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WRITTEN SO YOU CAN UNDERSTAND IT

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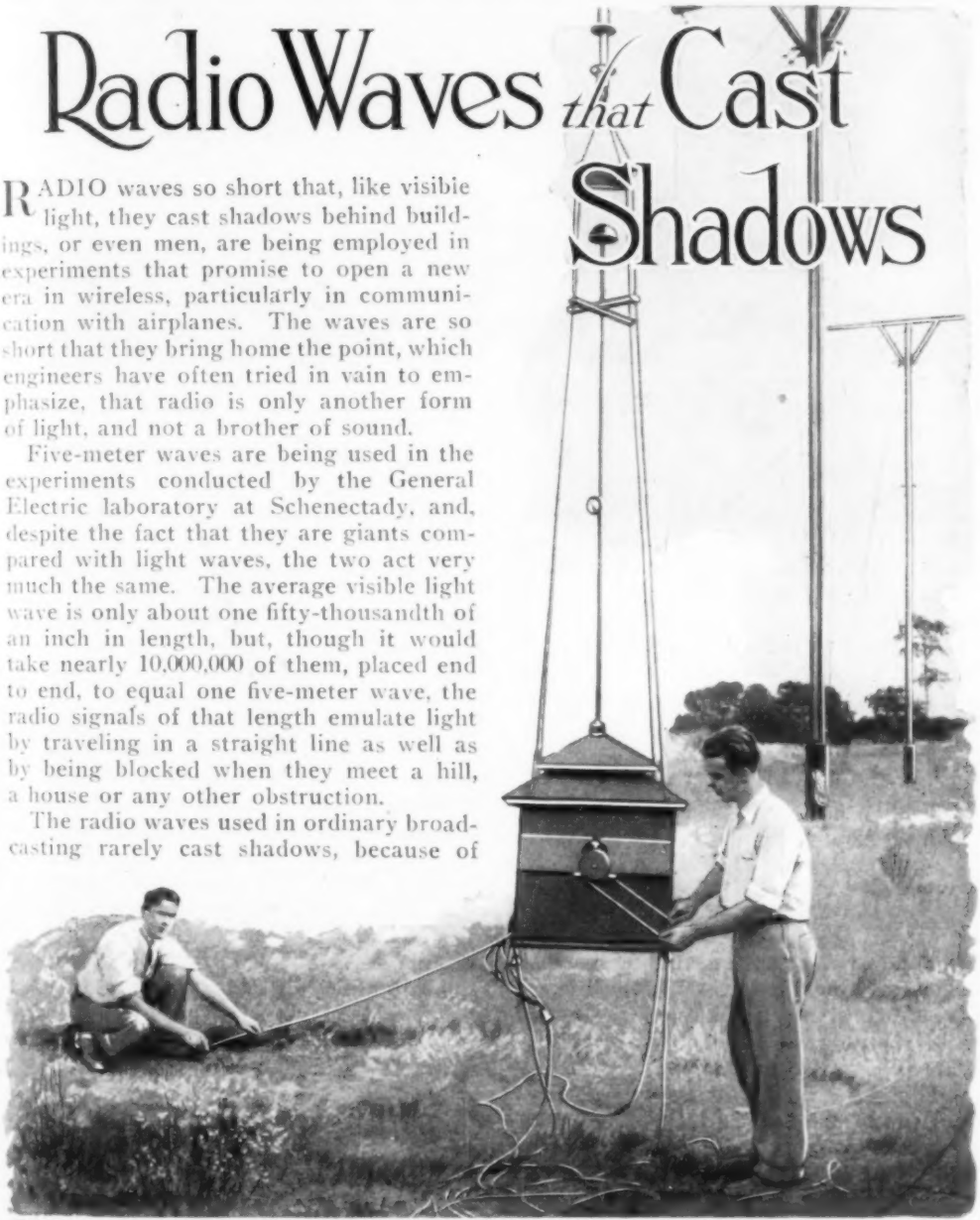
No. 1

Radio Waves *that* Cast Shadows

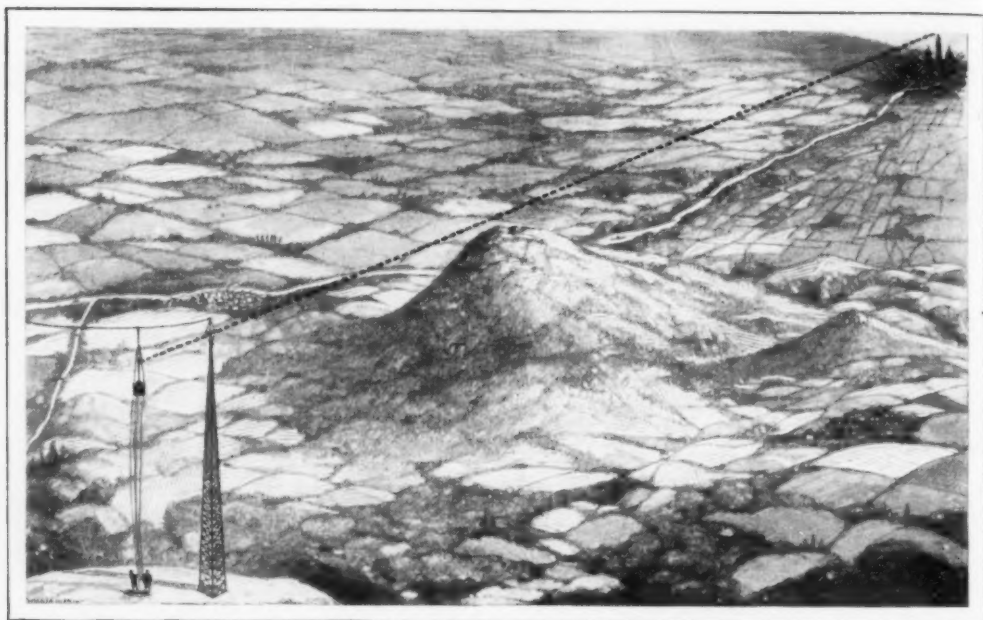
RADIO waves so short that, like visible light, they cast shadows behind buildings, or even men, are being employed in experiments that promise to open a new era in wireless, particularly in communication with airplanes. The waves are so short that they bring home the point, which engineers have often tried in vain to emphasize, that radio is only another form of light, and not a brother of sound.

Five-meter waves are being used in the experiments conducted by the General Electric laboratory at Schenectady, and, despite the fact that they are giants compared with light waves, the two act very much the same. The average visible light wave is only about one fifty-thousandth of an inch in length, but, though it would take nearly 10,000,000 of them, placed end to end, to equal one five-meter wave, the radio signals of that length emulate light by traveling in a straight line as well as by being blocked when they meet a hill, a house or any other obstruction.

The radio waves used in ordinary broadcasting rarely cast shadows, because of



Preparing to Hoist a Radio Transmitter to the Top of a Tall Tower; It Is Tuned from the Ground by an Endless Cord, and the Small Meter on the Aerial Rod Is Read with a Telescope



Elevated to a 300-Foot Mast, the Transmitter Will Have a Clear Line of "Vision" to the Receiver atop the Woolworth Building on Distant Manhattan Island

their great length. There are occasional exceptions, as when a near-by mass of metal, such as a gas holder, will block reception from a broadcasting station on its other side. The long waves bend as a rule around very large objects, just as visible light waves may be bent around atoms. On the basis of their comparative size, a house or office building is no more to the long radio wave than an atom to the fifty-thousandth of an inch light wave.

Because of their straight-line propagation and the shadow effect of interfering objects, unusual arrangements were necessary in the experiments with the five-meter waves. The transmitter, instead of being housed in a building or placed on the ground, was swung in the air from the top of a 300-foot aerial mast at Schenectady. An endless rope, running over a pulley on the condenser dial, made tuning possible from the ground, operating much like a chain hoist. The small output meter, fixed to the antenna, was read from the ground through a surveyors' transit. Wires dangling from the transmitter connected to the current supply on the ground.

The receiver used was a miniature "ham" set, consisting of regenerative detector and one audio amplifier. No antenna was necessary at the receiving end for the

phone cords furnished wire to pick up sufficient energy. The tiny grid-tuning coil contained but five turns of wire, a half inch in diameter, and the tickler coil was a quarter inch long and a quarter inch in diameter, inside of the grid coil. Two very small condensers were used, and to keep the leads short, they were placed as close as possible together. They were so close, in fact, that, in order to use standard-size vernier dials, extension shafts were necessary. The condensers were placed at an angle to each other and a false end was built in the receiver cabinet to accommodate the angle of the dials.

Tests were first made over a distance of thirty miles. On top of a hill, with a clear "line of vision" to the transmitter, the signals came loud and clear, but as the portable receiver was carried down the far side of the hill and passed out of the straight-wave range, the signals faded and disappeared.

Following a survey of topographical maps for the country from Schenectady to New York city, arrangements were made to place the receiver on top of the Woolworth building, as the survey showed that, from its great height on lower Manhattan island, the transmitter atop its 300-foot mast at Schenectady would have an un-

abstracted path for the radio waves, passing over the Catskill foothills.

The short waves used have extremely high frequencies, a five-meter signal representing approximately 60,000,000 cycles a second. A four-meter wave would have a frequency of 75,000,000 cycles. In the 15,000,000-cycle space between four and five meters, every radio station now in use—amateur, naval, broadcasting and commercial—might be operated without interference from overlapping signals. It is that enormous number of possible wave channels in the low waves that promises to revolutionize wireless. Experience has shown that a separation of at least ten kilocycles, or 10,000 cycles, is necessary between near-by stations. On that basis there are between 200 and 550 meters—the broadcast wave band—only some ninety possible wave channels, though they cover a 350-meter band, while the single one-meter band between four and five meters contains 1,500 wave channels.

The experiments are continuing, to determine the usefulness of the short waves in broadcasting over fairly limited distances. Radio engineers have been aware for some years that short waves are best for long-distance transmission. One of the interesting facts already learned is that the short-wave bands are practically free the year around from natural static, but that man-made static, such as that caused



Condensers Are Set at Angles to Get Short Leads, While the False Front Panel Makes the Use of Big Vernier Dials Possible

by the ignition system of a passing automobile, is particularly noticeable.

TRACTOR FITTED AS FIRE ENGINE HELPS GUARD FORESTS

By making various alterations in a familiar brand of tractor, an efficient engine has been afforded the guardians of a Cal-

ifornia forest to help combat fires. It has a six-speed transmission, pneumatic tires, a three-speed pump, reels of hose and, on the trailer, a tank holding 520 gallons of water. This may be used while the hose is being led to a creek or other natural supply.

A particular advantage of the outfit is that it can climb steep grades. In a recent test, one of the tractor engines was driven 215 miles over mountain roads in ten hours. When the destination was reached, the trailer was disconnected from the tractor and a plow attached, making a firebreak up a thirty-percent grade in low gear.



Forest-Fire Engine, Made from Tractor, with Trailer Carrying the Emergency Water-Supply Tank



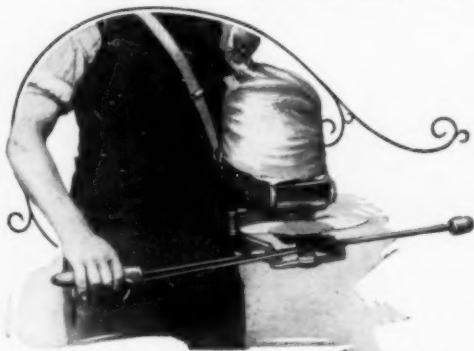
Taking the Seasickness Cure on Deck; Gas Administered from the Cylinder Is Said to Relieve the Malady

GAS FOR CURING SEASICKNESS LATEST TRAVEL AID

Comfort for the traveler who suffers from seasickness is seen in a gas remedy a German physician has prepared. It is carried in cylinders like those used in a dentist's office and the patient inhales it through a flexible tubing and cone. Treatments can be given on deck and are said to be effective immediately.

"FIDDLE" THAT SOWS GRASS SEED AIDS GOLF-COURSE KEEPER

Maintaining grass on golf courses is simplified with a hand-operated sower introduced in England. It works by pulling a "bow" back and forth as though playing a cello. This action causes a disk to rotate and scatter the seed which falls upon it from a holder above.



By Working the Handle Back and Forth, Disk Is Revolved and Seed Is Distributed from the Bag

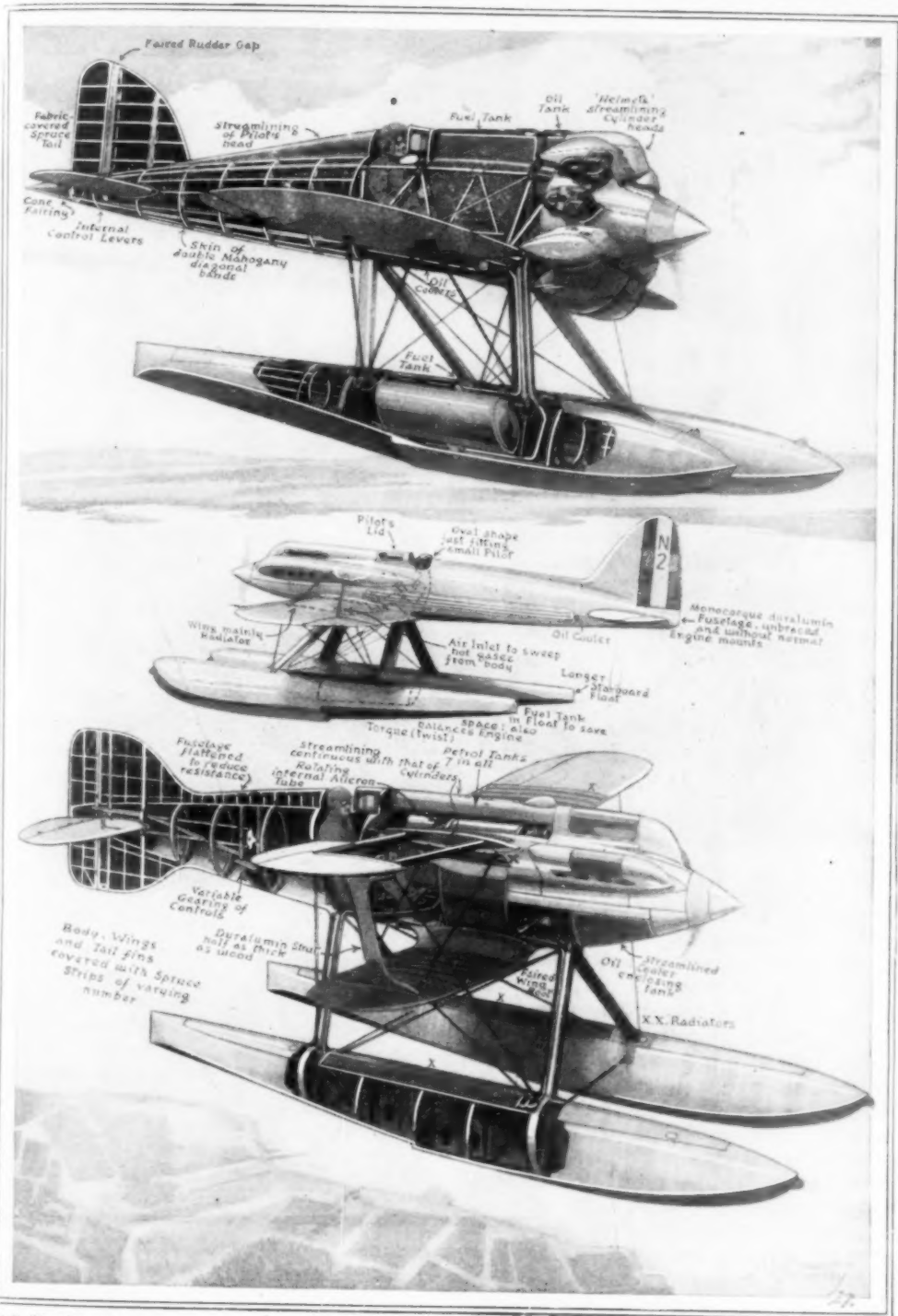
THREE HUNDRED MILE AN HOUR PLANES CARRY BALLAST

English speed planes, which took the Schneider trophy away from Italy this year, were so fast that they had to be specially weighted on the right-hand side to overcome the tendency of the plane to turn with the propeller. The winning plane, which averaged 281.49 miles an hour on the closed triangular course, attained a speed of more than 300 miles an hour at times on the straightaway. The winner, a Supermarine equipped with Napier engine, had a right-hand pontoon considerably longer and heavier than its opposite mate, as shown in the center sketch on the opposite page. It was unusual in several particulars. For one, the fuselage was built of sheet duralumin without any internal bracing or reinforcement, deriving strength from its tubular shape alone. The engine was water-cooled and the radiators occupied practically all the leading edge of the very short wings. Special ventilation was provided to blow the burned oil fumes and other gases out of the fuselage, to keep them from overcoming the pilot. Another of the English entries, which, however, crashed on its trial flight in Italy, carried all its gasoline in a large tank in the right-hand pontoon to offset the engine twist while in flight. The third type of British ship, of which two were built, was the Gloster Napier, the only biplane entered, the others being of the low-wing monoplane type, in which the wing is placed below the fuselage instead of above it. The Glosters were unusual in that the powerful engines were geared down to fairly slow turning. Wing struts

were of duralumin because strength equal to wood can be attained with considerably thinner sections. The wing radiators, used to cool the engine water, were supplemented by radiators in the pontoons, which utilize the sea water for cooling while the ships are on the surface.

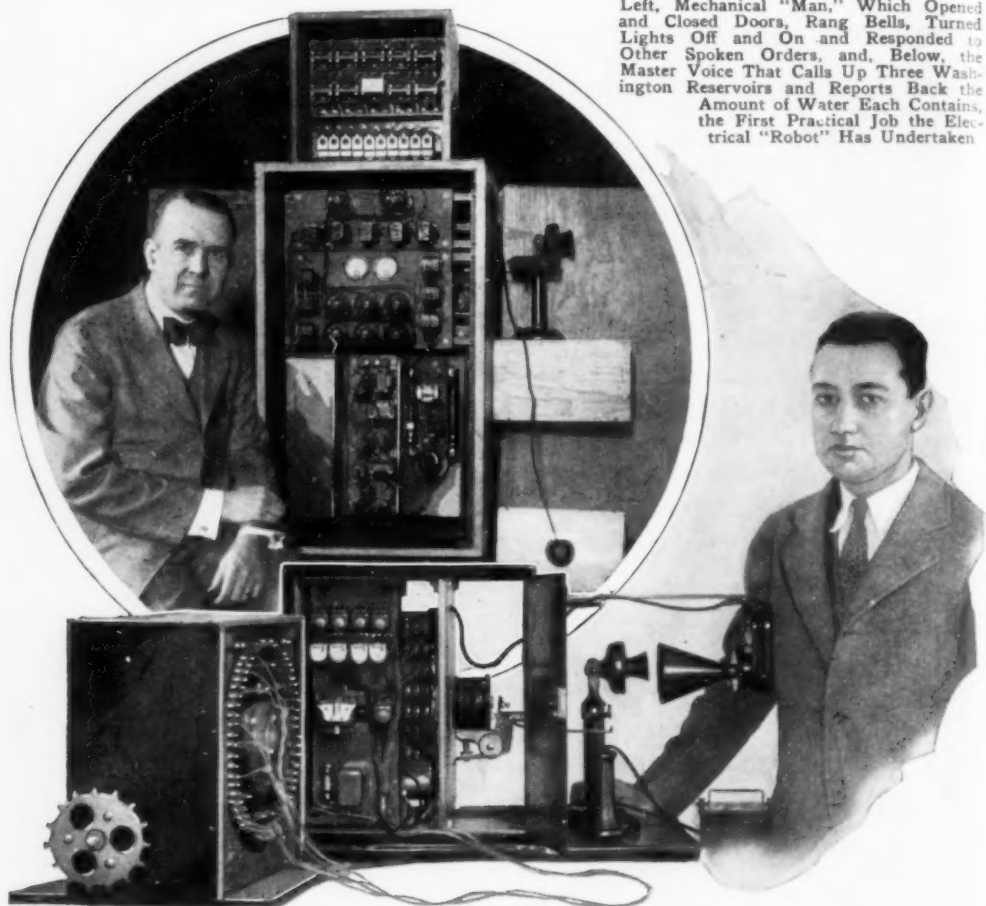
POPULAR MECHANICS

SECRETS OF THE WORLD'S FASTEST SEAPLANES



ELECTRICAL "MAN" OBEYS HUMAN VOICE ON PHONE

Left, Mechanical "Man," Which Opened and Closed Doors, Rang Bells, Turned Lights Off and On and Responded to Other Spoken Orders, and, Below, the Master Voice That Calls Up Three Washington Reservoirs and Reports Back the Amount of Water Each Contains, the First Practical Job the Electrical "Robot" Has Undertaken



An electrical machine that answers the telephone, starts and stops machinery, reads the water gauges at reservoirs and can be made to perform an infinite number of other tasks, has been constructed by Dewey M. Radcliffe, a government engineer, and R. J. Wensley, of the Westinghouse laboratory staff. Three of the automatons have been installed in the war department at Washington, taking the place of nine watchmen who patrolled three water reservoirs. When the official in charge wishes to know the depth of water in any of the reservoirs, he calls central on the telephone, gives the proper number, and the mechanical man answers, reads the gauge and reports back the depth. A similar machine, demonstrated at the Westinghouse offices recently,

turned lights off and on, started and stopped an electric fan, operated a searchlight and an automatic sweeper, and even opened and closed a door. A laboratory model was worked by the human voice speaking into a telephone transmitter, delicate selectors and relays responding to certain tones and syllables. For practical installation, the human voice has been replaced by electrically operated tuning forks, which transmit the desired note. The mechanical man grew out of the need for a device to control distant machinery without the prohibitive expense of maintaining special private wires over long distances. At the control office in the war department, the telephone stands on a small box, which has on it three push buttons. When the waterworks official wants

to check the water level in the reservoirs, he calls the number of the reservoir, the operator completes the connection, and the bell at the other end rings. The signal operates a relay that lifts the hook and starts a buzzer that sends back through the transmitter a signal to advise the caller that contact is established and also the desired information.

BLACK BLOTTERS FOR BANKS TO DEFEAT FORGERS

By using the blotter that has been applied to a signature, forgers have sometimes fashioned an accurate reproduction of the writing, but with a type of blotter now being employed in banks, they will no longer be able to do this. The blotters are black, so that the ink is almost completely lost in the color. Besides this advantage, they are not so easily disfigured.

TURN OF WRIST WORKS JACK WITH COMPRESSED AIR

Raising a car with a twist of the wrist in a few seconds is accomplished with a compressed-air jack now on the market. It is operated from a service-station air line, or with a small container of air compressed to 120 pounds and released from the tube into the jack.



Jack in Place and About to Raise the Car When Compressed Air Is Released by Twisting Tube Handle

GAS MASK AS DIVER'S HELMET WOULD AID IN RESCUES



Submerging to Test Fireman's Gas Mask as a Diver's Helmet, Wearer Stayed Under Twenty Minutes

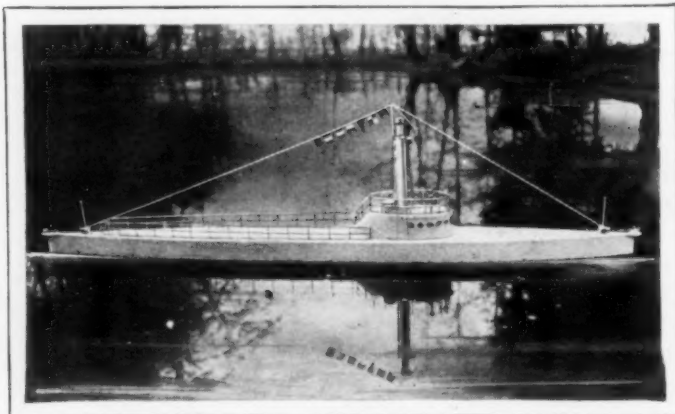
That a fireman's gas mask can be successfully used as a diver's helmet was demonstrated recently by Capt. C. H. Virdin, of the Los Angeles department. Wearing one of the masks, he remained submerged for twenty minutes. It is thought that the equipment would prove of special service to companies detailed along water fronts or where emergency calls for rescues of drowning persons are likely.

CENTER OF INDUSTRY MOVES TOWARD THE WEST

Centers of industry and population of the United States are gradually moving westward toward the center of agriculture and the latter, in turn, is a bit nearer the geographical center of the country than it was a few years ago. The industrial center has moved seventy-five miles south and west in the last eighteen years, and is now in northern Indiana. The center of population is also in Indiana, in Owen county, 170 miles south and slightly west of the industrial center and almost at the Illinois state line. The agricultural center is about thirty-five miles southwest of Hannibal, Mo., and the geographical center near the middle of the northern boundary of Kansas, close to Nebraska.

SPEED BOAT TO CROSS ATLANTIC IN FIFTY HOURS

Trips between New York and Paris in fifty hours are anticipated by a French in-



Eight-Motored Speed Boat for Rapid Trips across the Atlantic Is to Be Built after This Model

ventor in a boat he has designed to rival aircraft. It is in the model stage so far and shows similarities to a submarine, being fitted to travel under water for a considerable time. It is to have eight motors, six for forward and two for reverse travel, with a total horsepower of 2,400. A maximum rate of over eighty-six miles an hour can be attained, the designer believes.

THOUSANDS OF QUAKES YEARLY BUT FEW PERIL MAN

As many as 30,000 earthquakes may occur yearly, but not more than thirty are what can be considered catastrophes so far as man is concerned, according to R. M. Wilson, of the geological survey. Sensitive seismographs show that the earth is almost constantly quaking and trembling somewhere, but hundreds of the disturbances are so

slight that they cannot be considered "earthquakes" in the accepted sense of the term, and fewer still possess sufficient intensity to cause great damage in centers of population. Just a few weeks ago, a severe quake was registered on instruments in various parts of the world. It was believed to have occurred somewhere under the ocean off Alaska. No damage was reported, hence the quake is not recorded as a catastrophe, although it was a severe shake. Between Sept. 1, 1924, and Aug. 31, 1926, 551 notable disasters in various places were tabulated in "The World's Health," recently published in Paris. The list included sixty-six earthquakes, four volcanic eruptions, nine avalanches and landslides, 197 floods, 148 cyclones, eight tidal waves, twenty-three droughts, forty-eight big fires, seventeen famines and thirty-one plagues of locusts.

DEFECTS IN SPEECH RECORDED TO AID PUBLIC SPEAKERS

Embryo orators and actors at the University of Southern California, have a means of studying the defects and good points of their own voices in an instru-



Speech Repeater in Use; Tones of the Voice Are Recorded and Amplified for Study of Defects

ment that registers the tones as they are spoken and repeats them as a phonograph does. It is essentially a combination recorder and repeater, and the voice is sufficiently amplified as it is rendered by the machine, so that a number of persons can hear it at one time in a classroom or other place. The volume may also be diminished to suit a smaller area.

