses actually lived in, and showing how as much as \$1,000 can be saved on a home, may be obtained for 20 cents.

THIS house shows the modern trend in building small homes of individuality and distinction. It is an ideal combination of features that make for convenience and comfort with unusual design. Graceful well-balanced arches form the entrance to the front hall and to the comfortable porch. Every room is of good size, well lighted and livable.

In this design, even the hall has individuality. It is ample in size, with beautifully arranged open stairway and large triple window. The large opening from the hall to the living room permits a delightful view across the living room into the cool, shadowed porch. A fireplace, and a group of wide windows in front, add greatly to the distinction of the good-sized living room. In the side entry there is both a broom closet and a coat closet.

On the second floor there are three good-sized bedrooms, bath and five closets.

Two of the bedrooms are exceptionally pleasant.

Counting over the advantages of this plan one cannot fail to see that they mount up high. A paved porch, a grade entrance, a vestibule, stair hall, fireplace, plenty of closet space and many windows—and above all a plan well thought out for convenience and beauty. The exterior does not suffer by comparison, for its well-balanced walls and roof lines show the hand of the expert.

Materials used: Frame construction, with stucco finish on metal lath. Trim, hardburned flash brick; shingle roof.

Width over all: Thirty-five feet.

Depth: Twenty-four feet three inches.

Approximate size of lot: Fifty feet.

Facing: The plan, as shown, is designed to face south or west, but can be reversed.

Basement: Under entire house, except the porch. Contains a well-lighted laundry.

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