LIMITLESS-SPEED HIGHWAY IS BUILT FOR SAFETY

What is claimed to be the fastest public highway in the world for motor vehicles has been developed in the vicinity of Milan, Italy, with such success during recent months that plans have been projected that call for the ultimate addition of many hundreds of miles of such highway. These are known as "autostrade." Believing that speed in itself is no serious hazard in modern motor-car travel, because of the high degree of mechanical reliability of these vehicles, the Italian highway builders have created roads leading to four divergent points, near Milan, on which



strade. All cars are checked on entering and leaving these highways. The control gates are in charge of watchmen who exact a moderate toll from users, note the number and name of the car and, of course, are in a position to exclude any drivers who may be, for some reason, incompetent. Because fast traffic is an impossibility through towns and villages, these new roads have been laid out to avoid all intermediate centers of population. In the year just passed, the average daily traffic on the thoroughfares amounted to about 2,000 cars, and the next extensions of the system that



One of the Concrete Bridges on the Bergamo Branch of the "Autostrada," and a Futuristic "Billboard" Figure: It Attracts Attention Even When Motorists Drive at High Speed

there are no speed restrictions. On these broad, smooth thoroughfares, motor cars travel from fifty to eighty miles an hour and the records show an almost negligible accident factor. The engineers have reduced the number of curves to a minimum and eliminated all grade crossings. Furthermore, the road is well protected by fences which shut out possible intruders. There are no abrupt grades in the auto-

are now contemplated will be similar roads to Brescia and Venice.

CIGARET LIGHTS ITSELF

Self-lighting cigarets have been introduced by an English dealer. A tiny disk, containing paper and an igniting material, is attached to their tips. Strike them against the packet and they are lighted.

CLOCKWORK IN SAFETY RAZOR MOVES BLADE SIDWAYS



Operating the Clockwork Razor in Which the Blade Moves Rapidly from Side to Side

Shaving with a safety razor recently introduced in England is somewhat like running a mower, for the blade oscillates from side to side instead of remaining stationary with respect to the holder. This is accomplished by a clockwork mechanism in the handle. The razor is said to be especially adapted to stubborn beards.

AIRPLANE TO FLY STRAIGHT UP THIRD OF A MILE A MINUTE

Realization of one of the fondest dreams of aviation is anticipated in a plane that, it is hoped, will be able to rise vertically at the rate of 1,900 feet a minute, make perpendicular descents in safety with the motors dead and thus permit landings in restricted areas. The ship is not a helicopter, engineers report, but is classed as a vertically rising airplane. So far, its possibilities have been judged wholly on the basis of wind-tunnel tests with a model of the plane. So convincing have these demonstrations proved, however, that a large aircraft company is reported to have voted \$75,000 for the construction of a full-sized ship from the model plans. The small unit employed in the tests had four wings, but it is expected that the big ship will have only three. They are to be in a horizontal plane and will rotate at a speed

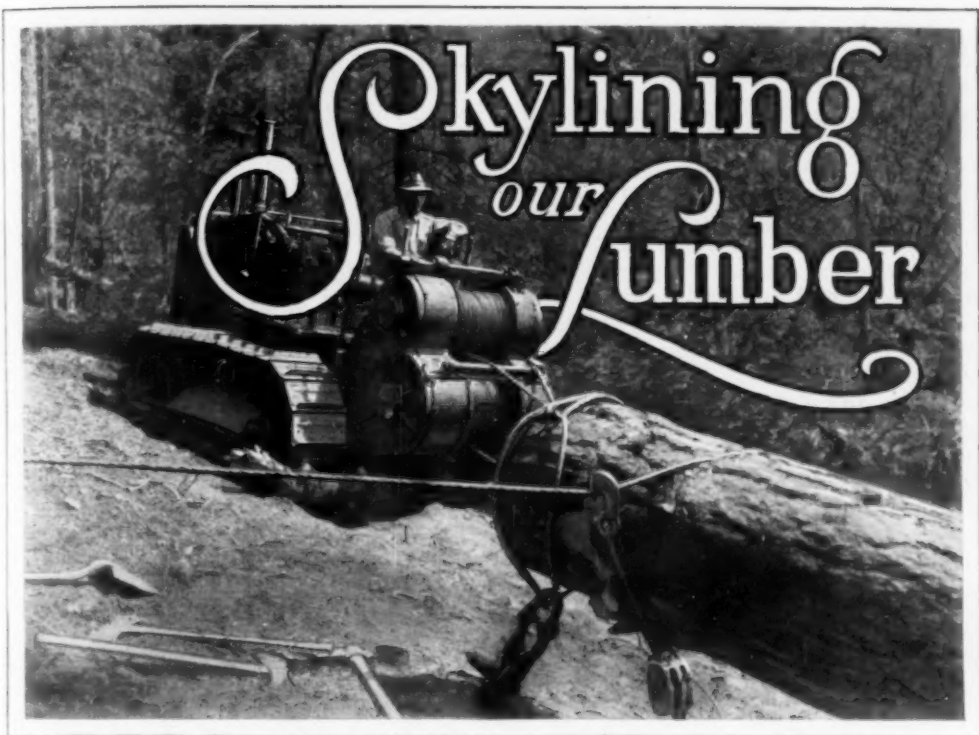
of 120 to 135 revolutions per minute. Each of the wings will have a thirty or thirty-five horsepower motor to turn it and will be mounted on a vertical shaft above the fuselage. There will be no propeller in front, the forward motion of the plane being attained simply by tipping it forward. This gives the wings a new angle, and since they are set for climbing, their revolutions will tend to send the plane ahead. Comparatively slow speeds will be made, from fifty to seventy miles an hour being all that is promised. As the ship comes down, the wings revolve, even if the motors are dead, creating a breaking drag against the force of gravity. This feature is expected to prove of great aid in forced landings, through fogs, for instance, or in alighting in confined spaces such as the tops of buildings or ship decks.

LIGHT SHINES AROUND CURVES FOR SAFER AUTO DRIVING

Hazards of driving the automobile at night are reduced by a special headlight so adjusted that a wide beam is projected to both sides of the road, without glare to approaching cars and with better illumination of the highway on curves. The lamp plainly shows the road before the driver turns. It is not intended to take the place of the regular spot or headlights, but for special service on winding roads.



Front and Rear Views of the Car Equipped with the Broad-Beam Light; Above, Illumination on Curves



Skylining *our* Lumber

Tractors Equipped with Winches and Steel Cable Handle Enormous Logs Which Would Have Taxed the Strength of Many Teams and an Entire Crew of Men a Few Years Ago

THE last of the great industries to abandon man power has been converted to machinery. Oil and gasoline engines, electric motors and the law of gravity, applied to the forests, have brought out more logs this year than men ever moved before, made of lumbering an organized industry, and left undamaged thousands of square miles of new-growth timber to replace that which men and mules and oxen had trampled into the slopes of our mountains.

An endless-tread tractor, tanklike, but equipped for peace instead of war, rolls into the forest, three men riding it. In the midst of the grove, the great machine halts, a portable saw is unloaded and placed against a towering pine, three feet thick at the base. Power is applied from the engines. In fifteen minutes the tree lies on its side. Again the saw is moved along the log, taking off the branches one at a time. Block and tackle, with a running pulley, is attached to the upper end. A pit is dug at the base. The tractor backs away, picking up the slack in a steel cable running from the top of the fallen trunk

to a winch on the front of the machine. The tree rises again, is guyed into place, and becomes what is known among the lumberjacks as a "spar tree."

From its top, or from the top of another high tree, a gang of men, with the aid of the tractor's winches, runs a steel cable to another tree, probably half a mile away down the hill. For a radius of 500 feet around the spar tree, the tractor and its portable saw cuts trees, as a man with a mower might cut wheat. As fast as one falls, it is trimmed and shot down the hill. With two tractors and six men, one California lumber company has cut and delivered, to the pond at the mill, 40,000 feet of lumber a day. Approximately thirty men with four or five ox or mule teams would have been required under the old man-power system, to get out that much timber in two days—instead of one.

When the logs arrive at the base of the mountain—for most of our forests are now on lofty mountainsides—it may be that the mill is still miles away. If there is a large stream, the logs are rolled into

it and floated down. But here, machinery has eliminated not only labor, but danger. If the logs jam, a cable from the tractor is thrown around the key log, and with sixty horsepower straining at the steel line, that particular timber is jerked out, and the jam freed. No longer do men with canthooks risk their lives amid the tumbling logs, and dynamite is no more needed to free the crossed timbers in the stream. If logs run wild, as they do in high water, sliding over the dam at the mill, the modern lumberjack, turned into an imitation cowboy, "ropes" them as they whirl in the stream, and the tractor does the rest, pulling them gently to the bank and snaking them back up to the mill.

Where there is no stream at the bottom of the aerial railway, several new mechanical means of getting the logs to the mill have been put into use this year. If a large area is to be logged, a single-track railroad is laid without much grading, and over it comes a train of great flat cars, pulled by what seems to be an interurban express car. As a matter of fact, it contains a Diesel engine, direct-connected to a generator, providing current for electric motors on the wheels. This is an entirely new factor in logging, which has been tried during the past year with great success. But, if a track cannot be laid to the base of the mountain, the tractor is called in again, and, by several methods, the logs are taken to the mill. First, there is the "bummer," a four-wheeled dolly, of which two are towed behind the tractor, a third of the log being raised up, also by tractor power, and rested on the bummer, while the remainder trails behind. Then there is the old and simple method of "snaking" the logs out, by means of chains attached to the tractor, as many as six or seven logs being handled in this manner in tandem by two men and tractor.



With the "Spar Tree" Set Up and Rigged, the Tractor Is Able to Handle All the Logs for 500 Feet Around, and Later Skyline Them to the Road or Railway



Skylining, Showing How the Aerial Tramway Works, and, Inset, a Huge Log Crossing a Ravine

More recently, "high-wheelers" have been applied, in which the log is picked up between the wheels of a two-wheeled skeleton trailer and towed by the tractor. This is particularly effective where there are many stumps or boulders, since the logs are carried high enough to clear such ground obstacles. In the swamps, where there is mud all the way out, floats or skids, made on the ground from smaller logs, are towed out by tractor. Even the donkey engine, which in some lumber camps superseded the team, in turn has been virtually put out of business by the portable power plant, with its winches filled with steel cable, and its ability to move itself anywhere. Fire danger from the old-time "donk" also is removed. Other mills, in Montana and California, similarly situated on the downhill sides of their forests, use chutes or flumes. Running sixty miles from mountain mill to railroad, in California is the longest lumber flume in the world. It handles cut timbers by a stream of water, the lumber being halted at any loading station by ropes and snubbing posts.

One large lumber company has now in process of construction, at a cost of \$250,000, an incline railroad down one side of a deep gorge and up the other, to be operated by electricity. This installation

will make available approximately half a billion feet of lumber, sufficient to occupy this mill for the next eighteen years. The distance is about ten miles. One 200,000-pound electric hoist will drop the lumber-laden cars into the canyon, where another similar hoist will lift them out. The cars will slide down and climb out at a virtually uniform speed of 600 feet a minute.

Lumbermen agree that profit in their in-



Two Views of a Sixty-Mile Flume, Built at a Cost of \$3,000 a Mile, to Carry Lumber from a California Sawmill to the Railroad

dustry depends on three factors: first, getting the fallen tree to the mill at the lowest possible cost; second, with speed that will increase volume, and, third, with least possible damage to standing growth and young timber. The first two have been supplied by the new mechanical devices. The third is being materially helped by the elimination of large numbers of men working in gangs, the removal of long teams of mules or oxen, and the complete stoppage of sparks and other fire hazards by the use of oil and gasoline engines and electric motors.

But these mechanical devices have not taken all the adventure out of the life of the lumberjack. Half a million feet of logs recently escaped from a main boom at Merced Falls, Calif., during a sudden rise in the river and jammed against an irrigation dam three miles down the stream. There was no way to get these

logs back by ordinary methods, since the stream was too swift for navigation. There was danger of damage to the irrigation dam, and for this reason the time-worn use of dynamite to break the jam was impossible. A tractor, with winch and steel cable, was called in, the logs snaked out one at a time, and then picked up by high-wheelers and carried back to the mill at comparatively small cost. Three men rescued all the logs, a job 100 men working under old-time methods of logging could not have accomplished.

TONGS TO REMOVE CLINKERS SAVE COAL AND DIRT

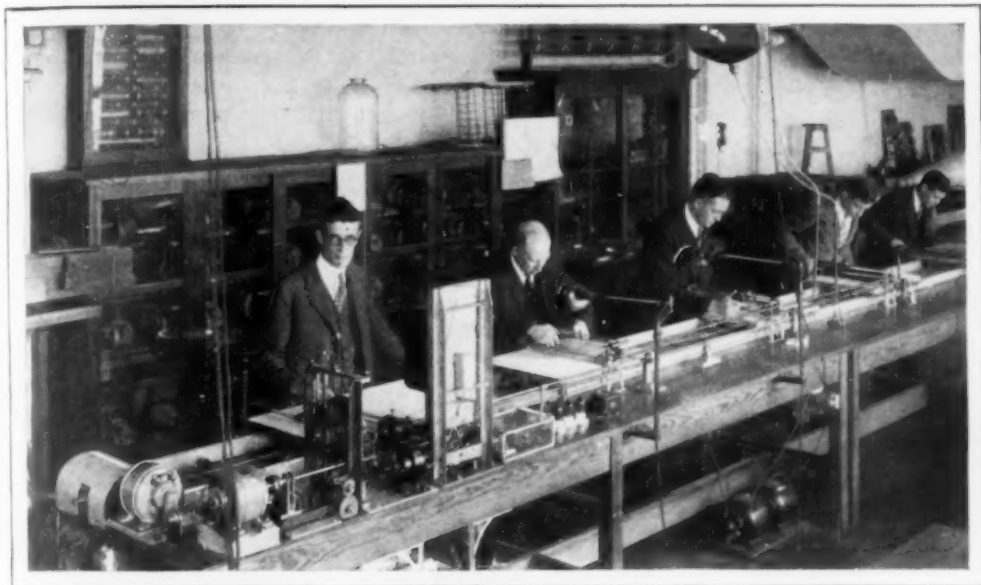
Clinkers are easily removed from the furnace, without useless shaking of the grates and breaking up of the fire, with a special pair of tongs now on the market. Sharp prongs and a powerful

gripper, operated by a lever, afford a convenient and efficient tool for getting hold of the most stubborn piece.



Gripping Tongs That Clutch the Stubborn Clinker, to Effect Its Removal without Shaking the Grates

MACHINE SOLVES PROBLEMS TOO DEEP FOR BRAIN



Where Answers to Profound Problems Are Ground Out by Machinery; the Electric "Brain" in Operation; It Is Described as an "Adding Machine Carried to an Extreme Design"

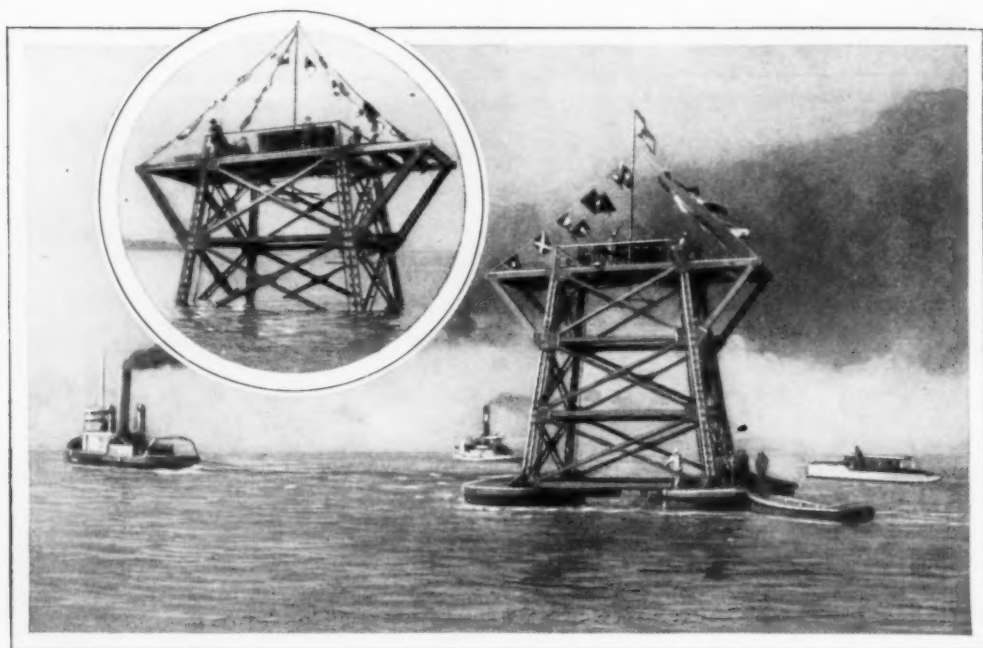
Answers to mathematical problems, too complex for the human brain to master, are ground out with ease on an electrical instrument devised by eastern engineers. Given the conditions of the problem, it writes out the answer as efficiently as another machine takes in lumber and chemicals and produces finished boxes of matches, the authorities report. It is called the "Product Integraph." Dr. Vannevar Bush, of the Massachusetts Institute of Technology, one of its makers, says that it might be classed "as an adding machine carried to an extreme design. Where workers in the business world are ordinarily satisfied with addition, subtraction, multiplication and division of numbers, the engineer deals with curves and graphs which represent for him the past, present

and future of the things in which he deals." The machine works especially in this field of graphs and curves. It is virtually a man-made brain which transcends human reasoning and readily plots the answer to some classes of problems that cannot now be solved by formal mathematics.

ARTIST WHO MODELS IN GLASS
PRODUCES NOVEL EFFECTS

Interpreting Nature in Glass; at the Right Is a Tiny Tree of Delicate Design

Choosing glass as a medium of expression, an eastern artist has produced a wide variety of creations rivaling those of the foreign glass blowers and showing new possibilities in the material as a decorative substance. Tiny fir trees with the delicate needles reproduced in glass are among the objects which he has made



Preparing to Lower the Caissons for the Submarine Tunnel That Will Link Japanese Cities; the Passage Will Be Ten Miles Long and Will Supplement Ferry Service

TEN-MILE TUNNEL UNDER SEA TO LINK JAPANESE ISLANDS

An engineering task, rivaling anything of its kind in the world, is under way in Japan, where builders are at work on a ten-mile tunnel that will connect the cities of Moji and Shimonoseki, now linked by ferries and boats that ply between the islands. In places, the water line of the tunnel will be eighty feet below the sea bed, and difficulties, such as soft strata and other obstacles, are being encountered.

ENGINE BURNS OIL AND WATER FOR CHEAPER POWER

Oil, water and air are mixed and burned to run an engine developed by a western inventor for the cheaper production of electric power and for many other purposes. An essential unit of the apparatus is said to be a springless mushroom valve that works successfully under the 5,000 pounds' pressure required to prepare the proper emulsion for combustion. The mixture is also suitable for fuel in home-heating plants. The engine employed by the inventor to demonstrate the performance of the fuel was a one-cylinder, ten-

horsepower unit of an old model. A low grade of oil, air and water were pumped in and compressed to 5,000 pounds in a small steel cylinder. The engine was first started with gasoline and the mixture cut in later. The exhaust from the emulsified fuel was free of carbon and noxious fumes, and was cool, according to reports.

BASKET BALL WITHOUT LACING TO IMPROVE GAME



Absence of lacing, and a side valve for inflating it, are features of a basket ball introduced this season. The bladder is at-

tached inside and air introduced through a valve screwed into an opening in the cover. When the valve is removed for playing, a little rubber flap closes the hole. The slit through which the bladder is put in, is sewed up, making a smooth surface, and the stitches do not have to be undone except to remove the bladder and put in a new one.

AERIAL MAPS CUT CITY TAXES

Using aerial maps to locate tax dodgers has proved successful in five Connecticut towns, according to the department of commerce. In Middletown, the first to have an aerial photographic survey made, 1,896 buildings which were not on the tax lists were disclosed by the map. Seventy-nine stores located on Main street alone were in the list. As a result of the survey, which cost \$4,000, the Middletown tax list was raised from \$20,500,000 to \$31,500,000 and the tax rate reduced from thirty mills to twenty-four mills. Rocky Hill, Conn., increased its tax list from \$1,500,000 to \$4,000,000 by locating buildings which had escaped taxation, and as a result lowered the tax rate from twenty-two to eight and a quarter mills.

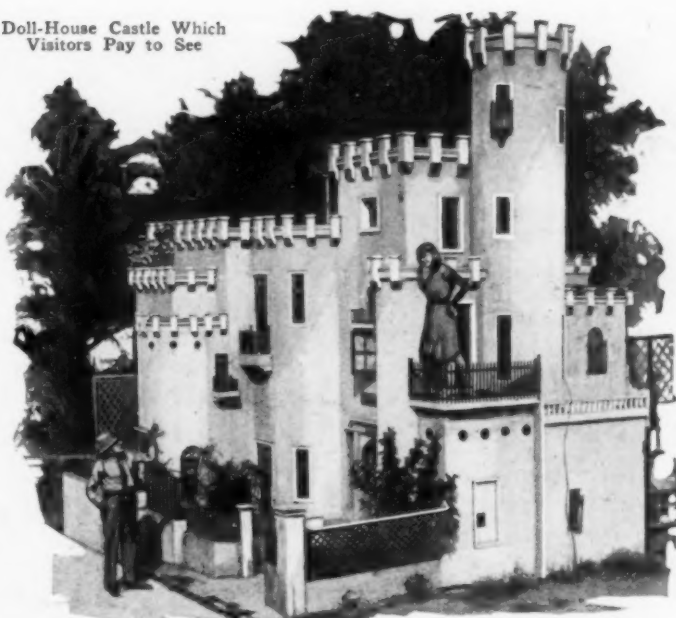
AUTO BED THAT DISAPPEARS ADDS COMFORT TO TOURS

Entirely concealed when not in use, and easily extended, a folding automobile bed invented by a southern man is hidden under the rear-seat cushion, when closed, and pulls out over the front seats. It has comfortable springs and keeps the bedding shielded from dust.



When Not in Use, This Bed for the Auto Tourist Folds Up under the Rear-Seat Cushions

Doll-House Castle Which Visitors Pay to See

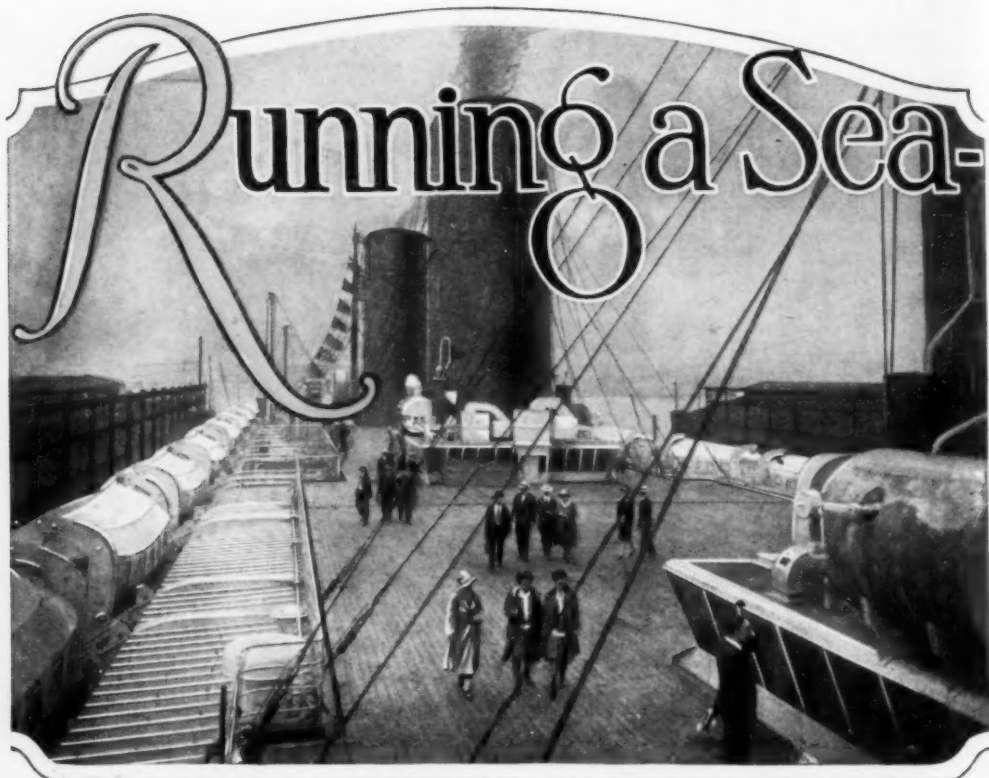


MINIATURE CASTLE DOLL HOUSE ATTRACTS CROWDS

Built in one summer as the result of a hobby for model construction, a miniature doll house in the form of a castle is proving a source of revenue for its owner, a California man. He charges admission for inspection of the curious three-story abode, and visitors gain access by stooping low under the doorways and squeezing through sidewise. The house was built after he had seen a similar model owned by a friend.

LAUNDRY USES STEEL BOXES TO COLLECT PACKAGES

Steel collection boxes, resembling the large-size parcel boxes of the post office department, are used by a Nebraska laundry to collect the bundles of its patrons. The boxes are scattered through the city on private property, usually a corner occupied by a gasoline-filling station. They attract laundry customers to the filling stations, and make it convenient for them to deliver their laundry while getting gas service. The laundry-collection wagons make regular rounds, and the finished work is then delivered direct to the customers' homes.



Just a Portion of the Broad Sports Field and Promenade Grounds Furnished by the Boat Deck of a Modern Liner; Here Tennis and Other Games Can Be Played at Sea

EATING your way across the Atlantic is a far different matter now from the days of clipper ships. There is no mention of salt beef or hardtack in the neat menus found in the modern steamship dining rooms.

Modern refrigeration changed the entire plan of catering on ocean liners. The passengers of these days can be served anything they desire in the way of fresh salads, eggs, milk, fruit and vegetables.

The refrigerating plants of the large ships are as big as good-sized city apartments. Each room is set aside for a particular kind of food, so that the chefs never have the unfortunate experience of the housewife who finds that her butter tastes a bit like salmon. On a ship there is at least one room for vegetables, one for butter, one for fish, one for beer and several for wine on European liners.

Catering on shipboard smacks of a science in its exactness, and like the sciences, it is careful with figures. The

stewards have estimated the number of ounces of food required for each passenger on a voyage, and they know the cost of serving meals within a quarter of a cent a meal.

The food served on the liners is bought by the purchasing departments of the companies which own them, in most cases under the supervision of former chief stewards. The ships of American registry buy a large proportion of their supplies on this side, but foreign ships buy their staples abroad and try to confine their buying in this country to fresh supplies. Despite this rule, one line, in which most of the ships are of foreign registry, bought \$2,000,000 worth of food in New York last year.

America excels so much in some foods, the stewards say, that even foreign lines buy these foods in New York for both east and west-bound passages. These foods are beef, coffee and several fruits, including grapefruit and oranges.

Going Hotel



The Dream of Liner Architects and Decorators Is to Simulate a Land Hotel and Hide All Evidences of the Sea; This Main Dining Room of the "Ile de France" Achieves That End



The stewards say that the earmark of the American passenger is his insistence on grapefruit for breakfast. After the grapefruit he wants a cereal and then eggs, perhaps with bacon or ham, and toast and coffee. The Englishman is more likely to ask for a grilled bloater, ham or a rasher of bacon, a couple of fried eggs and oceans of tea. The stewards have to provide for every national taste in their international bills of fare.

Some standbys, such as roasts of beef, turkey, chicken and lamb, boiled potatoes, carrots, peas, turnips, string beans and cold meats, are on every menu. On most ships cold meats are a feature on sailing day; a table heaped with decorated cold meats is placed in the dining room. The average menu for dinner in the dining room includes soup, fish (small portions of each of these), an entree, a roast, a salad, sweets, coffee and cheese.

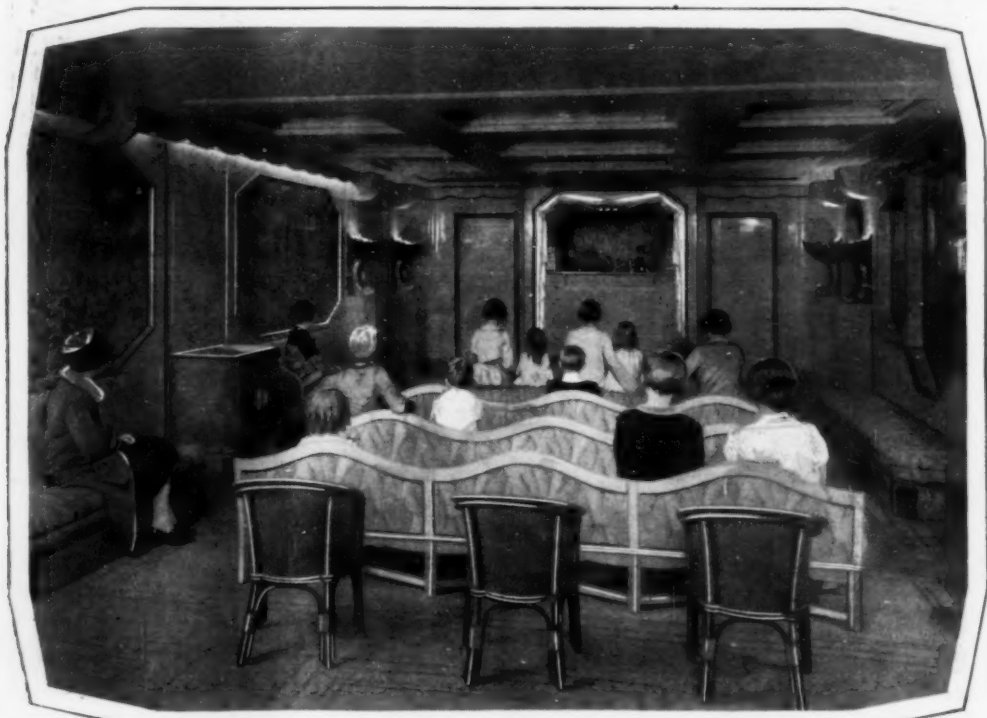
Most of the largest ships, for instance the "Majestic" and "Olympic," carry French restaurants. The meals in the dining room are paid for by every passenger

when he buys his ticket, but some prefer to eat in the French restaurant, which costs them an average of \$10 a day each. Those who prefer the restaurant are principally the society people on board and those who ape society's manners.

Those who eat in the dining room have breakfast between eight and ten o'clock. The lady who has her meals in the French restaurant is likely to order coffee and rolls in her room about 10 a. m. She comes to the restaurant for her first meal at 12:30 or 1 p. m. At 8 p. m. she has an elaborate dinner, remaining at the table for a couple of hours.

She will order delicacies, such as artichokes, braised chicory, salads of tender young vegetables, romaine, hearts of lettuce, snails, plover's eggs in jelly, steak Chateaubriand, which is a steak cooked between two steaks, a great variety of shellfish, pheasant and grouse.

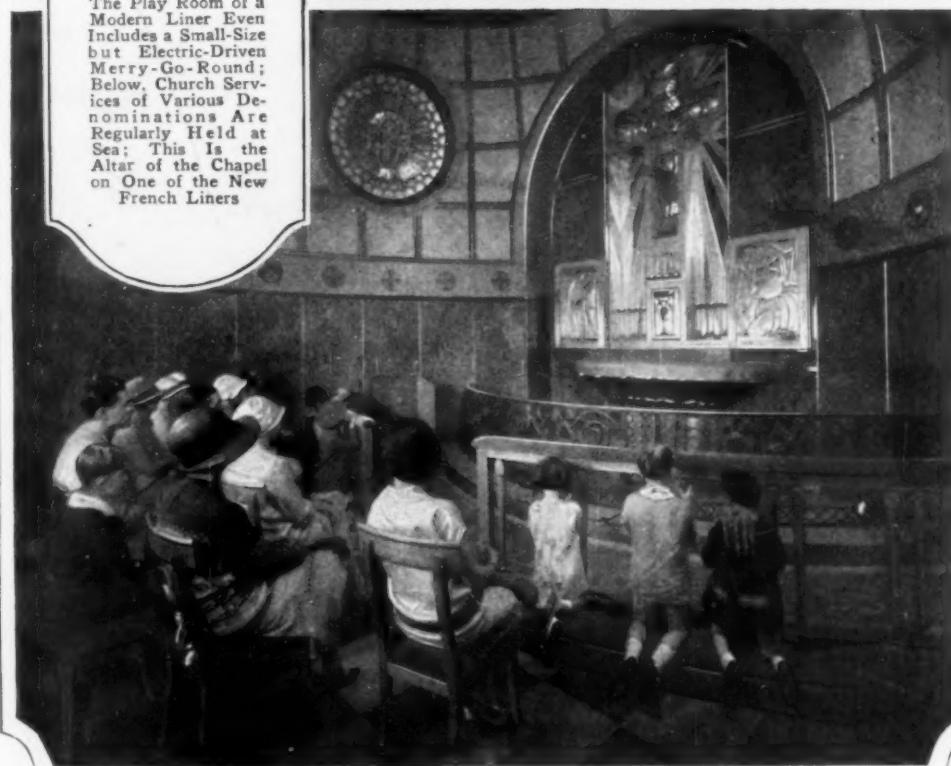
The waiters in the dining room on English ships are English, in the restaurant, French or Italian. These waiters, or rather stewards, are paid about forty-five



The Punch and Judy Show Has Almost Disappeared in the United States. But the French Liners Have Provided the Immortal Manikins to Entertain Children, and Grown-Ups, Too



The Play Room of a Modern Liner Even Includes a Small-Size but Electric-Driven Merry-Go-Round; Below, Church Services of Various Denominations Are Regularly Held at Sea; This Is the Altar of the Chapel on One of the New French Liners



dollars a month, in addition to their board. The normal tip for a dining-room steward is from five to ten dollars a passenger for a voyage. A steward will collect from thirty to sixty dollars a voyage in tips. He will average about one round trip a month, working three weeks and staying ashore one.

The smoking-room stewards make more in tips than the dining-room men. The chief steward of a ship is not tipped but the second steward finds nothing in tradition to keep him from taking everything that is offered. It is not unusual for a second steward to receive a tip of as much as \$100 from a wealthy passenger. The chief steward often makes more in round-about ways. He may receive advice on investments, from some financier whom he has served on many voyages, that will be worth more to him than all the tips received on a voyage by all the men who are under him.

Americans, the stewards say, have a great liking for sweets. All the ships carry pastry cooks and confectioners, compe-

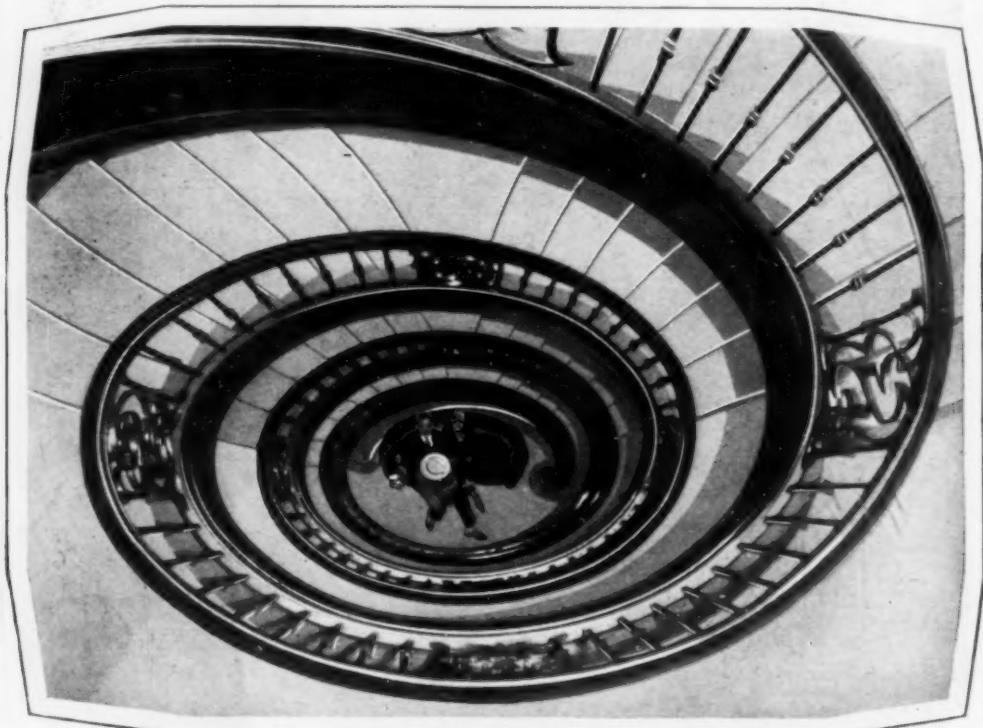
tent and well-paid men. One of the most important jobs of the confectioner is to make fancy birthday cakes for passengers who have birthdays on the Atlantic.

A good chef is paid at least \$5,000 a year. The chef on the "Majestic" has under him seventy cooks, including a first, second and third meat cook, a first, second and third fish cook, etc. They cater to the tastes of passengers, who eat much more than they do on shore. The stimulation of salt air and other factors of ship life whet the appetite.

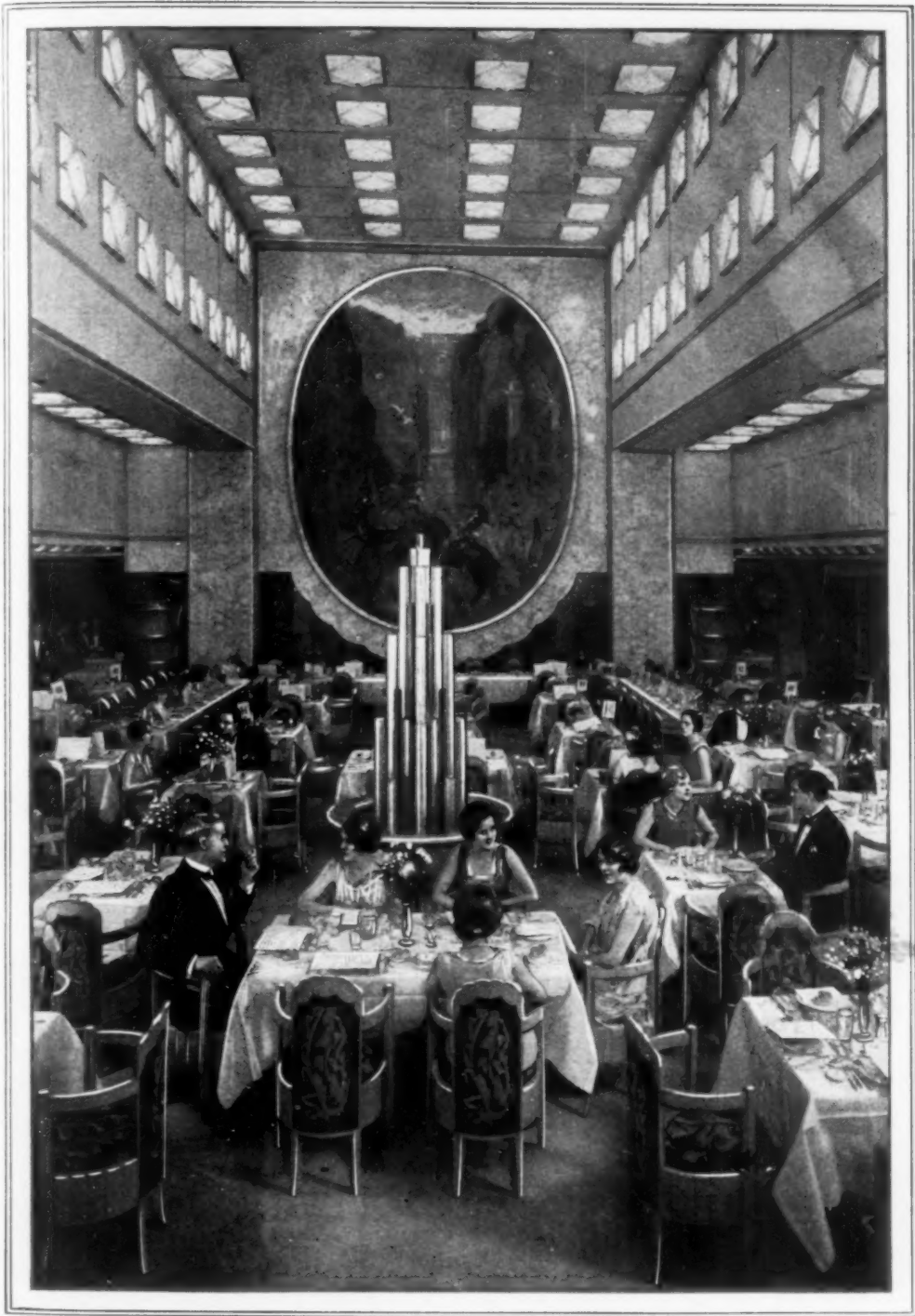
The stewards insist that few passengers miss meals because of seasickness, on the largest ships, and say that they expect and prepare for every passenger on the ship's list at every meal. On exceptionally rough voyages in the winter, however, there are many vacant chairs.

A housekeeper would be staggered by the job of caring for the kitchen and dining-room equipment on the "Majestic."

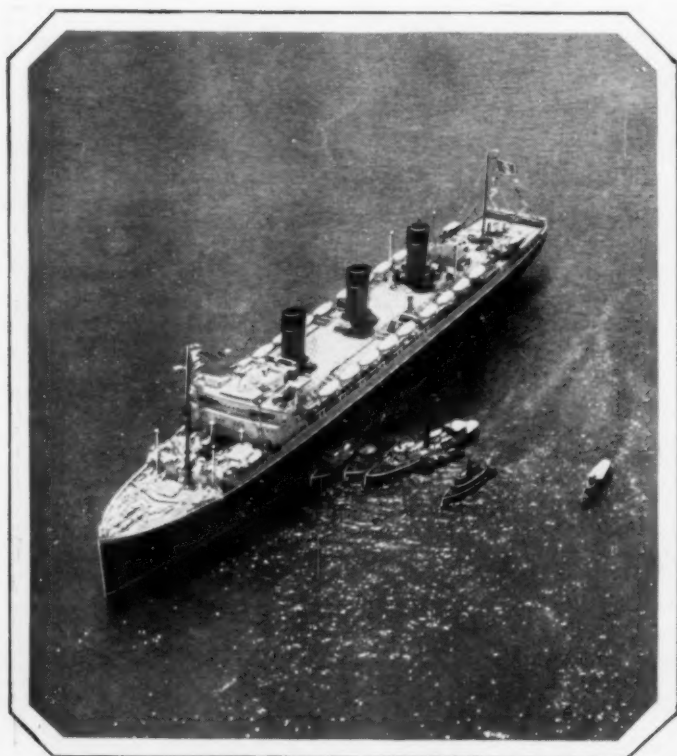
There are seventy-five tons of dishes and cooking utensils and more than three tons of silverware and cutlery.



What Is It? Just a View, Looking Downward, of the Circular Stairway of a New Liner, Built to Descend Many Decks into the Depths of the Ship, and Yet Save Room



It Is Hard to Imagine, When Dining in This Luxurious Room, That One Is at Sea on the Stormy North Atlantic, for There Is No Hint of Sea in Room or Decorations



The "Ile de France" on Her Maiden Trip; Although Not So Large as Many American and English Liners, She Is One of the Most Luxurious

The steward has in his charge more than 10,000 tablecloths, 45,000 napkins and 5,000 aprons for the use of the cooks, stewards and stewardesses.

If the napkins were hung on a single line, side by side, the line would have to be seventeen miles long, and the tablecloths would occupy a line nineteen miles long.

If the ship's linen, including the bedroom linen, could be hung on a line at the rate of six pieces a minute on the basis of an eight-hour day and five-and-a-half-day week, it would take twelve weeks to complete the job.

There are 80,000 pieces of china and crockery carried by the ship, including 30,000 plates, 16,000 cups, 13,000 saucers, 10,000 cooking dishes, 2,700 pitchers and 2,400 tea and coffee pots. Glassware totals 29,000 pieces, including 8,000 tumblers, 7,000 wine and spirit glasses (one notes that water seems to be more popular than wine), 7,000 salt, pepper and mustard containers and 1,600 water bottles.

Food by the ton and by the carload is

needed to stock the "Majestic" for a round-trip voyage over the Atlantic.

The ship can carry a total of 4,100 passengers and has a crew of about 1,000. To feed these 5,100 people for a single round trip, the ship's refrigerators are stocked with seventy-five tons of meats in addition to ten tons of ham and bacon, twenty-eight tons of fish and about eighteen tons of poultry.

The vegetables served with these meats will include thirty tons of potatoes, seven tons of carrots and turnips, ten tons of cabbage, several tons of onions and half a ton of hot-house tomatoes.

Stores for a voyage include 1,000 each of plover, quail, snipe and pheasant, 750 each of partridge and grouse and 500 wild ducks, a total of 6,000 game birds.

The chef has for his menus 600 boxes of apples, 400 boxes of oranges and grapefruit, sixty boxes of pears and a ton of hot-house grapes. To prepare his desserts he has a ton of American ice cream, and has three tons of jams and marmalades.

The baker has for his ovens thirty-five tons of flour. The list of supplies includes eight tons of sugar, five tons of butter, three tons of coffee and tea, 80,000 eggs and 500 gallons of milk.

Smokers on board need not fear lacking cigarettes. They are consuming a supply of 250,000 cigarettes and 2,240 pounds of tobacco on a voyage, which ought to be enough for any reasonable group.

GIANT NUGGET KEPT BY BANK AS GOLD RESERVE

Weighing more than eighty ounces and valued at \$1,408, a gold nugget forms part of the reserve for a national bank in Baker, Oreg. It is one of the largest nuggets ever found and was mined near by.

VOLCANO MODEL IS FEATURE OF EXHIBIT

Although Mt. Lassen, California's active volcano, is more than 10,000 feet high, it was graphically portrayed to visitors at an exhibition in San Francisco in a model, fifty-four feet high and with a base 300 feet long. The contours of the peak were faithfully reproduced and trees were placed about the model in such a way that, from a distance, it could hardly be distinguished from the real mountain.

COTTON RIVAL SEEN IN ANCIENT PLANT

Ramie plants, the fibrous stalks of which were used to clothe the Egyptian kings and to weave fabric coverings for their mummies, are being cultivated in California today. In the opinion of one grower, the crop holds great promise for the future as a source of textile material that can be used instead of cotton. An apparatus has been devised for cleaning it in large quantities and at little cost.



Cultivating the Ramie Plants; Growers Believe That the Fibers May Be Used as Cotton Substitutes



The Fire-Escape Slide for Outdoor Playground Gives a Much Longer and Faster Coast

FIRE ESCAPE AS CHILD'S SLIDE GIVES HEALTHFUL SPORT

One of the most popular units on an outdoor playground is an old fire-escape chute that has been converted into a slide for the children. It is securely attached to a substantial scaffold, and a flight of stairs leads to the entrance. Being higher than the average slide, it affords more thrill.

FORTY THOUSAND GLASS EYES USED IN U. S. YEARLY

The United States imports 40,000 glass eyes annually, according to official reports. Many of them are works of art and so closely resemble the natural organs that they can hardly be distinguished from them. Safety experts are recommending the universal wearing of goggles by industrial workers, pointing out that hardly any occupation can be considered entirely non-hazardous with respect to the eyes.

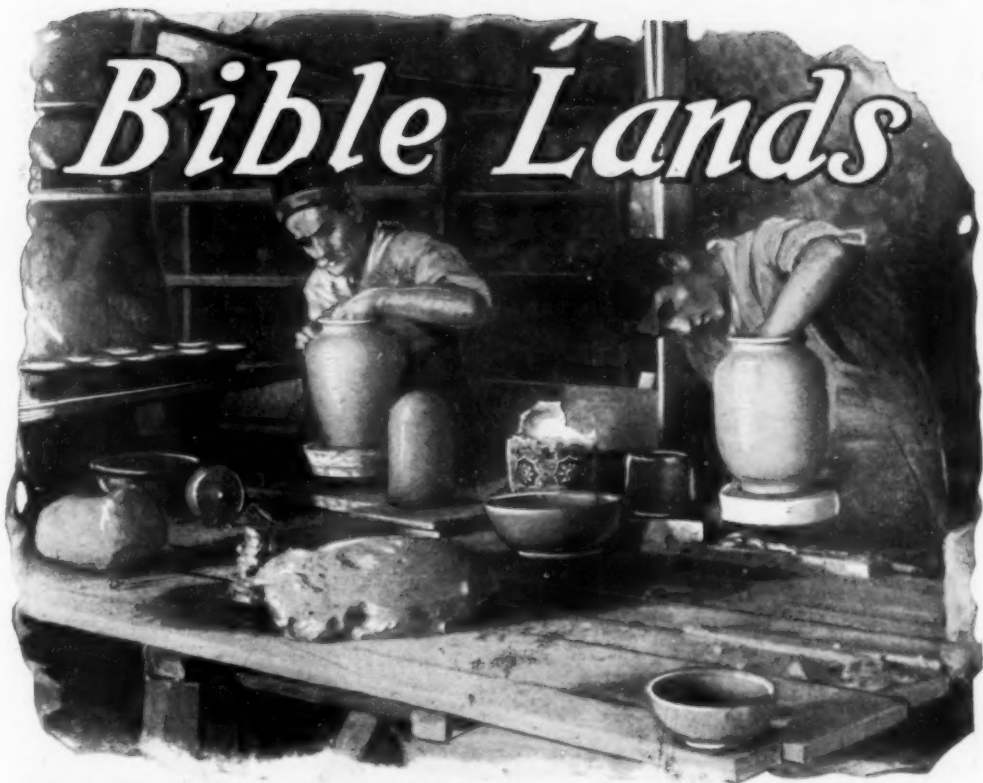
Digging Up the



Shepherds in Flowing Robes Still Guard Their Flocks by Night in Palestine, Just as They Did More Than 1,900 Years Ago When They Saw the Star over Bethlehem



Bible Lands



Workmen Who Are Reviving the Famous Faience Works in Jerusalem; They Shape Their Jars on the Potter's Wheel, One of the Oldest Pieces of Machinery in Existence

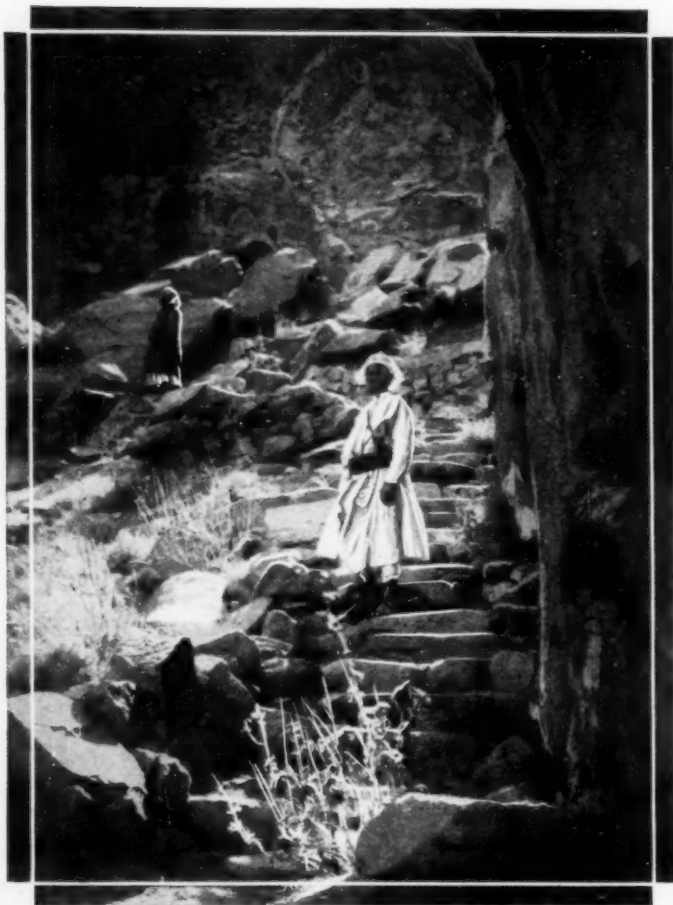
By HAROLD J. SHEPSTONE, F. R. G. S.

PALESTINE is at present the scene of an intense campaign of excavation. There are no fewer than eleven different expeditions in the field, representing seven different nations. Great Britain, America, France, Italy, Denmark, Germany and Austria.

Under the Turks, excavation work in Palestine was not only costly, but the restrictions imposed were very irritating. Today, under the British, every encouragement is being given to a scientific exploration of the mounds and sites which are known to mark places of historic interest. Furthermore, valuable work is being undertaken in preserving the existing ruins. One feature of this work is the reconstruction of an ancient synagogue at Capernaum, believed to be the very one in which Christ taught.

Jerusalem itself has been the scene of much activity during the past few months.

On the site of Ophel, to the south of the present walls of the city, excavations have been made to the ancient level, and a part of the wall that inclosed the ancient Jebusite city has been discovered. It is built in the slanting manner, each course of stones being farther in than the one below it. This is the same kind of Canaanitish fortification as has been found at ancient Jericho. The Canaanitish wall continues southward, but just next to the bastion is seen a corner tower of a very different type, built of larger stones and better masonry. This is Davidic work, and, as it intervenes in the gap in the Canaanitish wall, is thought to be the "breach," which David is recorded to have built up, and may be the "Millo" which is often mentioned in the Old Testament, and which actually means a "filling up." To the east of this, there is a wall of a later period, which lies outside of the



Steps That Were Carefully Matched from Natural Rock, in Biblical Time, Still Render Good Service in Palestine

Canaanitish rampart. It is virtually the finest of all and is attributed to Hezekiah. It has been suggested that it was between these two walls that Zedekiah and his men escaped when the city was besieged by Nebuchadnezzar.

Interesting also is the work which has been carried out by the Jewish Palestine exploration society in uncovering the foundations of the third, or northernmost wall of Jerusalem, built by Agrippa I, grandson of Herod. The next task will be to discover a connection between the third wall and the line of the second wall, which inclosed the city in the days of Christ. If the course of the latter wall could be ascertained, it would at once settle the vexed question as to whether the Church of the Holy Sepulcher, which marks the alleged site of the Crucifixion

and Burial, lay outside the city or not.

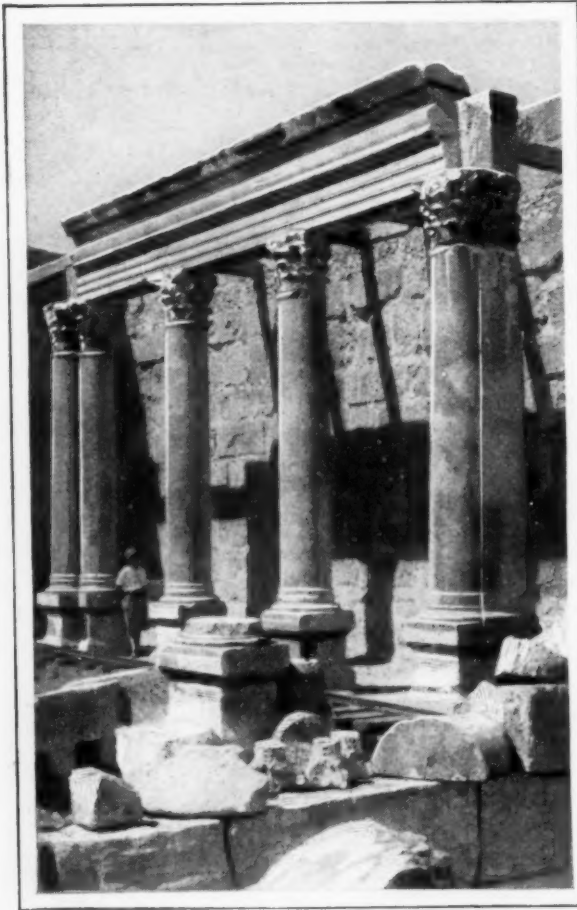
Mention should also be made of the recent find in Solomon's Quarries, those huge subterranean caverns close to the Damascus gate, from which it is thought Solomon obtained his stone for the erection of the Temple. Here has been found a wall which experts believe was a hiding place used by the Jews during the siege of the city by Titus in 70 A. D. There are signs of places for self-defense, as if the refugees who were hiding had fortified themselves against the besiegers.

In actual field work the American universities are taking a leading part and are carrying out valuable excavations at Kirjath Sepher and Mizpeh, as well as at Bethshan.

Ever since the discoveries in Babylon and the Hittite country of clay tablets, hopes have been entertained that in Palestine similar finds may come to light. The site that especially attracted attention was Kirjath Sepher, for the name implies the "town of books," or library. It is referred to in Joshua in connection with the story of Caleb, one of the two spies who brought a good report of the land. But no one knew for certain where the ancient city stood. Dr. W. F. Albright, of the American school of archaeology in Jerusalem, was successful in locating it some fifteen miles to the southwest of Hebron.

Here he has been toiling with most interesting results. He has laid bare a portion of the old city wall and two well-preserved gates, practically the first of the early Israelitic period yet found in Palestine. The sloping walls, which varied from ten to twelve feet thick, and probably towered thirty feet in height, not only date





Rebuilding the Pillars of the Synagogue at Capernaum in Which Christ Preached

back to the Canaanite period, but resemble those found at Jerusalem and Jericho. The buildings were evidently made of white, compact, sun-dried bricks, such as have not been met before. A couple of hundred pottery vessels of various shapes and sizes were found, as well as weavers' weights of clay, dyeing vessels, pestles, mortars and sling stones. A shaft sunk on the site, reaching down to the level of the base of the wall where it was laid bare, seems to indicate that there were five periods of occupation, each followed by the burning of the city. The third, fourth and fifth destructions were probably the work of Othniel, Caleb's nephew; Shishak, king of Egypt, in the time of Solomon; and Nebuchadnezzar of Babylon. So far, however, the search has failed to reveal

the existence of any clay tablets. Some seven miles to the north of Jerusalem, not far from Ramallah, Dr. W. F. Bade, of the University of California, has been digging over the site of ancient Mizpeh. It is known from the sacred narrative that Mizpeh was a strongly fortified position, and it was here that Samuel judged Israel for twenty years. Quite early in the work a city wall was struck, so massive as to alter all preconceived notions of the strength of ancient fortified cities in Palestine. The wall averaged sixteen feet in thickness and this width is considerably increased at points where towers and citadels formed part of the ramparts. This defensive structure is undoubtedly of the Bronze Age and was erected long before the Hebrew occupation of Palestine. A number of silos, or grain bins, were also discovered as well as ancient cave tombs, from which many pieces of pottery were taken.

Excavations are to be resumed at Bethshan, or Beisan, in Galilee. In 1925, an American expedition dug over the site when the two temples of the Philistines mentioned in the First Book of Chronicles, in one of which the armor of Saul was placed and in the other his head,

were found. The finds then made have now been examined and the report makes most interesting reading. Beisan and the surrounding districts are replete with Biblical associations. On one side of the fertile and picturesque valley in which the city reposed, rise the mountains of Gilboa, on which Saul took his life, and on the other side the lower slopes of Little Hermon. Near by is Jezreel, where Jezebel lived, and also Endor, where Saul consulted the witch. Along the roadway through the valley here the Philistines brought the headless body of Saul and his two sons, and here came the bloody chariot of Ahab bearing his lifeless body to Samaria. All that remains of Beisan today is a large mound, 200 feet in height, which covers the ruins of several cities.



Mother-of-Pearl Workers in Bethlehem, Above, and Workmen Removing the Tombstone of the Crusader Knight, Sir Philip d'Auligny, near the Church of the Holy Sepulcher



Armenian Girls Decorating Faience Vases in a Factory on the Reputed Site of Pontius Pilate's House, Above, and, at Left, Carving of a Quaint Structure on Wheels, Believed to Represent the Ark of the Covenant, Found in the Ruins of Capernaum

MILLIONS SPENT ON CURVES THAT FOOL THE EYE



Straight Dotted Lines, Above, Show the Amount of Curve in Two Walls of the Philadelphia Art Museum; Below Is a View of the Vast Building as It Appears from a Distance

A vast stone building, to be used as an art museum, costing \$11,000,000 and spreading over a hilltop in Philadelphia, is nearing completion—without a single straight line in it. Every wall bows in or bulges out, the roof has an artful hump, and the massive columns of the porticoes lean at the top toward each other and also toward the building. Yet so carefully

out of the straight and plumb has each piece of stone been cut and fitted that, to the eye, the building is perfect, whereas if it really were as straight as it seems, the eye would be convinced that the columns were too thin in the middle, that the roof sagged and the walls were bent. There are forty great stone columns, each eighty feet high, in the porticoes. Each column

leans about four inches, so that straight lines drawn upward through their centers would all meet about two and a half miles in the air. Walls 125 feet in length, vary as much as five inches at the point of greatest curvature, and even the terracotta roof is built concave to register on the eye as a straight line against the horizon. The late Prof. W. H. Goodyear, of Brooklyn institute, worked out the corrections to the building, and from his figures a scale model was first built. The separate parts were so crooked, it seemed impossible they could be hidden, but when they were all assembled the curves could only be detected by one who knew where to find them.

LATHER BULB REPLACES BRUSH TO SIMPLIFY SHAVING

Instead of a brush, a rubber bulb and spout that produce lather for shaving, have been introduced for greater convenience and cleanliness. The lather may be applied directly from the spout to the face or squeezed into the hand and rubbed in with the fingers. Dangers of infection from unclean brushes are practically eliminated with this outfit, which is also said to save time and do away with the need of carrying an extra package of soap.



Close View of the Lather-Bulb Outfit, and, Below, the Bulb in Use



Riding the Inclined "Ducking Wheel": Many Persons Can Enjoy It at One Time, and Contests May Be Staged upon It

SPINNING WHEEL FOR BATHERS ADDS TO BEACH SPORT

Amusement and healthful exercise are afforded bathers in a targetlike wheel, set at an angle on a platform near the shore. By crowding one side of the wheel, the other one is spun upward, throwing persons clinging there into the water. As the outfit is adaptable to shallow beaches, it is safe and easily rigged. The wheel itself is about twenty feet in diameter and is strongly constructed.

AUTOMATIC RUDDERS ON PLANE INCREASE FLYING SAFETY

To keep airplanes on an even keel and help prevent accidents, a German inventor has introduced an automatic steering-gear arrangement which is said to have proved efficient in actual tests. It consists chiefly of a rapidly rotating top to control a vertical rudder, a lead weight and a mercury pendulum of special construction to govern the other controls. The rig is said to be easily fitted to any machine and functions by causing a motor to correct the steering to compensate for any departure from the course decided upon.

☛ Approximately 20,000 kinds of beetles are found in North America.



Street of the City of the Future, with the Arches of a Vast Suspension Bridge, Such as Has Been Started across the Hudson to Link New York and New Jersey, in the Background

Have Skyscrapers Reached Their Limits?

The Higher Up They Go the Deeper Down the Foundation
and Sometimes There Is No Bottom

By UTHAI VINCENT WILCOX

HAS the skyscraper reached its limit? Is the tall building becoming impossible for human beings to inhabit?

There is some evidence to indicate that American cities are about to call a halt on these tall structures that reach into the clouds and down into the earth.

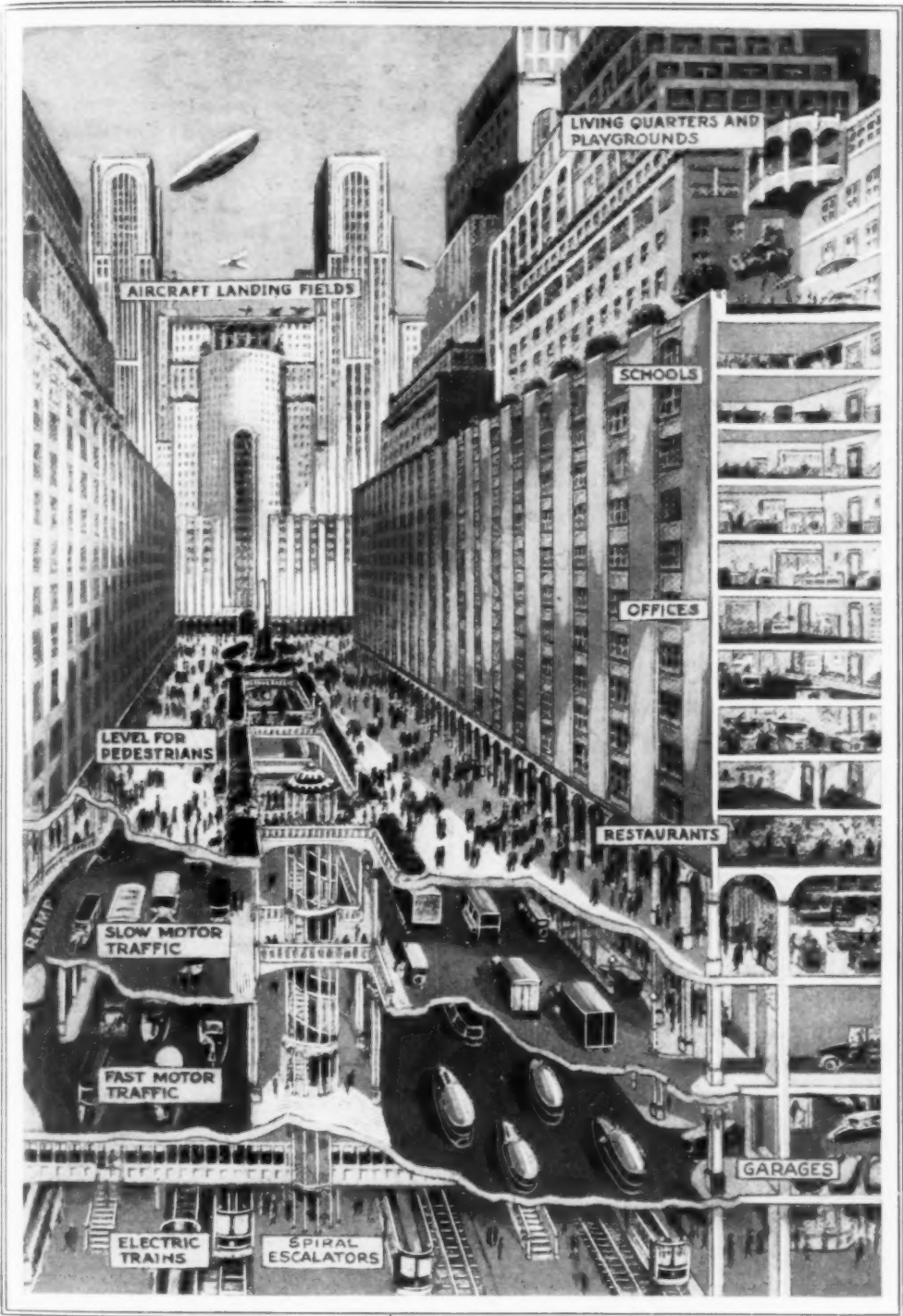
Even the physical limits are being approached. The higher the building, the deeper the foundation must go. That is understood, of course. But it is not always so easy to keep on digging to find a solid rock bottom that will sustain millions of tons of concrete, steel and marble.

The thirty-four story skyscraper of the Albany, N. Y., state capital offices has discovered this to be true. For nearly a year the construction crews have been trying to find a solid bottom to support the great building. More than 2,000 concrete piles have been sunk into Capitol Hill, and the bottom needed isn't there. The vast excavation is getting deeper and in places has not yet approached the tops of some of the concrete piles which have

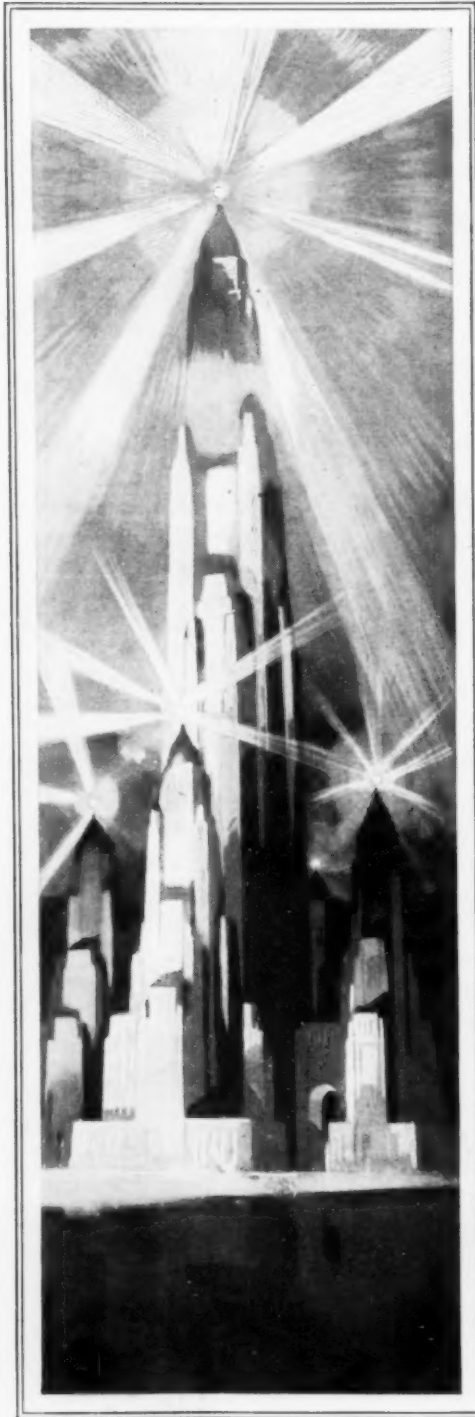
been driven into the hill. Meanwhile ten floors of structural steel are in storage awaiting something stable to support them.

While the troubles of the Albany contractors are many, engineers tell of similar conditions that are being encountered as the height of buildings increases. Geologists say that many cities are located on mounds of earth that are just short of liquid in their consistency as far as proper skyscraper foundations are concerned.

The troubles of contractors are illustrated by the amazing experience at Albany. It was estimated that concrete piles imbedded thirty-seven feet into the earth would each support thirty-five tons, and with enough piles the building's height would be assured. The great pile driver sent the concrete log down to within one inch of the thirty-seven foot depth. It took three blows of the five-ton hammer to drive the pile the last one inch and there was but another inch to go. The hammer came down once and hit the pile again and presto! the pile simply disappeared.



Cross Section of the Future City as Mr. Corbett Sees It, with Many Traffic Levels Underground; Top, Street for Pedestrians Only, and Airplane Landing Fields, Above



Block of Buildings Rising in Terraced Masses into the Skies, and Topped by Airplane Beacon Lights to Guide Passing Flyers

Other piles showed the same result. There was not enough resistance and the piles disappeared into the soft earth below. Then the engineers placed a twelve by twelve timber on top of one of the concrete posts and set the pile driver to work. The pile, as a consequence, went down 112 feet before it hit hardpan. Geologists who were watching said that solid rock was down still farther.

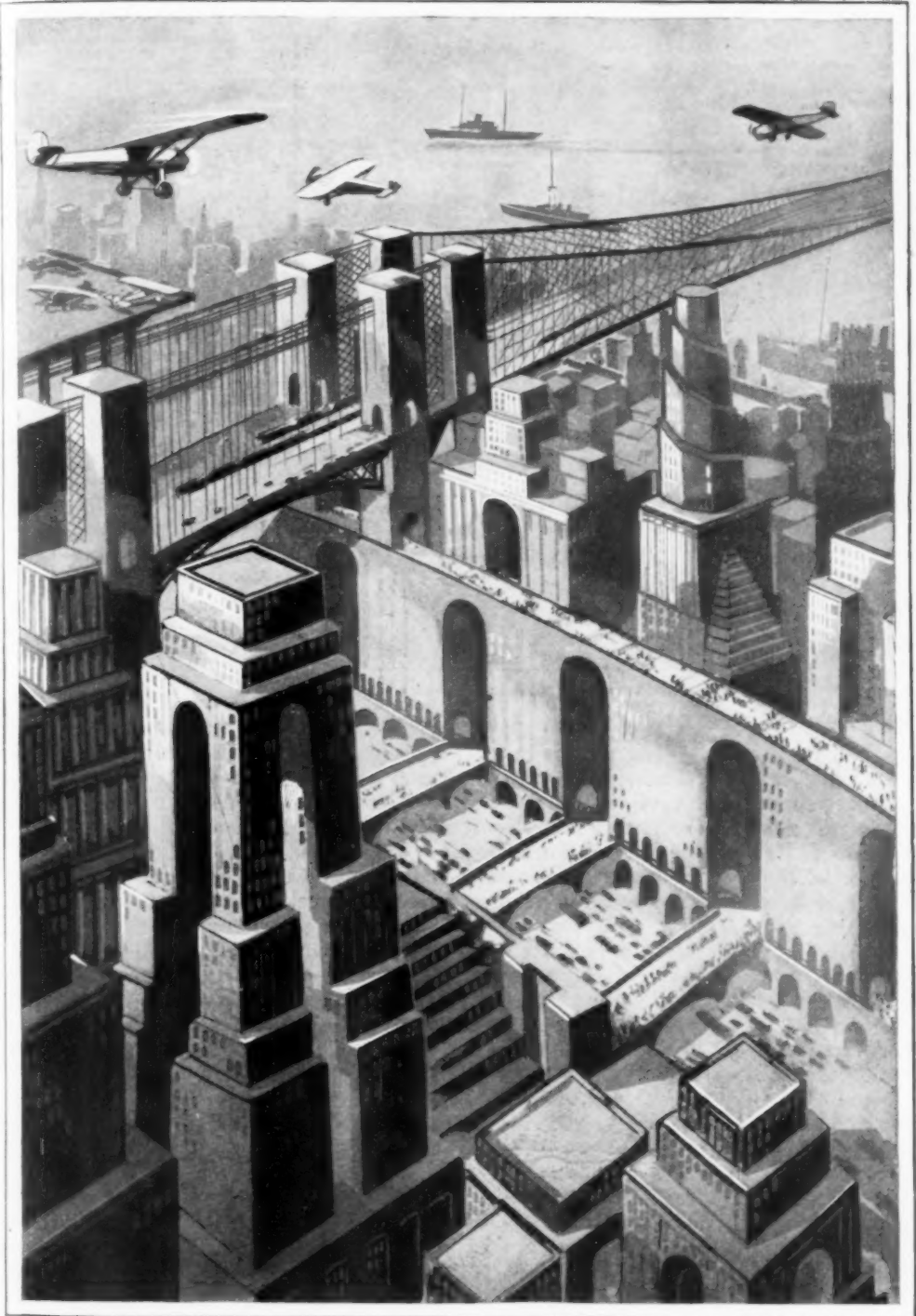
The Albany building is not a great skyscraper as such buildings are known. It is designed to be but thirty-four stories high, and such a height is dwarfed in these days. While New York is located on solid rock, some geologists claim that the weight that can be piled on this rock is limited.

Meanwhile other cities continue to plan giant buildings. Harvey Wiley Corbett, noted city planner, who champions the skyscraper, predicts that American cities will soon have buildings twice as high as those of today, which many people are claiming as too tall. Major Henry H. Curran, also of New York, opposes Mr. Corbett and points to the impossibilities of such buildings in terms of human happiness as well as construction.

Mr. Corbett as an architect shows what he believes New York will look like in 1975. There will be other cities like it—Detroit, Chicago, Philadelphia, St. Louis, perhaps. "American cities will be composed of gigantic towers," he says. "Pedestrian traffic will be separated on elevated highways from vehicular traffic moving in "canals" below.

"The big cities will be modern Venices with motors instead of water filling the canals. The big stores will have two entrances, one below for automobiles and one on the second-story level for pedestrians. Shoppers will be able to walk from store to store undisturbed by traffic. The open park plazas will be lifted to a level with the pedestrian lanes and the space below will be used for parking automobiles.

"The step-back skyscrapers of the future will have moving stairs on the outside of the buildings instead of elevators, with facilities for passengers to alight at any floor," Mr. Corbett declared. "There will be airplane landings everywhere. Artificial light, now in its infancy, will revolutionize our life, turning night completely



Elevated Sidewalks May Connect Various Levels of Blocks of More or Less Uniform Skyscrapers, While the Lofty Bridges Will Be Carried over the Tower Tops





Even with the Street-Level Drives, Pedestrians May Be Cared for by Elevated Sidewalks in Colonnades

into day. The cities' business hours will be twenty-four instead of eight or ten; people will work in six-hour shifts. The churches will be located atop of the great commercial buildings, commanding attention, or be buried in nondescript buildings below."

Mr. Corbett bases his prophecies on a lifetime of leadership in designing great buildings, and is a world authority. He continued: "Buildings will cover entire blocks, reaching in series of lifts and towers to supreme heights.

"Some of the skyscrapers will be a half mile high and will house small-sized cities. Stores will occupy lower floors. Then will come banks of floors devoted to offices. Atop of this section will be the residential part, floors where those who are employed in the business division of the structure might live. Schoolrooms, churches, theaters and social features will take over the next section of floors. The roof will be used for airplane landings or station stops for air transit to various

sections of the country, or for that matter, the world.

"Imagine these new cities with no smoke, where the heat, the power and the light are all supplied by burning coal at the mine that is transformed into electric power and sent to the cities, where the upper portions of the buildings are more attractive than the lower, where we can take advantage of our terraces and use them for our gardens, if we wish."

But there are problems other than that of foundations to offset such a great dream, says Major Curran, who is counsel for the New York city club and member of the New York board of aldermen and himself an authority on city activities.

Major Curran sees in the skyscraper the cause of much discomfort. "There

are everyday workers who count their ribs on release from its elevators and the subways that take them to their offices. They must pop out of kiosks like prairie dogs and move in the center of crawling motors that spit fumes from curb to curb."

Major Curran continued: "Now a New York architect announces a building of 110 stories! This inverted spyglass is to rise 1,200 feet in the air, thus outstripping not only Detroit's effort but also the Eiffel Tower in Paris, which is still the highest piece of construction in the world."

The physical difficulty of digging into the earth may deter the super-super-super-skyscraper. Perhaps a great accident will have its effect, for as the new building's foundations must be dug, the old ones must be watched carefully, and frequently a new foundation must be placed beneath the adjoining structure. Such complicated underpinning and transferring of loads running into thousands of tons are accomplished in the face of the ever-present menace of flood, fire and explosion.

MODELS HELP TEACH POLICE STREET LOCATIONS

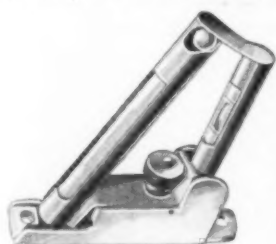


German Policemen Studying Model Section of Berlin, to Learn Location of Streets, Alarm Boxes and Other Details; the Plan Is Especially Helpful to New Recruits

Accurately constructed models of sections of Berlin and suburbs are used in teaching the police recruits the location of streets, buildings and patrol boxes. They are also of service in explaining traffic regulations and give the candidates a clear idea of the beats they are to travel.

BALL IN TUBE TESTS BRAKES FOR AUTO SAFETY

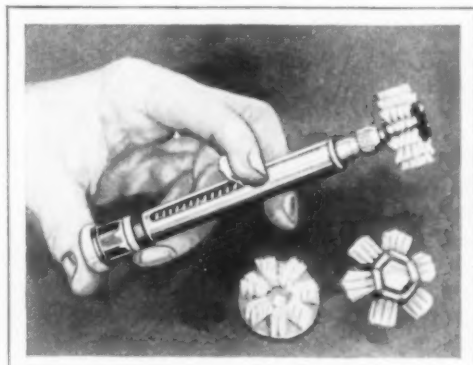
For a quick and accurate test of the efficiency of the automobile brakes a simple little gauge, introduced in England, has given satisfactory results. It consists chiefly of a glass tube mounted on the instrument board in a fore-and-aft direction and at an angle to the horizontal. The tube contains a steel ball which normally rests at the bottom of the tube but, when the car is slowed down by the brakes, tends to roll upward. The extent of the movement shows the efficiency of the brakes. One advantage of the gauge is that the measurements do not have to be



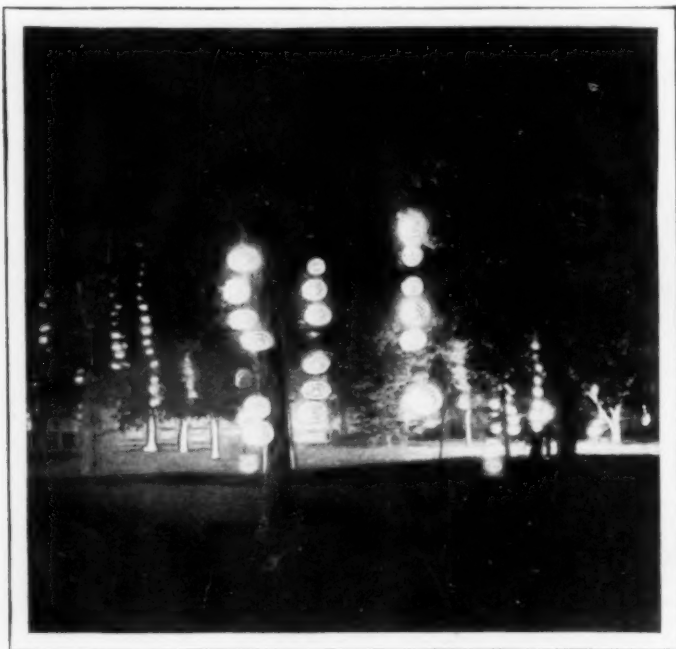
taken on a level road as moderate gradients do not affect the performance of the indicator in any appreciable degree.

ROTARY TOOTHBRUSH GIVES AID TO DENTAL HYGIENE

Pull a little lever in the handle of a toothbrush and the bristles revolve, saving the hand movements and more thoroughly cleaning between the teeth, the manufacturers assert. New bristle fillings may be quickly inserted when the old ones wear out, the handle being intended to last indefinitely.



Spring-Driven Rotary Toothbrush with Replaceable Bristle Wheels, to Clean Teeth Thoroughly



Courtesy General Electric Co.

Where Lighting Engineers Produced Unusual Effects; Part of the Garden Scene at Outdoor Party When Ultraviolet Rays Were Used

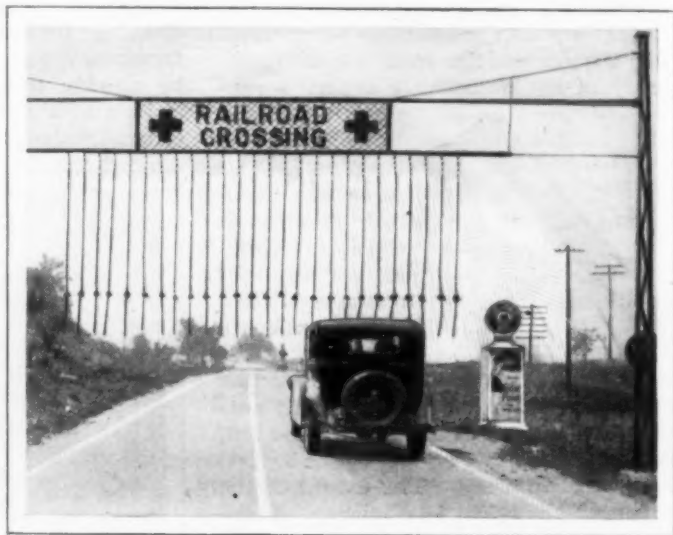
MAGIC OF INVISIBLE LIGHTS ADDS TO GARDEN FETE

For the first time in history, invisible lighting was employed for the outdoor decorations and displays at a garden party in Colorado Springs. Special ultraviolet searchlights swept the lawn and shrubbery which had been treated with chemicals, so that each leaf and twig glowed under the rays of the unseen light, and the water in a fountain contained chemicals which made the stream sparkle in multi-colored brilliance. Souvenirs, also treated with luminescent materials, were distributed among the guests who enjoyed the novelty of the changing effects as they passed in and out of the invisible beams. Dress goods, particularly those con-

taining aniline dyes, glowed under the ultraviolet stimulation, and the crowd was amused to see teeth and eyeballs curiously affected by the rays. In addition to these novelties, use was made of rubber balloons and animal-shaped shades for the ordinary lights so that the garden, in places, was transformed to a miniature zoo with glowing animals and shining balloons that enhanced the weird aspects of the luminous decorations.

OVERHEAD STRAPS WARN AUTOISTS OF CROSSINGS

For the further protection of motorists, safety experts have gone to the railroads for an additional device to warn drivers of hazardous grade crossings. This unit is the overhead strap line, similar to that used on the railroads for many years at approaches to tunnels and low viaducts, warning brakemen, or others on top of the cars, to duck their heads. The strings



To Rouse the Indifferent Motorist to the Danger of the Railroad Crossing Ahead; the Straps Are Always on Duty

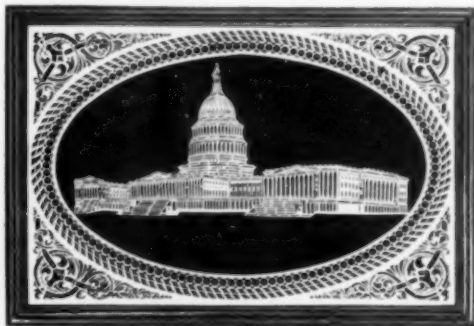
over the automobile road hang low enough to brush the top of the car close to the driver's face and so warn him, by day or night, to look out for the crossing which is not far ahead.

THE OLDEST LIVING THINGS

So far as is known, the oldest living thing in the world today is a tree. It may be one of the giant sequoias of the Pacific coast, an East African baobab or one of the cypresses of Mexico. A tree of this kind, near Oaxaca, is said to have lived 6,000 years. It is forty-one feet through the trunk and, though its exact age cannot be determined without cutting the trunk and counting the rings, an approximate reckoning is made by comparing it with others of the same kind. By counting the rings, it has been found that some of the sequoias have lived at least 5,000 years. Among the animals, the longest-lived generally are supposed to be the big tortoises of the Galapagos islands, which are estimated to be 200 years old. Carp, kept in ponds, have lived to be 150, and parrots have lived eighty years in captivity. The longest-lived insect is the locust, but it spends all but a month of its seventeen-year existence in larva form.

PICTURES CHISELED IN BRASS LATEST ART FAD

Interesting stencil pictures can be made in brass with comparatively little work, and the results are unusual, since there is an opportunity for decorative backgrounds and development of detail. In the accompanying illustration of the national-capitol stencil, a black base for the brass emphasizes the proportions of the building and shows how the entire structure has been accurately suggested by using only the strongest and simplest features. The work of cutting the stencil consumed about three days, and it is framed under glass.



Stencil Picture of the National Capitol, Cut in Brass and with Black Background, to Emphasize Detail

ROYAL ELEPHANT WEARS ROBES STUDED WITH GEMS



State Elephant of the Prince of Mysore. Decorated in Gold, Velvet and Jewels for the Royal Procession

When the Maharajah of Mysore recently celebrated the twenty-fifth anniversary of his coronation, Europeans invited to the ceremony witnessed one of the most gorgeous processions for which India is noted. Even the royal elephants, which participated in the parade, were clothed in plush, gold and precious gems.

The beast which bore the gold howdah of the maharajah had golden rings on his tusks, and his head, with the exception of peep-holes for the eyes, was completely covered by a jewel-studded and gold-ornamented head-dress, with a floral design painted on it in brilliant colors.

Receiving Paris
Fashion Designs
by Radio



Courtesy Marshall Field
& Co.

FASHION DESIGNS BY RADIO SPEED STYLE CHANGES

Dress designers in Paris made their sketches and, three hours later, visitors in Marshall Field's store in Chicago were looking at the drawings, for they were sent by radio and registered on a screen by the latest wireless-picture methods. The innovation was staged in connection with the celebration of the store's seventy-fifth anniversary and was made the more impressive by the models in old-fashioned costumes who paraded near the wireless machine while the latest Paris patterns were being received.

BEAUTIES OF MAPLE FLOORING SHOWN BY SPECIAL STAIN

Hard-maple floors, in a wide variety of colors to accompany special schemes of decoration, are now possible by using a transparent stain and wear-resisting varnish. The finish is especially adapted to hard maple, since this wood has fibers so closely woven together that the stain does

not change color when applied. Floors may be prepared one day and used the next because of the rapidity with which the materials dry, it is said.

WASPS RAISED TO FIGHT MOTHS THAT DEVOUR FRUIT

By cultivating a wasplike parasite that destroys the codling moth, a California man hopes to reduce damage done to the walnut crop and to apples in many parts of the country. It has been known for some time that this parasite preys on the moths, but its efforts could be enlisted only where weather conditions were favorable, for the insects could not survive the winters. A plan has now been worked out whereby the "wasps" can be raised by the million and shipped to any section of the United States. Moth eggs are collected and put on coated cards in a "parasite cage" for three days. At the end of that time, the parasite has imbedded its own egg in each moth egg, which provides food for the developing insect and, at the same time, destroys the egg. These cards are easily shipped by mail so that an orchardist, bothered with the moth pests, can receive the services of an invading "army" through the post office. The parasites are said to be harmless to everything else but the codling-moth eggs.



Ravages of the Moth Larva in Walnut, and Disks on Which Eggs of Helpful Parasites Are Shipped

Wealth *from* Ambergris



This Whale Is Worth About \$4,000, a Humpback Variety Common in the Pacific but Never Known to Be a Producer of Ambergris

By JOHN EDWIN HOAG

IF you were walking along a piece of ocean beach, and something assailed your nostrils—a smell like all the musty, mouse-infested cellars of the world rolled into one overpowering odor—you'd probably do what most people would do under such a circumstance—flee. But the person who does that risks walking right away from the possibility of sudden and unexpected wealth—a mass of ambergris washed up by the sea. A small fragment of it is worth \$1,000. Larger masses have brought \$25,000 to \$150,000.

While ambergris may be unknown to the majority of people, it is the base of perfume's pleasing fragrance, as well as the chemical element which makes the best perfumes expensive. How a substance that smells like nothing else on earth can be transformed into the odor of roses, violets, lilies of the valley, and other delicate fragrances of the most exquisite perfumes, is merely one of the tricks of the chemical trades, and it is done as effectively as the ancient alchemists of fairy tales turned base metals into gold.

Ambergris is a product of the sperm whale. If there is romance in the prospecting of mountains and deserts for gold and other valuable minerals, the searching of the seas for ambergris is infinitely more

romantic. The "prospecting ground" for this substance is the whole seven seas, and every mile of the shore line of all the continents and islands. It is naturally most abundant in the waters inhabited by sperm whales, which usually prefer water that is colder than that chosen by other whales. Ambergris floats, and the occasional piece of it which becomes dislodged from the body of the whale may drift for thousands of miles by wind, tide and currents. Once ashore, it may remain on the beach to disintegrate, or to be picked up by the lucky finder who is able to recognize it.

The world's supply of ambergris has never been sufficient to lower the market value to a point to make the search for it less romantic than it is today. No satisfactory substitute for it having ever been found, the price is always high. For market purposes, the substance is divided into two classes, black and gray, which serve to indicate both color and quality. Gray ambergris often has brownish tinges, or may be mottled to a sort of pepper and salt color. Gray ambergris is the best quality, and is therefore most in demand. Only limited quantities of gray ambergris have been available during the past year, with the result that the latest New York quotation upon it is now \$35 per ounce.

Drift ambergris, the kind that the sea



the markets, comes from the bodies of sperm whales taken by the crews of whaling ships. When a sperm whale is caught, the carcass is always carefully dissected for even the smallest piece of ambergris. The wealth derived from such a find is divided between the owners of the ship and the crew. The world's greatest source of drift ambergris, where it is usually picked up at sea before it ever reaches shore, is in the Indian ocean and the China sea. These seas are infested with thousands of Chinese junks, East Indian and Malay "proas" (native sailing canoes), "sampans" and other craft, manned by hundreds of Asiatic coolies, who ply their trade as fishermen, but who are always on the watch for any floating object that may look or smell like ambergris.

Considering the varying color, weight and consistency of ambergris, the only fairly reliable identification left for one who knows nothing about it is the smell. So, when one is at sea, or along the beaches, the source of an unusually unpleasant smell may always be considered

Into Port with a Whale, and a Lump of Ambergris That Brought Fisherman \$6,720

washes up on the beaches, may be found almost anywhere the land and sea meet. In the United States it is more abundant on the Atlantic coast than on the shores of the Pacific. This is for the obvious reason that sperm whales are scarce in the eastern Pacific, while fairly abundant in the western part of the Atlantic. Drift ambergris is usually found in small pieces but quite frequently in masses of sixty to 250 pounds.

On the Pacific coast there are six commercial whaling stations. They are scattered from Mexico to Alaska, with two in California. These stations have been in operation for years, and report only eighteen sperm whales taken among the hundreds caught. Yet, several noteworthy finds of ambergris have been made there.

As may be surmised, the greater part of the commercial ambergris now reaching



worth investigating. It may not be ambergris, but if it is—your financial worries may be ended.

☐ Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished free upon application to our Bureau of Information.



Candidates for Auto-Driving Licenses Taking Tests at the Traffic Board; Model Street and Cars Represent Actual Conditions Autoists Would Be Required to Meet

"GAME" TESTS AUTOISTS' SKILL FOR DRIVING LICENSES

People sitting at a table and apparently playing a game with tiny automobiles on a model street is a common sight in the motor-vehicle license offices at Los Angeles. But the "game" is a serious one, for the persons about the table are being tested as to their ability to solve traffic problems while driving an automobile. The examination is part of the formality connected with issuing drivers' licenses and, before permission is granted to operate a car, the candidate must prove that he can satisfactorily manage the little autos and answer the problems put to him about how he would drive his own car. His solution of the questions is illustrated with the models.

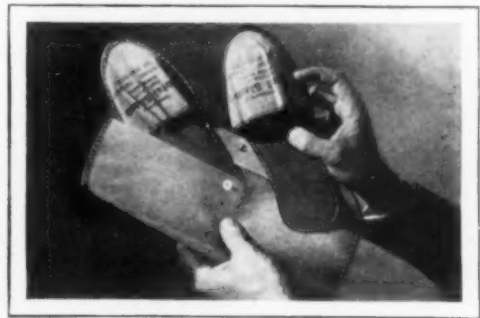
GROWING UMBRELLA HANDLES

Three years of careful attention are usually required to shape the young trees that are to be fashioned into umbrella handles. At the end of the first year, the tree is trimmed back, quite short, and the wood twisted into various shapes. The carvings are sometimes made at this stage, and the designs swell as the tree grows. One of the chief tasks of the cultivators is to keep the sap flowing and to prevent the

tree from dying in its crippled condition. After cutting, each stick is sun-dried and then given a vapor bath to soften the wood for the final shaping.

PAPER BEDROOM SLIPPERS GIFT TO HOTEL GUESTS

Bedroom slippers, Japanese style, made of paper, and inclosed in a paper envelope, are being provided for guests in many hotels. The slippers have a sole of cardboard and toes of a heavy crepe paper, the edges being bound with a narrow tape, sewed on, so that it also holds the toe in place. The envelope, made of the same



Souvenir Bedroom Slippers of Paper for Hotels to Supply to Their Guests

heavy crepe paper as the toes, is fitted with a snap-button fastener.



Cactus Plant with Some of the Apples Used for Making Jellies and Candies

RAISE CACTUS APPLES ON FARM FOR JELLY AND CANDY

Near San Fernando, Calif., is a large farm devoted to the raising of cactus apples, the pulpy product of one of the species of the familiar desert plant. The apple is used for the making of jellies and candies or is eaten in its natural state. It has a sweet taste and is about eighty per cent water. An acre of land will produce 500 to 600 boxes of the apples, which were selling for \$1.25 a box last season.

WORKERS PRODUCE MORE TODAY DESPITE SHORTER HOURS

Sixty-seven workers, in 1923, were producing as much as 100 men did in 1899, in spite of the shorter hours prevailing five years ago, according to a survey of productive efficiency in the manufacturing industries by the national-industrial conference board. This was accomplished by the development of machinery and better

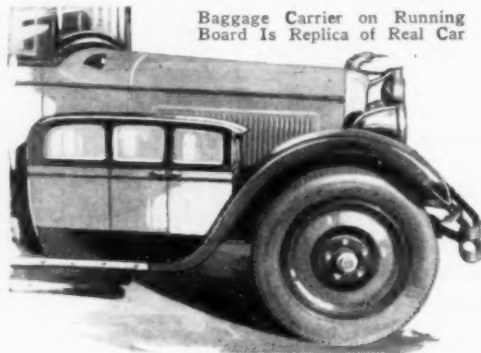
organization. Today, iron screws are being made by automatic machinery at a ratio of 1,000 to every one formerly made by hand. The ratio for spikes is about 200 to one, and in various other branches of the metal trades, many articles are being made by machine methods at the rate of fifty to one by the old hand processes. In the automobile industry, thirty workers in 1925 could do as much as 100 in 1914, the board discovered. In the production of food and food products, seventy-five persons in 1925 performed as much work of all kinds as did 100 in 1899.

BIG SMOKESTACK KEPT DARK TO PROTECT BIRDS

The 506-foot smokestack of a copper company in Great Falls, Mont., ordinarily lighted at night with flood lamps, is being kept dark part of the time to protect migrating birds. For some reason, it has exerted an attraction on birds and hundreds of them have been killed by flying against the shaft. Small birds, as well as ducks, geese and other larger kinds, have met death in this way. When the Boy Scouts learned of the conditions, they requested the company officials to keep the stack in darkness during the seasons of bird migration.

AUTO HAS TWO EXTRA BODIES FOR ICE AND BAGGAGE

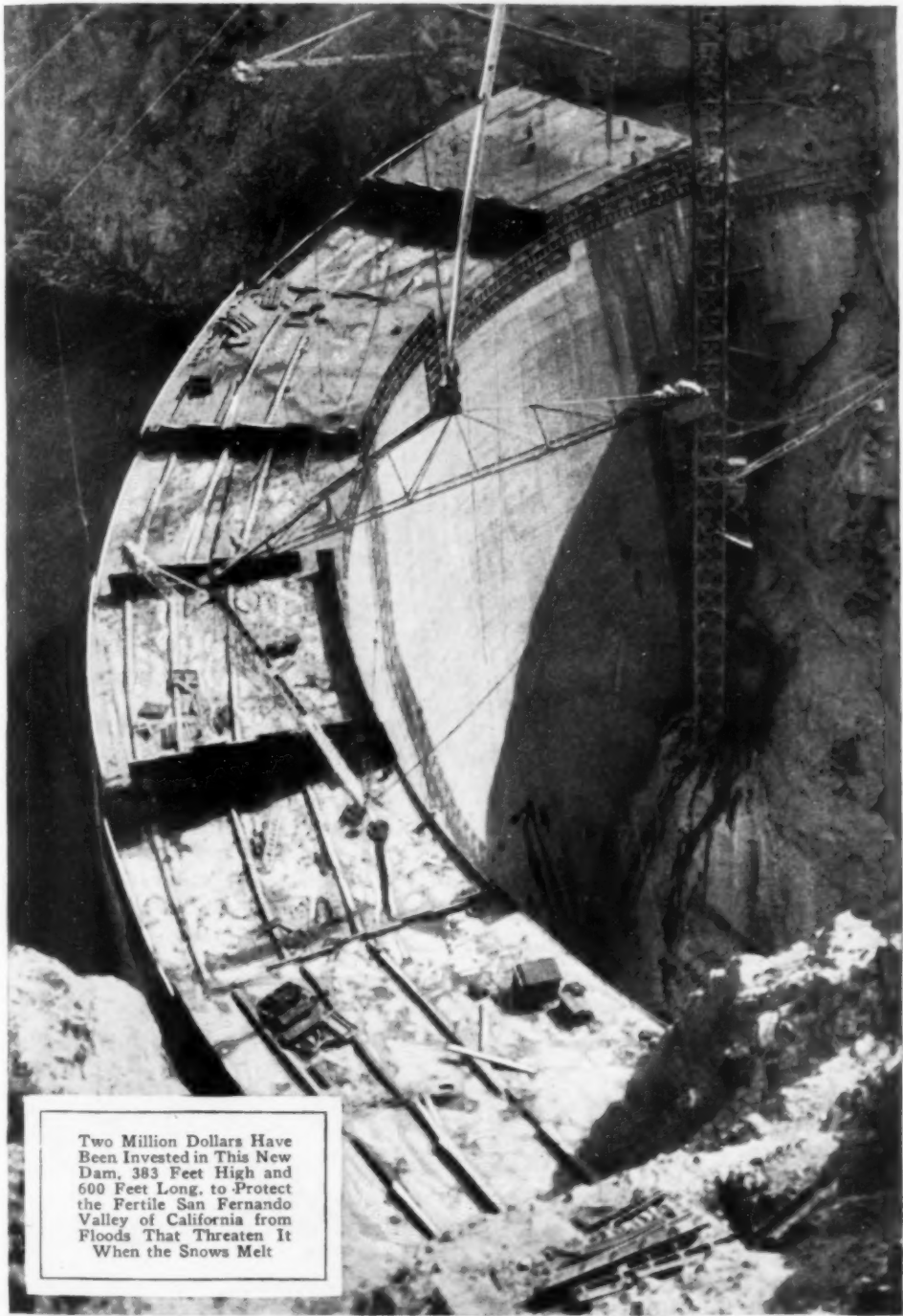
Render carriers for ice and luggage are exact duplicates of the body of the automobile on a car introduced in California. Even the door handles are similar, the windows have real glass, backed by curtains, and the top is hinged at the rear, the



Baggage Carrier on Running Board Is Replica of Real Car

"sun visor" making a convenient handle. The carriers in this style are less conspicuous than the ordinary type and are said to be more efficient because of the ease with which they can be opened and the extra protection offered the contents by their construction.

CAGING THE FLOODS BEHIND STEEL AND CONCRETE



Two Million Dollars Have Been Invested in This New Dam, 383 Feet High and 600 Feet Long, to Protect the Fertile San Fernando Valley of California from Floods That Threaten It When the Snows Melt



By Rocking These Boxes on Pivots, Realistic Waves Were Produced for a Motion-Picture Scene on Location near Los Angeles

WAVES ARE MADE WITH BOXES FOR MOVIE SCENE

By means of weighted boxes on levers, realistic waves were produced on a quiet pool in the Los Angeles river for depicting a South Sea island motion-picture scene. The disturbers were carefully moved to give the waves a long rolling action, as much like those of the ocean as possible. The illusion was strengthened by imitation tropical vegetation on the beach.

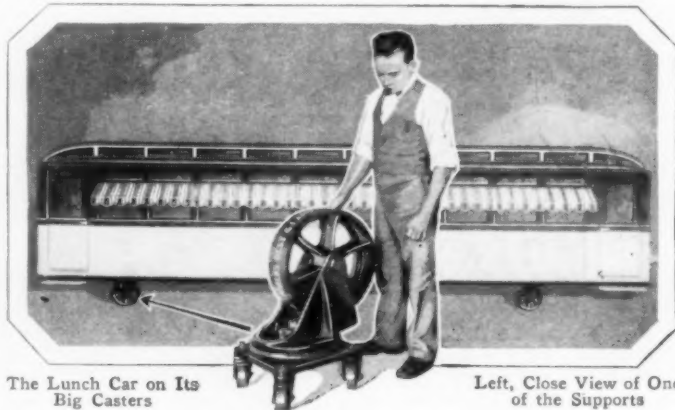
CHEMICAL ICE FREEZES PIPE WHILE THE SUN SHINES

Use of chemical ice solved a perplexing water problem in Washington, D. C., recently, saving much time and work and making it unnecessary to shut off the supply to Georgetown. It became necessary to cut in an extension to one of the mains, but this could not be done without first stopping the flow and there were no shut-off valves convenient for that section. To have halted the supply entirely would have resulted in a serious water famine over a

large area. An engineer suggested that the pipe be frozen on either side of the place where the break had to be made. Ice and salt were packed about the main but they only chilled the water. Finally, a chemical company was appealed to. They brought out a small box of chemical ice with a temperature of 160 degrees below zero. While the sun shone on the workers, they quickly froze the pipe, the entire process taking less than twenty minutes. The extension was cut in, the sun was allowed to thaw the pipe out again, and a tie-up in service, that might have cost many thousands of dollars and much inconvenience, was avoided.

LUNCH CAR IS EASILY MOVED ON GIANT CASTERS

What are said to be the largest casters ever constructed have been made for a sixty-foot lunch car to simplify the task of getting it in and out of difficult places at carnivals, race tracks, fairs, and the like. The units each weigh 425 pounds, are more than twenty-five inches high and the wheel itself is twenty inches in diameter with a six-inch tread. Roller bearings facilitate moving, and there is a special locking device to keep the car steady.



The Lunch Car on Its Big Casters

Left, Close View of One of the Supports

ORCHIDS GROWN UNDER GLASS RIVAL TROPIC KIN



Samples of Cultivated Orchids, Various Stages in Growth of Plant, and inside the "Nursery," Where the Tender Shoots Are Grown Until They Approach Maturity

Orchids grow wild in parts of the tropics, but cultivating them under glass at a California farm is a task requiring skill and patience, for it takes nearly five years for a plant to mature from the seed and only about one seed in a million produces blossoms. The flowers will remain fresh and colorful for three weeks to three months, if left on the plant, and from ten days to two months in water after cutting. Healthy plants can be counted on to live for fifty to 100 years if properly tended. How successful cultivation has reduced prices is shown in the case of one variety that formerly sold for \$1,250 a plant. It

can now be purchased for \$15. The California producers are trying to grow an orchid twelve inches across

THE MOST DANGEROUS JOBS

Firing a railroad locomotive stands fifth among the most dangerous American occupations in a table prepared by the labor bureau. The percentage of deaths from accidents among this class of workers is 43.6, while that of the highest, drivers in coal mines, is 82.1 per cent. Powder makers are second and railroad brakemen and electric linemen third and fourth.

Putting Your



Automatic Recorder to Measure the Muscular Control of a Pianist While He Plays; the Bellows on Each Wrist Actuates the Pair of Pens Which Mark the Revolving Chart

By DONALD A. LAIRD

(Professor of Psychology, Colgate University)

"WHAT chances have I to be an inventor?" With hard work, sufficient knowledge, and a harnessed imagination the chances are good.

Inventors differ from the rest of us only by having better success at putting their imagination to work. We all have imagination, but not all of us have yet found how to make use of it.

When we look into a show window, or read a magazine, or examine a radio set, we are using our minds for discovery.

Dr. Robert S. Woodworth, head of the department of psychology at Columbia university, says that as soon as we use imagination our mental processes change from discovery into invention.

When Benjamin Franklin watched the discharge from crude batteries and the flash of lightning, he was using his mind for discovery. Franklin stepped out of the crowd when he put his imagination to work on these discoveries and made inventions.

There are five conditions which help the use of imagination for invention:

Youth is a favorable condition. The ages from twenty to forty are the best. Under twenty is the time to master the subject; after twenty is the time to use this knowledge through the imagination for invention.

Good physical condition is essential. The world's geniuses are not weaklings,

IMAGINATION to Work

although the common opinion is that they are. Most geniuses have lived longer and better than the average run.

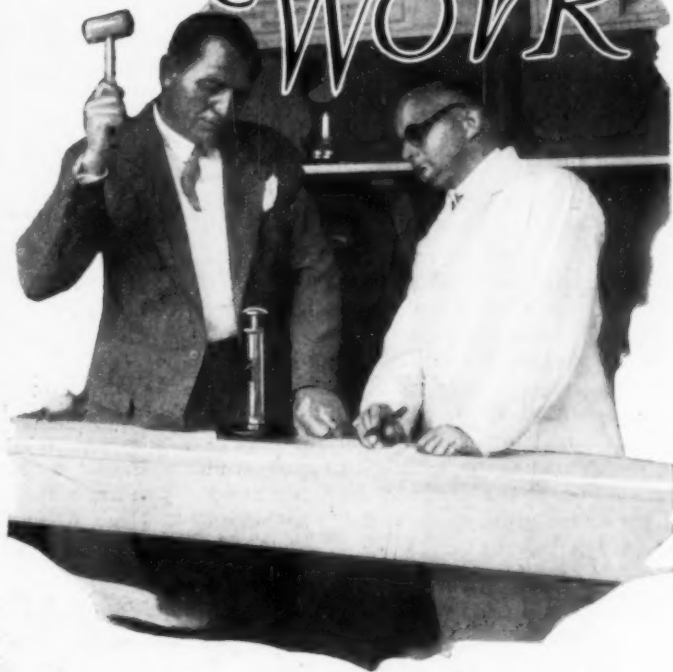
Mastery of the subject is also necessary. There are very few "lucky" inventions that have been made accidentally.

Another requisite is hopefulness. A pessimist is rarely an inventor. The inventor has to have enough imagination and confidence to take a chance. Lindbergh was willing to take a chance.

Inventors should restrict their imagination to very definite problems. Francis Galton, the first scientist to study imagination, found that inventive mechanics had considerable imaginative ability. "The best workmen are those who visualize the whole of what

they propose to do, before they take a tool in their hands," he said. This power to see things in the "mind's eye" can be helped if one systematically exercises the imagination. Day dreams are merely the play of imagination, not exercises. Reading maps and picturing in imagination the contour of the roads, the appearance of the mountains and the positions of the cities is a good exercise. Practice studying blueprints so that you can see the completed machine working in your imagination. Exercise your imagination to see how the furniture in your room would look if it were rearranged. Odd moments can be used to profit on exercises such as these.

How people are different in their imagining abilities is astonishing. Some people can easily imagine how things would look if they could be seen, but are totally unable to imagine sounds. The musician, it



A Measure of Hitting Capacity Is Obtained with Mallet and a Scale

has been found, should have a good imagination for sounds.

The value of imagination-developing exercises is shown by eminent composers insisting that pupils compose music without the help of an instrument, using only paper and pencil. They must be able to compose by "hearing" the notes only in imagination in order to become really great composers.

Beethoven lost his hearing, but had such a well-developed imagination for musical sounds that he was able to write some of his most triumphal symphonies by hearing them only inwardly in his imagination.

Not all of us have the auditory imagination and other mental abilities to make us great musicians, but each person has some strong points in his imagination of which he should make the most use.

There was the case, for instance, of a

highly educated merchant who was born in Vienna. He was master of German, Spanish, French, Greek and Latin. His visual imagination was remarkable. He no sooner thought of persons or things than, in his imagination, they stood before him with all the clearness, sharpness and accuracy of the real object. He could add difficult columns of figures by seeing them solely in his imagination.

To depend almost entirely upon one form of imagination is often a handicap. One of the masters knew this and, in teaching art, had his pupils not only draw from memory to cultivate their visual imagination, but also had them follow the outlines of objects by moving their pencils around in the air to force them to cultivate their muscular imagination.

A curious application of this is cited by a foreign observer, whose quarters were visited by some North American Indians. The drawings in magazines which they saw there struck their fancy, and one of them, who wished to make a similar drawing on returning to his wigwam, followed the outline of the drawing with the point of his knife, so he could carve it better on his return home.

There are some inventors whose muscular imagination is so defective that they are unable to construct the machines they invent. They have to make drawings of them or describe them to someone with a good muscular imagination who builds the models.

It is visual imagination which is the greatest help for invention. Some wonderful mechanics are poor inventors because they have cultivated their muscular rather than visual imagination. The following tests may help you not only to cultivate your imagination but also to develop it:

Where is the strong part of your imagination? Grade yourself from 0 to 3 on each question as follows:

0, if you are unable to imagine it at all;

1, if you can imagine it only faintly;

2, if your imagination of it is fairly strong;

3, if it is as vivid as though it were actually present.

Visual imagination:

Try to imagine the west side of the house you are now living in.

How is your imagination of a mixed bouquet of carnations and roses?



Demonstration of Apparatus Used by Scientists to Measure the Subjects' Powers of Observation; Many Industries Use Such Tests in Picking New Employees



The Ability to Withstand Fatigue Is an Important Factor in Many Lines of Work, Which Tire Some Muscles Excessively; Here Is a Woman Receiving the Fatigue Test

Get a mental image of the appearance of a schoolroom you have known.

Hearing imagination:

Imagine a four-cylinder automobile motor, with one cylinder missing.

Grade your imagination as you recall the voice of your favorite radio announcer.

How strong is your imagination in recalling the sound of a coarse file at work on brass?

Muscular imagination:

Imagine you are winding your watch. How distinctly can you feel the ratchet and the increased resistance of the spring as the watch is almost wound?

How vivid is your imagination of the muscle strain in throwing a ball with all your strength?

To get a total for each variety of imagining power add the grades you gave yourself, keeping each of the three sections separate and comparing the sums.

Use your imagination to fill in these blanks so the paragraph makes good sense:

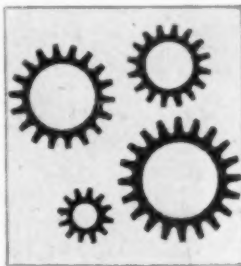
When Fulton . . . the first steamboat on the Hudson river a couple of . . . men . . . a living by ferrying . . . from New Jersey . . . New York. A few . . . were engaged . . . operating

sailboats up the river. These . . . fought the steamboat bitterly . . . they feared that a few . . . would do all the . . . they were doing and that most of them would lose their . . .

How many words can you build with the letters e, b, a, h, t, m?

A fertile imagination will be able to see many words using only letters included in this list.

LOCK WASHER HAS EVEN GRIP TO DEFEAT VIBRATION



Rust-proof washers with "cog-wheel" edges, that grip the surface to which they are applied with numerous points about their rims, are said not to spread or jar loose and permit the use of shorter bolts. As they are thinner than the usual kind and light in weight, they are adaptable to many special uses and are fitted for any part subjected to vibration.



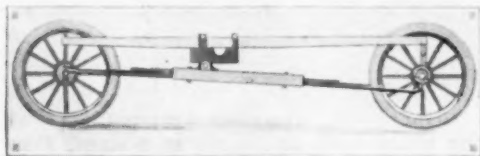
Pupils Receiving Hearing Test with Aid of Phonograph Record; Sound Is Transmitted through Headphones and Each Child Writes Down Words He Hears; Volume of Tone Can Be Varied

TESTER OF CHILDREN'S HEARING ELIMINATES GUESSWORK

Accurate tests of pupils' hearing are possible with an instrument that transmits sound from a phonograph record through a number of headphones the children wear. The record is simply a series of numbers, spoken through a reproduction of the human voice and in constantly diminishing volume. The subjects write down what they hear, the results giving a faithful report of the acuteness of hearing in both the right and left ear. This method eliminates the guesswork usually attending ordinary whisper tests and other experiments where the acoustics of the room, the nervousness of the child and other factors are not properly taken into consideration in the final judgment.

SPRINGS AS LONG AS THE CAR ADD RIDING COMFORT

A new idea to increase the riding comfort of the small auto, provides 200-inch



For Smoother Riding in the Small Auto; Drawing to Show the "Cantilever" Springs in Place

springs which reach from one axle to the other, while the car is carried by a fulcrum joint just back of the engine. The springs, designed for a car having cross springs at front and rear, give the effect of double-cantilever suspension. The front spring is discarded and part of the rear spring retained. The car body is fastened to the rear spring and pivoted at a point near the dash. It is claimed the springs eliminate the usual swaying of the body and give the small car as good riding qualities as a high-priced automobile.

AIRPLANES MADE MORE STABLE WITH VANE CONTROLS

Promise of greater safety in flying is seen in a stabilizer arrangement which is reported to have proved successful in a number of tests. Its chief service is to automatically adjust the ship to correct the pressure of air currents and changes in engine speed, so that it serves as a silent pilot when the operator, for any reason, relinquishes control of the stick, yet it is said not to interfere with his actions when he assumes charge. The apparatus consists chiefly of a pillar mounted on a universal joint and with two vanes at the upper end. It is placed clear of the propeller and where no parts of the ship are likely to cause eddying. At the lower end, two sets of wires are connected, one pair

...anning fore and aft to the elevator controls which govern the ship's climbs or descents. The others are connected to the wing guides which affect the airplane's side movements. In actual use, the performance of the unit is somewhat as follows: Assuming that the ship is going eighty miles an hour and flying level, the wind pressure on the vane facing the direction of flying, drives it back against the tension of the adjustable fore and aft spring. If this has been set to the proper stiffness so that the plane is balanced at eighty miles an hour, when the nose tips down and speed is thereby increased the vane is driven farther back, tension on the spring relieved and the elevator in the back comes up, leveling the ship again to an even keel. Should the plane point up, decreasing the speed, the vane, subjected to less wind pressure, comes forward, pulling with it the control in the rear to tip it back again when the normal speed rate is restored. This same principle also is applied to the operation of the aileron controls, the side vanes being helpful in balancing the ship in turns and banks in ac-



Stabilizer in Place on Airplane Wings; It Tends to Correct the Ship's Position with Respect to Air Pressure at Various Speeds

cordance with the wind pressure to which they are exposed.



Glue and Wooden Pegs Hold This Norwegian Church Together; It Was Erected nearly 800 Years Ago

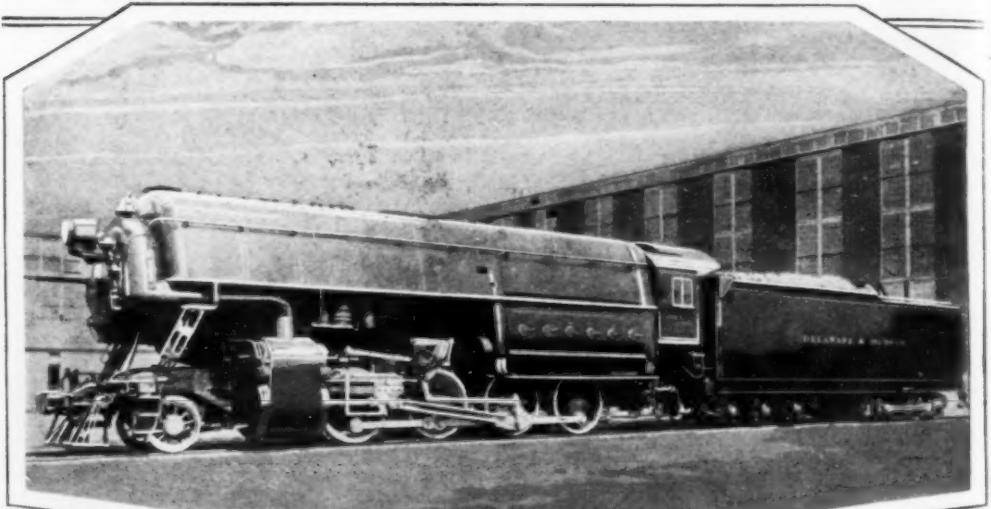
CHURCH BUILT WITHOUT NAILS EIGHT CENTURIES OLD

One of the sights of Oslo, Norway, is a wooden church, 800 years old and built entirely without nails. Glue, wooden pegs and braces hold the structure together. Its queer, pagodalike form illustrates the style of architecture peculiar to the period.

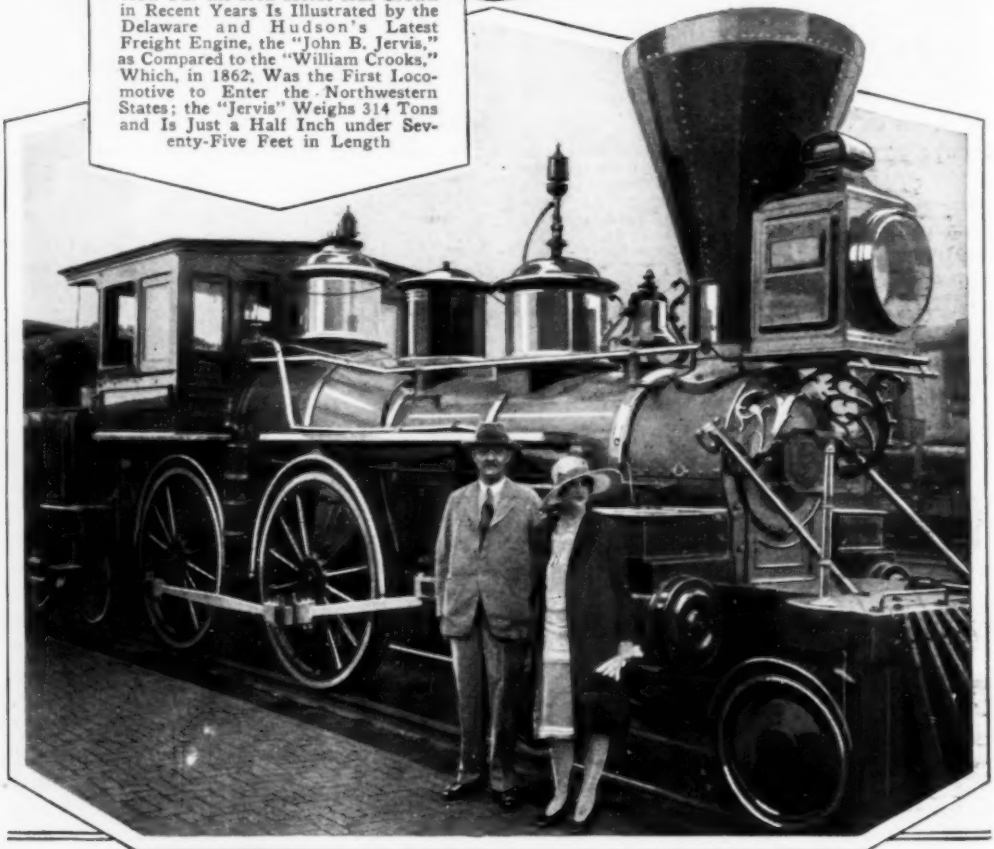
MOVIES OF BIRDS AND INSECTS TEACH FLYING SECRETS

Motion pictures of the dragonfly and humming bird have been prepared by the British government in the hope that the films may reveal flying secrets that will enable engineers to design more successful helicopters and other aircraft. The dragonfly and humming bird are masters of the art of pausing in the air and this is one of the feats man has been attempting to imitate in his airships for a long time. The pictures will be analyzed carefully when shown, in an effort to learn the wing and other movements. The humming bird is regarded as one of the miracles of nature because of its skill in balancing in the air without apparent effort.

SIXTY-FIVE YEARS OF PROGRESS IN LOCOMOTIVES



How Far the Iron Horse Has Grown in Recent Years Is Illustrated by the Delaware and Hudson's Latest Freight Engine, the "John B. Jervis," as Compared to the "William Crooks," Which, in 1862, Was the First Locomotive to Enter the Northwestern States; the "Jervis" Weighs 314 Tons and Is Just a Half Inch under Seventy-Five Feet in Length



NEW THIRTY-MILLION BRIDGE TO SERVE NEW YORK

Work on another bridge for New York city, to link the boroughs of Manhattan, the Bronx and Queens, and to cost approximately \$30,000,000 has started and is expected to be finished in four years. The structure will be 16,850 feet in all, the main part will have facilities for the operation of eight lines of vehicles and the Manhattan connection, six lines. There will be two five-foot walks for pedestrians. The bridge has been designed to harmonize with the Hell Gate arch bridge and will have a central span, 1,100 feet long, and two side spans, each 500 feet. The portion over the Harlem river will consist of a double-leaf bascule affording two channels, each 150 feet wide, and a vertical clearance of fifty feet at mean high water. Toll will be charged for passage across the viaduct, which is expected to prevent a traffic-congestion crisis that might develop, due to the increase in communication between Manhattan and Queens with the opening of the new artery at West 178th street.

FOOT LEVER ON WASH BASIN SAVES TIME AND WATER

Addition of a foot lever by which the water is turned on, is the latest improvement on the circular wash basin popular in large industrial plants. It leaves both hands free to use the liquid soap which is supplied from nozzles in a center rack, automatically shuts the water off when the foot is released, to prevent waste, and simplifies the cleaning of the basin. Water is poured forth as a fine circular spray, and is so distributed that ten men at one time can wash conveniently and thoroughly with no more water than ordinarily would be used by one man with an old-type single nozzle, continuously running.



Men Turn the Water On with Their Feet as They Wash at This Big Basin, Large Enough for Ten



Steel Lattice around High Smokestacks, to Shield Their Unsightly Appearance in Residential District

STEEL "DRESS" FOR SMOKESTACK IMPROVES CITY'S LOOKS

To hide the bare outlines of tall smokestacks on a power plant near a residential district in New York city, a framework of steel has been built around them. This feature, with careful smoke control, makes the plant much less objectionable to persons living in the neighborhood.

WINDSHIELD WIPER IS HEATED TO DO BETTER WORK

Ice and snow are said to be removed from the windshield as easily as moisture, with a wiper that is electrically heated. In most respects, it resembles the ordinary unit, but has a resistance element that comes in contact with the glass, keeping frost from accumulating and also expediting the removal of water.



Brake Mechanism Which Enables Pilot to Change Pitch of Propeller and So Slow Plane Down Quickly

BRAKE ON AIRPLANE PROPELLER TO AID IN LANDINGS

Airplanes can be stopped within a space about twice their length when landing, according to claims of a western inventor for his propeller brake. It consists chiefly of a small motor, with push-button regulator on the control stick, whereby the propeller can be made to push the air instead of drawing it back. This is accomplished by changing the pitch of the blades with the motor apparatus. It is expected that the device will also be of aid to the pilot when the plane strikes air pockets or other "bumps" along the sky ways.

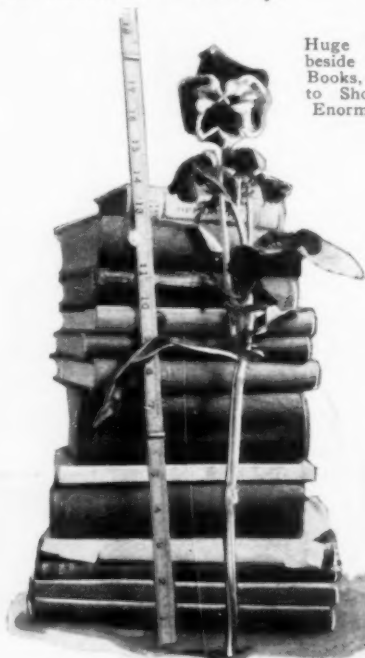
ROGUES' GALLERY OF MOVIES TO HELP CATCH CROOKS

Short pieces of motion-picture film, showing the subject in different poses, will be filed away in the rogues' gallery in Chicago, if present plans of the police department are carried out. It is believed that the movies will greatly help in identifying suspects, as they will show how

a man walks and performs other movements which would give additional clues to their identity.

FOUR-INCH PANSY BLOSSOMS PRIZE GARDEN FLOWER

Pansies with blossoms four inches across and with stems eighteen inches long, are grown by a Connecticut florist in large numbers every year. They are the result of selection of seed and care, but the grower declares that anyone could produce equally handsome flowers by proper methods. The seed is planted outdoors in summer and the plants are removed to hothouses at the approach of cold weather. They are reset in soil in which the flowers never have been grown before, and, at the end of the season, the soil is entirely replaced by new. Ordinary fertilizers are used, but one of the mysteries of the plants is that they will grow to such large size only in certain localities and, after having produced huge blossoms for a number of years, they will suddenly lose their size and quality. These constitute some of the hazards of the pansy-producing business the grower declares. In good seasons, however, he may ship as many as 75,000 blossoms in one day.



Huge Pansies beside Stack of Books, and Rule to Show Their Enormous Size



The Prince of Wales and Lady Mountbatten, in the Front Seat, Getting Ready to Emit Shriill Squeals, Just Like Any Other Customers at One of Coney Island's Rides

By HOMER CROY

INVENTORS of amusement-park devices gamble on human nature. And human nature is a queer fish. No one knows when it is going to bite.

Consider the case of William F. Mangels. He has been the inventor of amusement-park devices ever since he was a boy and has more than fifty patents to his credit. He built the "Razzle-Dazzle," the "Tickler" and the "Whip." The latter is a device of cars, fastened on a drive, which travel comfortably along a flat track until they get to the end of a straight run, when they whip around the corner with a sharp snap, from which it takes its name. It was tried out in Luna park, Coney island, in 1914, and has since traveled all over the world. The royalties on it have amounted to \$300,000.

But last year Mangels got the biggest idea of all. It was much better than the "Whip" and had a novelty which the public had never seen. He drew up his blue-

prints, got in his best builders and mechanics and set to work. It was to be the biggest and finest achievement of his life. At last the device was done and it fell as flat as a porous plaster.

"Why did it fail?" I asked him.

"Because it was paced too slowly. I was ten years late."

The public wants speed, he explained. The automobile has completely revolutionized riding devices. People used to be willing to poke along, but now when they go out for a good time they want it quick and fast.

Returning to the "Whip," the idea back of it has intrigued many an inventor. The favorite plan has been to add to the thrills and give the public an extra motion. One is to make the car, when it whips around the corner, turn completely around. One inventor added an up-and-down motion. The funeral was impressive. The reason was that a person out for pleasure can't

stand two motions at the same time. Instead of thrilling people, as the inventor had hoped, it made them seasick.

What will go and what will not, what will succeed and what will be a headstone, cannot be predicted. Before the World's Fair opened in Chicago, in 1893, an inventor came to the board of managers and asked for a concession to put up an amusement device. The management looked his blueprints over; they didn't think much of them, as the blueprints called for some sort of wheel extending up into the air, with seats arranged across it. He was advised against it.

"People aren't going to risk their necks on a thing like that," they told him.

But he posted the advance money and went ahead with the idea. The man's name was Ferris and he called his riding invention the "Ferris Wheel." To the astonishment of the board of managers, people rushed to risk their necks on it and the device became almost instantly world-famous. The day the fair closed, the "fool" who had invented it counted up his

money and he had taken in just \$726,000. It was new, it caught the public fancy, but it was an exotic flower that, financially, bloomed only once. The wheel was taken to St. Louis with the expectation of making a million, but it took in only \$450,000. At each succeeding exhibition its returns grew less. Ferris put out other inventions but none of them pleased the ever-fickle public, and he died on the fringe of want. The wheel, however, still appears in small size in the suburban parks, but the mastodon which amazed Chicago has joined the silent dodo.

In the world of outdoor-amusement inventions, you never know which way the "cat is going to jump." Some years ago there was a young boy working in an architect's office in Nashville, Tenn., at ten dollars a week. A fair was going up at Nashville and a prize was offered for the best architect's design for one of the buildings, and the young man entered his drawings under another name. When the award of \$2,500 was announced it was found that a lad, still in his teens, by the



Noah's Ark, One of the Successful "Walk Through" Entertainments Which Lets the Customer Do Most of the Work of Amusing Himself, While He Pays for the Privilege

name of Frederic Thompson, had won it. He took his wealth and went into partnership with an amusement man and put up an attraction at the exhibition. He made money, and then went to other fairs and exhibitions. Sometimes he won, and sometimes....

Once he rented an old coal mine at the edge of a fair grounds, lined it with red cotton flannel, put in some weird lights, called it the "Cafe de la Mort," and heard the pleasant tinkle of money coming his way. Next he went to Buffalo, where he put on "A Trip to the Moon," which made the Ferris wheel look like a peanut stand. And then, with banners flying, he marched to Coney island, the Mecca of amusement men. He put on "A Trip to the Moon" again and money still continued to roll in. And while the world was still dazzled by his brilliance, he conceived and built Luna park. He made money with both hands and spent it with a shovel. Money meant nothing to him and he died a comparatively poor man.

Where do the invention ideas come from that make the money—sometimes—at the amusement parks? Where do the fairies come from?—from the sky, from the clouds, from the flowers. Sounds ridiculous, doesn't it? But there is history to fall back on.

During the years of the Queen's jubilee, a tired inventor went over to England to get a rest. On the way back he came up on deck one day and lay gazing idly into the sky and letting his mind wander pleasantly among the clouds. Overhead, seagulls floated.

"If I could give people the idea they were flying, they would like it," he thought.



Sliding Down a Hill Has Just as Much Allurement for Grown-Ups as It Holds for the Children

The circling of the seagulls gave him the idea of working out a device which would fly in a circle. How? With some sort of a center pole supporting the cars. He took the idea to R. S. Uzzell, an old hand in the game; there were discussions, blueprints, promotions and the airplane swing, to be found in almost every amusement park, was born. There are now about 1,500 of them in the world.

A man in Portland, Oreg., sat on the floor one evening watching his son spin a top. The lad wound it up, pushed it out of the holder and set it going. The man pondered on the fun the boy was having.

"If I could invent a top that grown-ups could play with, I'd make a fortune," he thought.

The idea was alluring. "People are only children grown tall," he reasoned, and began to turn the idea over in his mind. At last, he worked out a principle by which a huge top could be constructed with cars on which people could ride, while the top spun merrily. But there was nobody in Portland familiar with the amusement game; getting on the train he went to New York. The men old in the business looked it over; it was a fine idea; passengers would be pleasantly pleased, but—its cost would be prohibitive. He was told it would require about \$18,000 to build, and he raised the money himself. It is the way fortunes are made—and lost.

When the first top was completed it had cost \$37,000. It was put up at Coney island—the "Giant Top," it was called. The inevitable happened. The people liked the sensations, it had the psychological appeal that amusement devices must have, but too much weight was concentrated in one place. Crash! The point broke, and a woman and child were injured, and two damage suits followed. It cost \$3,500 to raise the top again and to start it going once more, to say nothing of the money that went out in the lawsuits. The man with the idea failed; his home was lost and he retired from the amusement field.

Seemingly the idea was as good as the seagull idea, but . . . And that is something the amusement field is full of—buts.

Recently there was a storm in Florida and when the storm was over and the first people ventured out, a house was found balanced on the edge of a cliff. Chains and ropes were placed to secure it and curious people started walking through it to see what whimsies the storm had played. As they walked through the tilting house they had a curious sensation; they complained of being dizzy and when they came out they talked about how creepy it felt. The house became quite a local attraction.

One day an amusement-park man walked through it, and as he walked he wondered. Here was an idea; people liked it; people would pay money to see it. And so he had a house built using the same idea as that of the dislodged dwelling. He had the floors slanting and the windows set so that when a person walked in, the house seemed normal in every way; but after he had walked a few steps he thought that it must be a terrible night at sea. His feet had the curious feeling of stepping on nothing and they stumbled around like children who had been too long at ring around the rosy.



A Baby-Size Whip in the Children's Park at Coney; Trying to Improve on This Device Has Wrecked the Fortunes of No Less Than Eight Different Inventors in Recent Years

The explanation was simple. Everything was set at such an angle that the person going through the house had nothing to orient himself by, and he had the strange and creepy feeling of a world gone mad. The house was given various names, from the "Mysterious Knockout" to "Damfino." Under such names it is operating.

URGE WRECKING OF OLD SHIPS TO IMPROVE FISHING

A plan for converting useless old ships into assets is under consideration by the New Jersey fish and game commission. It has been found that fish are attracted to wrecks. So it is the idea of the commission to sink worthless craft off the coast where they will not be a menace to shipping and so draw the fish that feed on the marine animal and vegetable life that accumulates on the old hulls.

HOW THE EYES REVEAL DISEASE IS SHOWN BY CAMERA

Instead of tapping you on the chest and making you say "ah," doctors may peer intently into your eyes and take pictures of what they see with a special camera, if an instrument recently introduced becomes widely adopted. It is the product of Swedish experts, and, with it, physicians have traced the symptoms of various diseases in thousands of persons. The nerves, the blood vessels and the "seeing layer" of the eye are affected by maladies in such a way, the scholars say, that the changes are registered on a photographic plate and can be interpreted by a skilled doctor. A concentrated beam of light that is said to reveal minute blood vessels and nerves in the eye with the clearness of an X-ray, is utilized in connection with the camera in making the pictures.



Examining Patient with the Eye Camera Which Is Said to Enable Physician to Detect Disease

GEARLESS MOTOR CAR IS RUN ON TURBINE PRINCIPLE



Adapting a Principle of Steamer Propulsion to the Automobile; the Car with Turbine Drive

Instead of a system of gears an automobile devised by a Scotch inventor operates on the turbine principle. Power from the engine is transmitted to the drive by means of sets of revolving blades through the medium of a liquid.

FIND GOLD THAT TURNS BLACK IN AUSTRALIAN MINES

All gold is not alike. The Australian gold is redder than that found in California, while that from the Ural mountains is of a still deeper shade of red. Recently "black" gold was found in the famous "nuggety reef" in Australia. It assumes a silvery-white appearance when first taken from the ground, but turns black after exposure to the air. The metal is a natural alloy of gold and bismuth and, when properly refined, yields a gold equal to the nugget and sand varieties found elsewhere.



Cleaning One of London's Unique Weather Vanes; the Grasshopper on Top of the Royal Exchange

GRASSHOPPER WEATHER VANE HONORS BUSINESS MAN

At the tip of the staff on the Royal Exchange in London, is a huge grasshopper figure which serves as a weather vane and honors Sir Thomas Gresham, who founded the institution during the reign of Queen Elizabeth. Once a year, the vane is given a thorough cleaning by a steeplejack.

LOW-COST PARQUETRY FLOOR IS EASILY LAID

Parquetry flooring can be installed at about the same cost as strips, it is said, with specially prepared units, joined together with tongues and grooves on all sides. The blocks are made in two sizes, one eighteen inches and the other thirteen and one-half inches square. They are composed of carefully matched smaller pieces ready for laying, and it is claimed no special requirements are needed for the subfloor, which may be the same as that prepared for the strip flooring.

FAST MOVIES OF AIR CURRENTS TO HELP AVIATION

With a camera that can take 20,000 pictures a second, movies of air currents have been prepared for reference study in aviation. Details of breezes moving at fifty miles an hour, are revealed so clearly that the eye can easily follow the movements around various obstacles. The flight of a pistol bullet through an electric-light bulb looked like the slow bending and final disintegration of the glass. Currents of air from a windmill and the passage of the air around an airplane wing were also shown. The film was recently exhibited in New York, after being prepared in Japan with the "super slow-motion" picture camera developed there. The instrument is the outgrowth of research by German scholars and craftsmen. It has two parallel disks, one with a large number of small mirrors which reflect the image obtained through the lens of the other disk, which holds the films.

FLEXIBLE-CABLE LANDING LIGHT PREVENTS DAMAGING PLANE

By anchoring the landing lights on his aviation field to flexible cable supports that bend over without breaking when struck, a Texas manager has found a way to preserve the lamps and prevent damage to airplanes. The plan was adopted after several accidents had occurred, when ships struck the rigid standards.



Planes May Strike but Are Not So Likely to Break This Light, as It Is Attached to Flexible Cable

POLLEN COLLECTORS HELPING HAY FEVER VICTIMS

The old saying that it is an ill wind that blows no one good is well illustrated in the case of two enterprising former students of the University of California, who conduct a profitable business in collecting pollen to be studied by the hay-fever experts. The tiny grains are bottled and sold for \$1 to \$6 per gram, depending upon the variety. The pollen is ana-



Weighing Pollen, and Some of the Plants Collected for the Dust; the Pollen Is Believed to Spread Hay Fever and a Curb Is Sought by Destroying Plants That Produce the Harmful Kinds

lyzed in laboratories to determine if it is of a kind that contributes to hay fever troubles and, if found "guilty," efforts are made to eradicate the weeds that produce it, or serums and other substances are prepared to combat it.

WHEN A SHIP IS ARRESTED

According to maritime law, ships, like men, can be arrested for failure of the owners to pay just claims against them. Some large ports have a special dock which is used as a sort of marine lockup. In case of an arrest, a sheriff's officer usu-

ally comes aboard, shows a warrant of arrest to the captain and nails the document to the mast. The ship is then legally a prisoner. According to British maritime law, anyone who has done any service for the ship, such as towing, repairing, lending money or even laboring as a seaman, can demand payment from the owners and, if this is not forthcoming, arrest proceedings are authorized. Sails, gear or other instruments can be taken to the amount of the claim. When a ship rams another, or fouls it and then steams off without making good the damage, it may be arrested within three miles of any British port.



Triangular, Three-Sided Targets Used at Sea to Give Speedy Destroyers and Swooping Airplanes a Chance to Attack from Any Side, Making Complicated Maneuvers Possible

By G. K. SPENCER

SMASHING a thirty-foot target in the sea, eighteen miles away and out of sight of her gunners, the U. S. S. "West Virginia" recently has passed all world's gunnery records. Though the gunners did not have the slightest glimpse of their objective, owing to the curvature of the earth's surface, the co-operation of the fast observation planes resulted in the achievement, which brought a great sum in prize money to the gunners and the control forces.

The system by which this firing was made possible is one of the marvels of modern gunnery. Upon receiving information that their ship would be called upon to fire an unusually difficult schedule, in common with other vessels of the battleship divisions, the gunners were practiced assiduously in the southern drill fields of the Pacific ocean before they entered the Atlantic through the Panama canal. "General quarters" was sounded frequently and the men drilled by day and night at the great guns. The exhibition of morale was astonishing, but one of the most amazing

elements of all was the fact that not only the gunners, but the entire ship's company, in a divine service to which attendance was entirely voluntary, prayed for the success of their guns in the firing to come.

"The ship was in high morale that day," quietly commented an officer, who was asked to explain the result of the firing. "All hands helped us," declared a gunner. "they gave us perfect ranges from the tops, the radiomen caught every signal perfectly, the engineers gave us just the right amount of steam and power to the fraction of an inch of ship movement, the plotting room didn't make a single mistake, the "bridge" swung the ship's wheel accurately to keep our guns on the target, our captain trusted us—he knew the ship was right."

This gunner really epitomized the operation of the great ship, by which 1,400 men each performed a scientific task with perfect accuracy—and helped the gunners. He indicated that it is no longer sharp-eyed gunpointers who are solely responsible for hitting a naval target at sea, but



Gunnery Umpires, on a Platform Erected on the "California's" After-Turret Rifles, Watch the Shells Fired by the "West Virginia," While the Turret Motors Swing Them About

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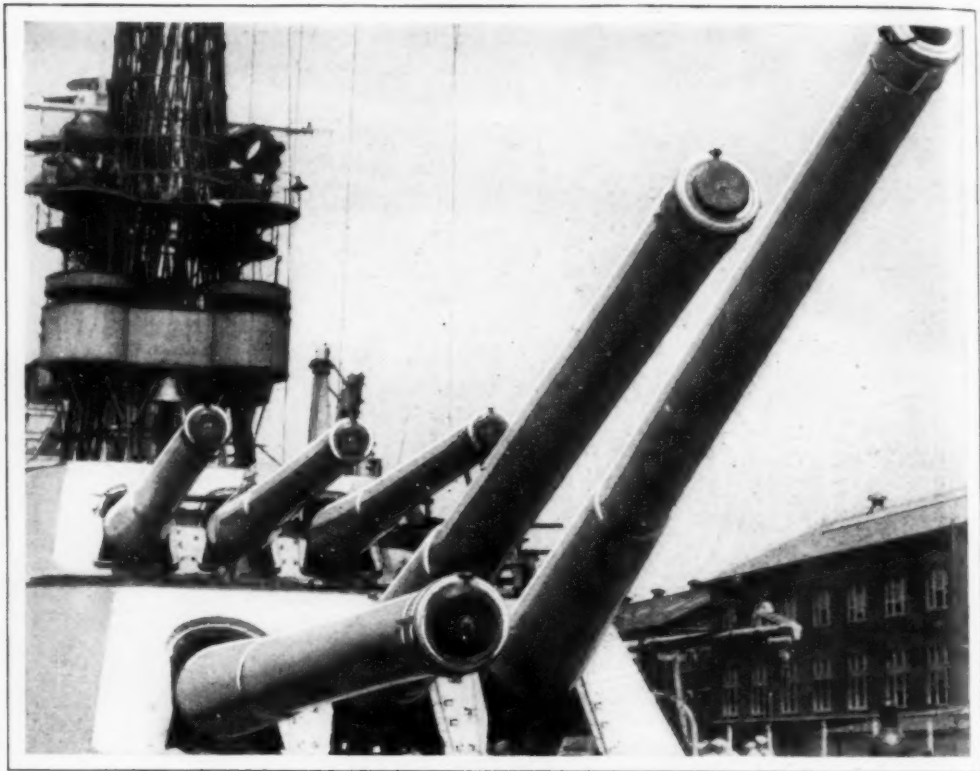
that 1,400 men are really behind each shell which is fired, for if the helmsman were nervous at his wheel, it is manifest the guns would be moved enough to throw them off their target. If an engineman gave too much oil to his boilers, the increased steam pressure would forge the ship ahead too rapidly; if a radioman failed to accurately receive a signal from the observing aircraft, the range would be in error, as it also would if the aircraft observing the target failed to judge correctly the number of yards by which the projectiles were going over the target or falling short of it.

The day of firing is preceded by months of practice drills. All hands must be perfect at their stations. A slight error may mean the lives of a hundred shipmates. The drudgery of the work is relieved by thoughts and hopes of the coming "shoot." Drills not only include the gunners, but the rest of the ship's company. The enginemen are at their stations simulating war conditions; the hospital corpsmen are at their battle dressing posts, the carpen-

ters and shipfitters are at their repair stations ready to "clear away wreckage." It is an inspiring moment when the "West Virginia's" bugles are sounded throughout the ship by telephonic loud speakers, and 1,400 men spring to battle stations.

Just as an intelligent trainer brings his athlete to a fighting edge and never permits him to go stale, so the shooting crews of the "West Virginia" are brought along until they are tense with the desire to see and hear the "big steel" thunder out its message to the waiting targets. Only the targets do not wait, but are towed rapidly by another vessel, which necessitates very fine adjustments to hit them. There is tension—but no nervousness. There must be perfect timing of all operations.

The turret is formed of three separate decks, all included in a great circular armored shaft of steel. On the top deck, the gunners stand on a narrow platform and work the guns; on the next deck down the shell room is located and shells are raised by electric elevators; on the next deck below is the powder room, from



Six of the "California's" Great Rifles Undergoing Elevation Tests to Try Out the Mechanism before Putting to Sea for Target Practice after the Annual Overhauling

which powder is also raised to the guns on electric elevators. The whole system is adjusted to a point where the men in the powder and shell rooms operate their small elevators so that, as soon as the shell is rammed into the breech of the gun by an electric ram, the powder elevator is rising with the powder. In case of serious accident, every man in the turret is willing to throw the proper valves which will isolate the turret, flood it and prevent fire spreading. The magazines, too, may be flooded, and the men in them are ever willing to die themselves if it be necessary to save the ship. When the U. S. S. "Mississippi" suffered the loss of twenty-one men in her No. Three turret three years ago, the entire ship was saved from destruction by a magazine explosion only because one of the men flooded the magazines as he was dying. His hand was found firmly clenched to the valve handle. Such accidents are now believed impossible, the navy having developed a system of creating air pressure in the turrets, so

that as soon as the gun breech is thrown open after firing one projectile, the air pressure from the inside is stronger than that from without, and the air rushes out through the gun's barrel carrying all unburnt powder and other hot debris from the gun out to the deck. Previously the air would rush into the magazine from the outside through the gun muzzle, carrying the hot powder particles into the space where there were hundreds of pounds of powder bags awaiting the next loading.

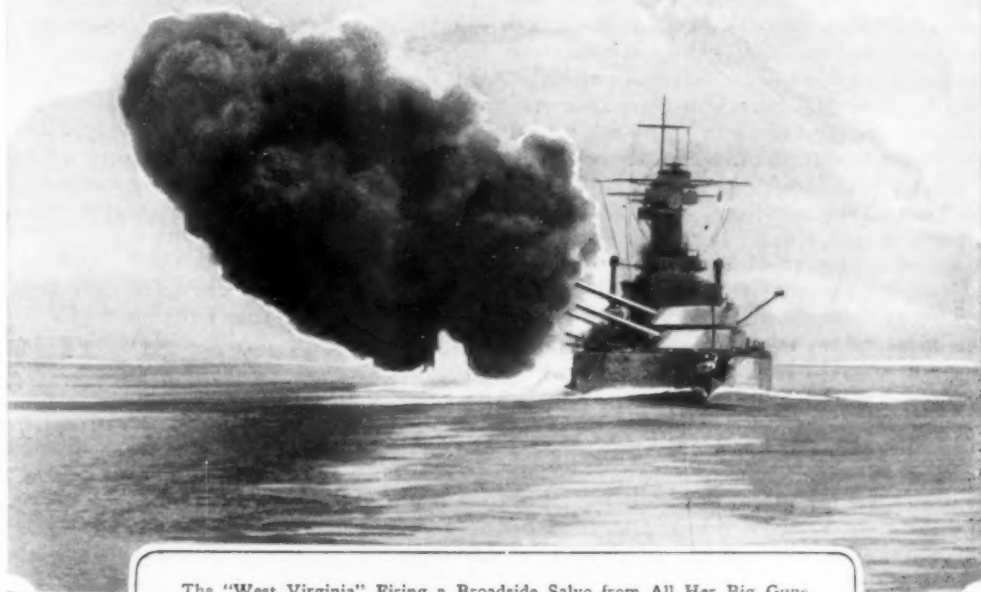
The big day arrives! The ship will shoot at noon! Up on the boat deck, where the anti-aircraft guns are mounted, the officers are making a final check of everything. The "director" crews are aloft, for now the United States navy uses the scientific "director fire" method which was first used by the German navy at the battle of Jutland. A gunner, standing ready, chalks a fanciful name on his great weapon, "Battling Betsy," for instance, and an old officer, standing by, brings his



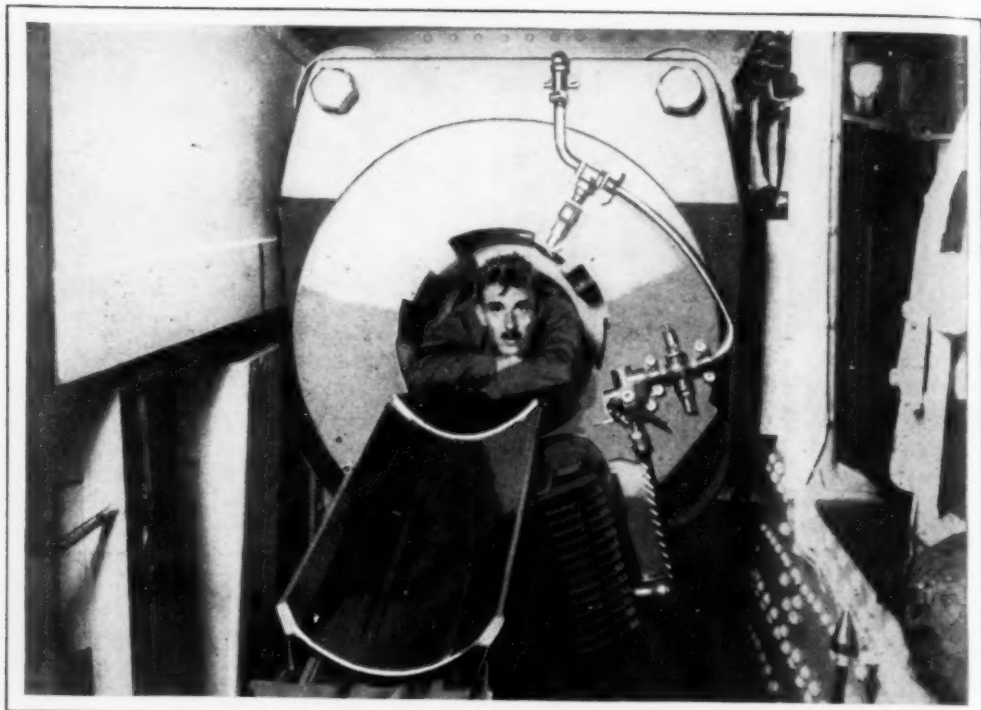
The End of a Target; the "California," from Which the Picture Was Taken, Is Towing the Target, While Shells from the "West Virginia," Eighteen Miles Away, Have Just Smashed It



Naval Aircraft Aloft, to Spot the Shots and Radio Corrections, Thus Defeating the Smoke Screen Thrown Up by the Destroyers



The "West Virginia" Firing a Broadside Salvo from All Her Big Guns, Which Can Be Brought to Bear on Either Side



The Breech of One of the "West Virginia's" Turret Guns; the Trough in the Foreground Is the Wheeled Cart Which Brings the Huge Shell Up to Be Slid In Where the Sailor Now Rests

eyelids to a wistful half-close. He remembers that the American navy has named its guns thus from the days of Paul Jones. "Good gunner," he thinks, "fine boy, and navy to the core." A high-school boy from the middle west, blond and young.

All hands are now at action stations; the ship is stripped for war. High up on the signal bridge the ranking officers pace, awaiting word from the admiral. Signalmen stand ready to haul down the "commence firing" signal flag, and hoist the blood-red pennant which signifies the ship is manning her guns.

The radiomen are tuning their sets to the airplane wavelengths. On deck the catapult men are preparing to shoot a plane from the ship with powder, as though the plane were being fired from a gun. The plane is hoisted to the catapult, hooked on—mechanics carefully test all connections, try all valves, tighten a nut here and there—then the officer aviators come on deck in their khaki flying uniforms and carefully buckle their parachutes, on which they sit when aloft.

Suddenly a flash of red bunting breaks

from the bridge and rapidly shoots upward. The aviators scramble into their plane. Another signal flag, this time a green one, flashes upward to the main truck of the foremast and the pilot raises his hand. The catapult is fired and the plane dips and begins to take the air. From other ships planes of the same type rise, they join and take battle station in the air, some with ominous machine guns poking fore and aft to protect other planes which fly lower. The commanding officer of the air takes command and all the planes forget the surface and obey the new commander, who is in turn instructed by radio from the admiral on the "West Virginia." The fleet is ready to open fire.

Deep in the bowels of the ship, the radiomen are tense at their instruments. The observer in the planes tunes in on the predetermined wavelength, which will change as the battle progresses, in order to confuse any "enemy" listeners. In the turrets, the big steel guns rest calmly in their carriages—110 tons of dormant destructive power. It is the calm before the storm; for these 16's are as loud as they are pow-

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...oul. The sound of their discharge is difficult to describe. Not just an ear-splitting crash, but an infernal super-thunder that reverberates long after the shell is speeding on its flight. The writer has been on deck behind a turret when the big guns were fired and the feeling is as though some giant hands were crushing one's body from all sides.

High aloft, the speeding planes await the striking of the first shot. They see the "California" towing the target rapidly. She is so close to the target that a landsman would believe it inconceivable that another battleship, eighteen miles away, could hit the bit of canvas without at least endangering her. But naval gunfire is so accurate today that there actually is no danger. A man might appear in a row-boat 200 feet ahead of the target and be perfectly safe so long as he could keep that distance away from the target.

The radiomen in the "West Virginia" suddenly hear their call sign and begin to receive directions from the planes in the air eighteen miles away. They hear, "100 over," and immediately yell it into a voice tube which reaches the bridge and gunnery officer. Instantly the turrets change the lay of their guns and fire again. Again the monster guns crash out, and this time the planes radio, "straddle"!

The guns are "on" and the welcome words from the planes, "no change," delight the waiting crews on the guns. These were the words passed that memorable day at Gonaives off the Haitian coast when the "West Virginia" made her record.

OLD AQUARIUM USED AS CHURCH SERVES RURAL COMMUNITY

Having been abandoned as a home for fish, an old aquarium in an Ohio city was remodeled into a community church. Its shape afforded a roomy auditorium, and the only alterations made were an entrance and a hallway.



Aquarium Transformed into Church in Ohio City

NOVEL SIPHON EMPLOYS BULB TO START AND STOP

Small Metal Siphon Designed to Extract Cream from the Milk Bottle, and a Big Tube for Barrels



A novel siphon built of aluminum tubing and equipped with a rubber bulb by which it can be started without the usual sucking has been patented by a Chicago inventor, who is marketing it in sizes small enough to extract the cream from the milk bottle, through grades up to siphons big enough to empty oil and gasoline barrels. A U-shaped tube extends into the container, and a third leg is bent down over the outside to provide the outlet. The intake hole is on the top side of the bend in the container. After the siphon is inserted, the rubber bulb is pressed once to expel the air and fill the "U" with liquid. A second pressure on the bulb forces the liquid over the upper

bend and starts the flow. The bulb can be held depressed, or slowly released without interfering with the action, and the flow can be stopped at any time by squeezing the bulb and releasing it quickly, which action draws the liquid back over the upper bend.



Courtesy George C. Hanson

Where Modern Manufacture Is Competing with the Old; Native Mongol Hut and One of the New Variety

TAXICABS AND CAMELS MEET AT ORIENTAL FAIR

What spectators declare is the most rudely picturesque bazaar in the world is the Gandjur fair held at Barga in Manchuria, the meeting place of east and west. A camel market is a conspicuous feature, but automobiles have been introduced and one taxicab driver is said to have made \$2,000 in six days, operating his car day and night, hardly stopping for food or rest. Ready-made houses, manufactured by Europeans, and resembling in some respects the mail-order variety popular in this country, have also appeared. They are made of wood, the parts being standardized for quick assembling. The native Mongol dwelling is known as a "yurt." It is constructed of skins with a hole in the domed roof for the smoke to pass out from the fire, which is built in the center of the earthen floor. Foreign-made furniture has also been displayed in recent

times. Much of the merchandise is hauled to the fair in native carts. The wheels are interesting details of these vehicles, the felloes being fashioned of a wooden stick from a single pole and bent into circular shape. Although the few automobiles that have appeared have proved popular in general, the exhibitors do not like them, for the machines frighten the horses and oxen.

FISH FROM TROPIC TRAVEL TO ZOO IN LUXURY

Scarlet fish, hermit crabs and jazz fish journeyed in luxury recently from the Madeira islands to the London zoo, for they swam in big tanks filled with continuously flowing steam-heated sea water, to duplicate as exactly as possible their natural surroundings. Nearly

ninety specimens were successfully transported. A large wooden tank was divided into compartments and fitted with steam pipes, while fresh water was pumped into the tank and kept at constant temperature by the steam.

STRIP INSULATION FROM WIRE WITH TIMESAVING TOOL

As a substitute for the slower method of removing insulation from wire with



pliers or other tools, a stripper now on the market is intended to save time and work. It has two notched steel jaws, which are snapped

around the wire simply by depressing a floor pedal. This cuts the insulation without touching the wire, and an easy pull slides the covering off.

CATCHING BIG GAME FISH FROM SMALL BOATS



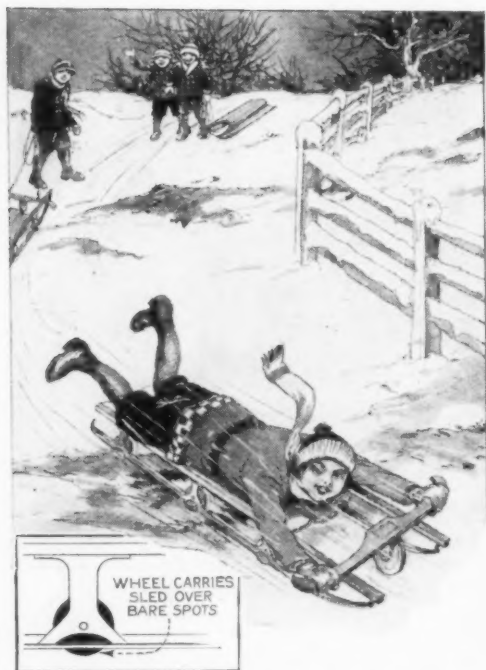
Landing 175 Pounds of Hammerhead Shark in a 200-Pound Boat, an Excellent Catch in the Pacific Ocean



Coming Home with a 143-Pound Tuna, Caught after a Hard Fight from a Sixteen-Foot Skiff, Above; Below, an Enormous Black Sea Bass Landed from a Little Outboard Motorboat; the Fish Weighs as Much as the Boat or the Fisherman



The Big Tuna, Caught with Rod and Reel from This Small Outboard Motorboat, Weighed In at Just Eight Pounds More Than the Fisherman, Who Tipped the Scales at 145 Pounds; the Tuna Is One of the Best Fighters in Salt Water



Bare Spots in the Coasting Slide Have No Terror for This Sled with Wheeled Runners

SLED WITH ROLLER RUNNERS SPEEDS OVER BARE GROUND

Bare spots on the coasting slide will not stop a roller-runner sled now on the market. Inserted in each runner, are three small wheels that project slightly so that, when bare ground is encountered, they permit the sled to pass swiftly over, yet do not interfere with the speed on snow. If the soil is not loose or muddy, the sled may be used for summer coasting and, when so employed, is easily steered by a wheel on the guiding arm. This has a spring that acts as a shock absorber if the wheel strikes an obstruction.

MAKING WEATHER FOR THE ZOO GUARDS ANIMALS' HEALTH

The hippopotamus is apparently a hardy creature, but it must be given special care when winter comes to the zoos. The hippo's bath must be kept at a temperature of fifty-five to sixty degrees. Monkeys suffer from colds and more serious lung troubles if not kept in temperatures equal to those of their native haunts, so the air is cleansed and moistened by blowing it

through damp silk cloths. Preparations for putting the animals in winter quarters are commenced late in September or the early part of October. The Siberian tiger will stand much colder temperatures than its cousins from Africa, so the first few cold days are not likely to harm it. Many of the tropical birds learn to acclimate themselves to the rigors of chilly winds and storms, and many of the fur-bearing animals display longer or shorter coats according to the season, after they have been in captivity for a number of years, although in their native surroundings there is little or no variation in their fur.

AIR-SERVICE STATION FOR AUTO ELIMINATES GAUGE

No gauge is needed in using an automatic air-service station for inflating the tires. You simply turn an indicator to the desired pressure, pull out the hose on a convenient spring reel, apply the chuck to the valve and, while the tire is being filled, a bell rings. It stops when the proper amount of air has flown in. The hose is then released and coils itself up on the concealed reel. The unit is an at-



Filling Tire from the Automatic Air Station, Which Shuts Off Supply When Proper Pressure Is Reached

tractive addition to the usual service station and has a bulb labeled air at the top.

Bars of iron were used as money years ago in Great Britain.

Eight-Cent Gold-Digger



Twenty-Five-Ton Steel Miner That Can Earn Big Profits from Worked-Over Gold Sands That Wouldn't Have Kept a Forty-Niner Supplied with Food; Five Men Operate the Dredge

By H. H. DUNN

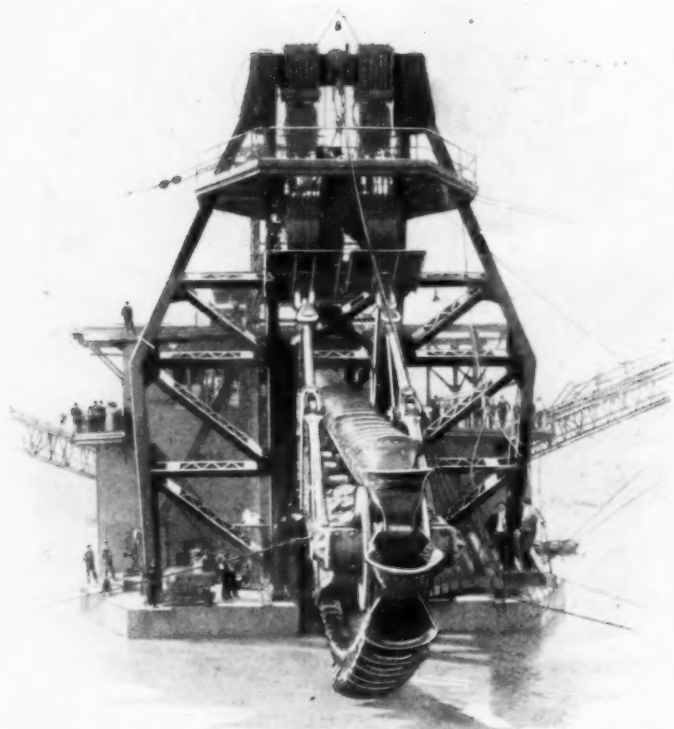
OUT of the great piles of sand and gravel discarded as worthless by the "Argonauts of Forty-nine," in their search for gold in California's mountains, new millions are being taken every year by a novel mechanical process, which does away with prospecting, makes mining a certainty and puts the yellow metal back as one of the most important products of the state. From ancient and often buried river beds, as well as from the mine dumps and tailings, handling nearly 100,000 tons a day, these great machines, the first of their kind in the world, are wringing wealth for their owners from sand and gravel running as low as eight cents a ton in gold.

These are the lowest-grade gold deposits ever worked by man. The mechanical miners that have reclaimed them are the largest in any branch of the mining industry, yet their operations are as carefully and as delicately carried on as those of any microscopic investigation ever undertaken in a laboratory.

There are six of these machines work-

ing the California mountains, digging their own paths, floating on their own rivers, piling up gravel and rock embankments, and searching out every fleck and flake of gold to a depth of more than eighty feet below their flat steel bottoms. More than 200 men are required to operate and keep them in repair; they work night and day, and consume as much electric power every twenty-four hours as a city of 60,000. They are built in the form of dry-land dredges, but they also operate on water.

Sifting a ton of sand and gravel to get eight cents' worth of gold would have been too delicate a task for the fingers of the miner of '49, and the results would not have kept him in beans and bacon, not to mention flour and molasses, since he was not able to "pan" much more than a ton of earth in a week. But the great scoops of the steel miner get it all, at a rate which has produced more than \$50,000,000 since the dredges went to work. In that time they have handled approxi-



Each Scoop Bucket on the Excavating Chain Weighs 4,400 Pounds and Can Descend Over Eighty Feet below the Water

mately 135,000,000 cubic yards more of material than were excavated in the cutting of the Panama canal.

Just as the placer miner of the days of gold in California shoveled the gravel into a crude rocker, poured water over it, and depended on gravity to drop the gold to the bottom, where mercury picked it up, so the dredge, taking a ton where the miner lifted a shovelful, goes through the same process mechanically. Five men, masters of the metal monster, handle more than 15,000 tons of gravel and sand in the twenty-four-hour day. There are, of course, three shifts of five men each in that length of time, but the crew of the dredge is never more than five men at once.

Two permanent channels, each 500 feet wide and nearly three miles long, have been dredged to a depth of more than sixty feet, and two others, which will be of approximately the same length and width, are now being made. The gravel, cleaned of all the gold, is piled in solidly packed walls along these channels, furnishing what the gold-

diggers' owners claim to be permanent holding walls, between which flood waters and freshets are carried away from the agricultural lands on either side.

All the work so far accomplished has been done on the barren waste of tailings, which accumulated in the days of unrestricted hydraulic mining, when millions of yards of this waste material was dumped annually along the upper reaches of the Yuba river, where the modern mechanical method of mining is being applied.

Each of the six dredges is larger than many a deep-sea steamer, being 165 feet long, 68 feet wide, and weighing approximately 2,500 tons. A set of huge steel scoops, hung on an endless chain running over the "trunk" of the metal mastodon,

reaches far down into the pile of gravel or the buried river bed and lifts out the dripping gravel. There are ninety-six of these scoops on the chain of each dredge, and each scoop carries one ton of material, when filled.

As the loaded chain moves sluggishly upward, dumping its content into the ever-open mouth of the mastodon, there follows a tremendous air-shaking medley of sounds, which becomes continuous as the dredge gnaws into the gravel. It is the crunching, groaning, roaring, grinding, clattering of stones from the size of a man's head down to that of a buckshot, all falling on moving metal screens and thence off these onto the shaking tables, until all has been sifted, the stones carried away and the heavier gold dropped through to be left in the grip of a pool of quicksilver.

The average depth to which the scoops go is sixty-two feet, but when a deeper pocket of gravel is found, the mastodon sends its great trunk down as much as



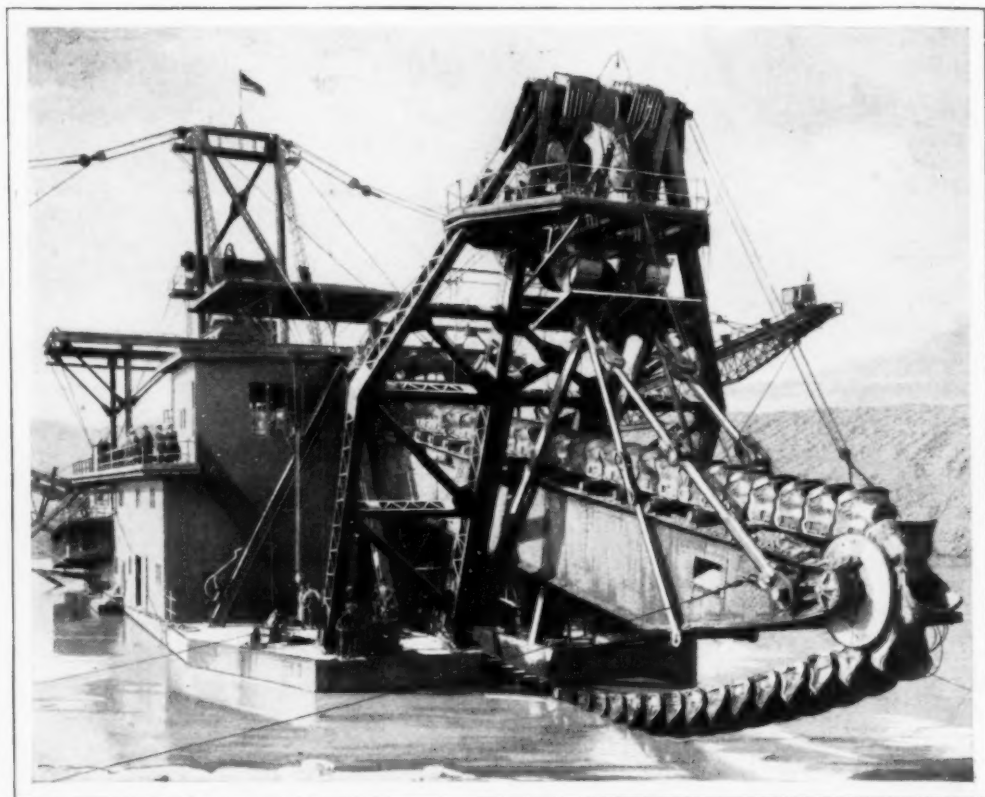
The Miner, with His Pan and Burro Supply Train, Could Handle a Ton of Gravel a Week, Whereas the Steel Miner of Today Extracts Gold from 15,000 Tons a Day

twenty feet farther—all in search of eight cents' worth of gold. Sand and gravel brought up by the scoops are dumped first into a huge steel hopper at the very top of the superstructure of the dredge. Thence they pass to a screen, which, revolving at a steady pace, separates the fine material from the coarse and discards the latter.

Water under heavy pressure is then automatically sprayed on the gravel and the finer, gold-bearing sand is thus washed through the screen into a distributor, from which it flows in a slow stream over rows of riffles, improvements over the sluice boxes of the hand miner who first worked these "diggings." In these riffles, quicksilver lies in wait to pounce on every grain of gold, so that, when the sand and gravel

leave the device, they are free of all values. In the meantime, the coarser gravel, from which the nuggets and flakes of gold had fallen away in the moving screen, is passed onto belt conveyors, which carry it over long arms and pile it at either side or to the rear of the dredge. When the engineer of this mastodon wishes it to move, he shifts a switch, and one or the other of two forty-five-ton steel legs—called "spuds"—languidly extends itself, buries its point fifteen or twenty feet in the river bed or bank, and, like a dancer turning on her toe, the 2,500 tons of dredge swings about. The second "spud" finds a hold, and the great machine either settles down to resume hunting for gold or continues "walking" on its twin steel legs.

It is estimated by engineers and mining



Cutting a Channel 500 Feet Wide, the Great Dredges Need Only Enough Water in the Pond to Float Them, For the Water Goes Along as They Move Forward in the Cut

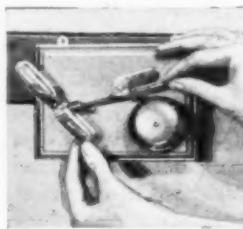
experts employed by the government of California that natural treasure, beside which that taken by the dredges is trifling, is still lying in the gravel deposits of the state. From 1853 to 1909, it is stated, \$1,200,000,000 in gold was produced by hydraulic and placer-mining methods from the river beds, old and new. State engineers believe that there are at least fifty, and probably one hundred, surface and buried-river gravel beds which never have been touched by miners, though their gold content may be too low for profitable working.

LONGER LIFE FOR RUBBER SEEN IN NEW TREATMENT

Chemists have developed a new treatment for rubber goods, to prolong the life of the material by counteracting the effect of oxygen. Experts declare that some rubber articles would last almost indefinitely were it not for the results of oxidation from the air. Tires, for in-

stance, suffer a serious loss in tread abrasion, owing to this process. Besides offsetting the action of oxygen, the new substance is said to counteract the effect of high temperatures, which is of importance regarding bus and truck tubes, often exposed to heat and air at once.

SANDGLASS EGG TIMER RINGS BELL WHEN DONE



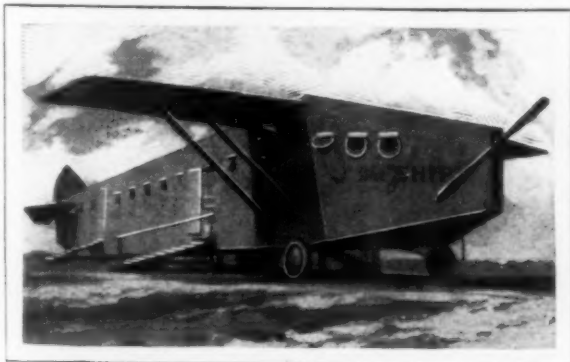
For boiling eggs up to five minutes, a timer operated by a sandglass has been introduced. It can be set for almost any interval under five, and as the sand runs into the lower glass, the weight causes the tube to descend. This releases another weight at the proper time, and a bell rings, announcing that the eggs are done.

GAS TO BE MADE AT THE MINES AND PIPED TO CITIES

Believing that the gas industry is still in its infancy, engineers predict that gas soon will be produced at the coal mines and piped into distribution centers, saving the costly transportation of coal and the erection of large plants on expensive land. The chief problem in the way at the present is a means of successfully transmitting the gas long distances and, when this is solved, it is believed that the gas industry will be able to take over a much larger percentage of the home-heating and cooking tasks than can now be done and that gas will be used much more extensively in manufacturing. Another problem that must be solved is the profitable disposal of by-products. Many of these materials have a limited market at present. How the gas industry is already aiding aviation was shown by the announcement that 1,500 companies are ready to mark their huge storage tanks with insignia that will help guide pilots. New England states—reported that the number of installations of home-heating plants using gas had increased from 1,308 to 2,600 in a year.

DANCE HALL LIKE MONOPLANE LATEST RESORT NOVELTY

Closely resembling a huge monoplane on the exterior, a dining room and dance hall in Fort Worth, Tex., has attracted considerable attention. It is sixty feet long, twenty feet wide and accommodates a fairly large crowd with comfort.



It Doesn't Fly but Dancers Enjoy It; the "Airplane" Hall near Fort Worth, Tex., for Dining and Dancing



Correcting His Own Lip Movements with Aid of the Mirror; Deaf Child Learning Speech

TALKING MIRRORS HELP DEAF IN LEARNING SPEECH

So that deaf children may more easily learn how to place their lips in correct position for pronouncing syllables, use is made of mirrors in a school at Atlanta, Ga. The pupils strive to imitate their teacher and with the aid of the reflectors, can correct their own errors.

SKIN REGISTERS EMOTIONS

Recent experiments by David Wechsler, a New York psychologist, have further shown that the skin is an emotional barometer, so that the familiar description of "thick-skinned" and "thin-skinned" persons has some basis in fact. However, the difference in behavior depends not so much on the question of relative thickness as on the electric resistance of the skin. Of all tissues, the skin is one of the best insulators and, like other materials, it offers less resistance to electricity when moist. Under various emotional strains, perspiration is induced, and the consequent increase in moistness results in greater conductivity of current. Practical use of this discovery has been suggested in the field of criminal investigations.



German Boys in the Special Car That Takes Them around the Zoo in Hamburg for Two Cents Apiece

SIGHT-SEEING BUS AT THE ZOO SERVES SMALL BOYS

For the equivalent of two cents in American money, small boys may enjoy practically all the wonders of the zoo in Hamburg even if the pens and cages are partly obscured by taller adults, for an elevated sight-seeing bus takes them all about the grounds. It holds thirteen passengers.

WHALES TAGGED WITH DARTS TO TRACE TRAVELS

Shooting silverplated darts into hundreds of whales, each dart being marked with the date and longitude and latitude, a party of British scientists have recently completed the first organized attempt to solve the life story of the big sea mammals. They spent two years in the antarctic seas, sailing in the famous old ship "Discovery," which was used by both Scott and Shackleton on their explorations of the southern ice continent. The expedition was directed by the government of the British colony in the Falkland islands, center of the whale-fishing industry of late years. The whalers have been asked to return the darts, with

the date and place where the whale was killed, in order that the age and migration of the big fish may be checked. The scientists hope to solve the riddle of the whale's family life, the number of his wives, and the length of his life. Although many whalers have claimed that the whales mated but once, the evidence gathered indicates that the whales really are polygamous. Besides studying the whales, they collected marine life in the southern seas to a depth of three miles. The "Discovery" was specially built for exploration in the ice pack, with plank-

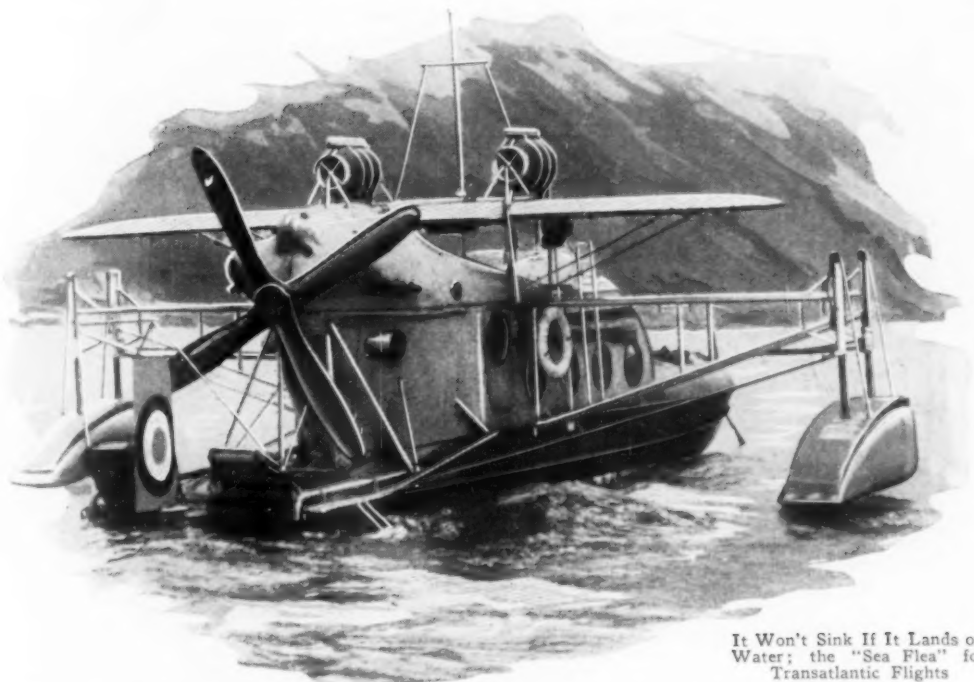
ing two feet thick backed by massive cross braces to resist tons of pressure, and fitted up for scientific research.

JEWELS THAT AIDED COLUMBUS VALUED AT HALF MILLION

The jewels that Queen Isabella of Spain pawned to raise money for financing Columbus and his voyage to America are valued at approximately \$500,000, although they are worth many times that from the viewpoint of their historical interest. The set consists of 280 stones weighing 500 carats, and the largest diamond weighs fifty-four carats.



Some of the Jewels That Helped Columbus Reach America; Part of Queen Isabella's Diamond Collection



It Won't Sink If It Lands on Water; the "Sea Flea" for Transatlantic Flights

"SEA FLEA" FOR OCEAN FLIGHT DEVELOPS HIGH SPEED

Half plane and half boat, an odd-looking craft, called the "Sea Flea," has been constructed for a flight across the Atlantic. It is designed to skim close to the surface of the water and forced landings will present no hazard, as the rig is constructed to float indefinitely. A speed of seventy-five miles an hour can be reached, it is claimed. On a test the flea crossed from France to England, a distance of twenty-one miles, in twenty-six minutes carrying three persons and the pilot.

SUPERSPEED PHOTOS OF TIRES TO REVEAL FAULTS

Thirty-two hundred pictures a second! That is the performance of a superspeed camera C. Francis Jenkins has developed for taking photographs of rubber tires while they are in actual service, so that engineers can determine where the strain and stress are distributed when traveling at high speed under varying conditions. The camera differs in many respects from the usual motion-picture instrument. Instead of one, it has forty-eight matched

lenses and the film moves continuously at the rate of 200 feet a second. The lenses are set in a disk which is rotated by an electric motor.

STRIPING AUTOS MADE EASY WITH PENCIL PAINTER

Applying the paint stripes to the automobile is usually left to experts because of the accuracy required. But with a striping pencil now on the market, a novice can perform the task without difficulty. The instrument is fitted with a specially designed base, which can easily be guided in a straight line by the car molding. A brass tube, containing paint, constitutes the pencil. It has a rubber bulb at one end for filling and a distributing point at the other from which the lacquer flows by gravity. Interchangeable barrels are provided for making stripes of different width.





By H. L. DILLAWAY

FOR twenty years I have been hunting some of the biggest game in America, though I have never carried a gun in all that time. For two decades I have photographed bears and written about them.

And still the most frequent question asked me is whether bears are dangerous.

The answer is that neither bears nor any other wild game in America is dangerous when you are letting them alone, or when something else has not happened to disturb them. But bears are individualists, just as much as human beings, and they respond to life in much the same way. We don't regard the human race as being dangerous because some people occasionally kill, and the same is true of bears.

In twenty years of hunting with a camera, I have chased bears and been chased by them, but I think it is easier to make a bear run away than to get him to run toward you. Bears may attack under certain circumstances, mother bears, for example, defending their cubs, but not all mother bears will do that, and quite a few of them will run away and desert their offspring. They really are as scared by man as he is of them.

I recall one day when a friend and I were walking along a mountainside and unwittingly passed by a mother bear's den. We heard her come out and dash away through the brush, so we turned back, located the den, entered and brought out three young cubs. They squalled and bawled terribly, but the mother did not come back, that day or any other, for we watched the den frequently to see if she would return. Had she kept quiet, we never would

have known there was a bear den near, but as it was, our passing along apparently ran her clear out of the country.

She got her revenge, though, for we paid dearly for the capture of those cubs. Every night for weeks they would wake up and squall until the nursing bottle was forthcoming, and never did all three get hungry at the same hour.

I have seen hundreds of bears, photographed them, studied them and tracked them, but I have never been scratched or mauled by one. I would rather take my chances, however, with any wild animal than a semi-wild one which, through captivity, has lost most of its fear of man.

A bear's eyesight is not good, and the best system when you meet one unexpectedly, is to remain perfectly still—or else charge. I have charged several bears, jerking off my coat and waving it wildly in their faces, and they have promptly turned tail and fled. Climbing a tree, if the bear belongs to the black or brown species, is useless, for they are both good tree climbers. A grizzly, on the other hand, is not, so a tree offers a safe refuge from "old Silver Tip."

with a CAMERA



Bears are very short-tempered, which explains most of their dangerousness. It is largely a matter of individuality, however. One bear will ignore a thing that will make another fighting mad, and on

another day their dispositions may be found quite reversed.

What they lack in eyesight, they more than make up in hearing and sense of smell. I know of one fully authenticated instance where a bear smelled carrion twenty-five miles away and headed directly for it.

In the hunt to photograph wild game, you are likely to run into new experiences. Your wits must always be working. One afternoon I was dead tired. I had scaled a high cliff and photographed a nest of baby eagles. Then I sat down to rest. I must have dozed. Suddenly I awoke, for no reason at all—just instinct. Not ten feet away was the largest brown bear I had ever seen. Bears were new to me then and I was scared stiff. The bear stood directly in front of me, waving his immense head from side to side. I never batted an eyelash; I couldn't. At last he moved away, went wearily over and sat

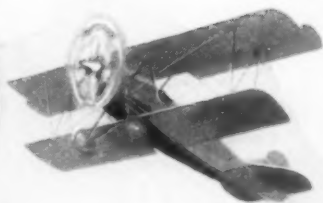
Pair of Small Cubs Discovering That the Trunk of a Dead Tree Is Not a Safe Refuge, and a Mother Bear, with a Rather Large Family, Snapped in an Unconscious Moment in the Woods



on a big fog, just like a tired old man. He sat there with his forepaws hanging down to his side, limp. I never saw a bear do that before or since. Bears like to stand on their hind legs, particularly the younger ones. As they grow heavier and older they are less likely to stand up. Cubs will spar standing up, and I have seen two-year-old, wild silver-tip grizzlies do the same thing.

Bears are large, bulky and look clumsy. They have an odd wallowing, rolling, head-swaying motion peculiar to themselves. To the uninitiated they seem to be slow, but a bear can stop a squirrel, mouse or gopher with a paw movement so quick that the eye can scarcely follow, and, as for speed, they can easily outrun a man. I once had a splendid chance to race a bear along a parallel woodland trail. We started together and I did my best, but, in no time he had left me far behind.

Another opportunity to try out an experiment on one of the largest black bears I had ever seen, offered on one occasion. I came across him suddenly, and we stood face to face on a path. I used a cowboy's trick to "rush him," for I wanted to see if I could scare such an immense animal up a tree. I only had a moment to work but figured he would run. I took off my coat, waved it in his face, and "rushed him" up that tree. I was utterly amazed at his speed as he went straight up. He set his hind legs under him and gave jerky jumps until he was well up among the limbs, when he turned about and faced me. He was apparently more surprised than angry and looked down as much as to say, "What in blazes is the matter with you?" When I walked away, he still bore the same expression.

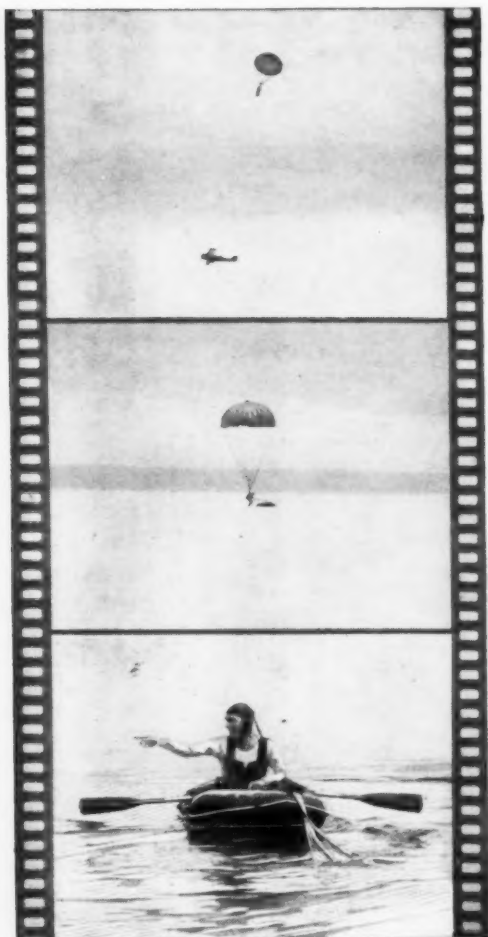


Climbing Up to Meet the Airplane Mail at Forest-Patrol Station, and Close View of Pilot Dropping the Bundle

MAIL DROPPED FROM AIRPLANE FOR FOREST PATROL

No one experiences greater joy at the arrival of the mailman than the forest lookout at his lonely post in the western mountains, but the sky, not the roads, is watched in this case, for the mail is delivered by plane. Special orders from the chief as well as other communications are dropped in a small package as the airplane, maintained by the forest-patrol service, glides down near the lookout tower and then zooms away for another delivery, miles away.

☐ We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.



Just off the Plane, Opening the Raft and Blowing It Up, Then Safe on the Potomac River

LIFE RAFT INFLATED BY GAS AS PARACHUTE DROPS

A recent test by marine-corps aviators has established the feasibility of including deflated rubber rafts among the safety devices of flyers. After reaching an altitude of 3,000 feet, in a training plane piloted by Lieut. V. M. Guymon, of Salt Lake City, Utah, Corp. R. L. Huffman stepped from the craft. At 2,925 feet, his parachute opened, and he unpacked the raft and inflated it with the two tubes of carbon dioxide which he carried. Three minutes after leaving the plane, he dived into the Potomac river and, immediately bobbing up, swam to retrieve the parachute and fasten it to the raft. Putting together the two-piece oars, he then calmly

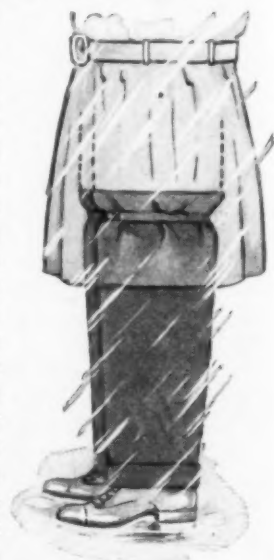
rowed to shore. The cylinders of carbon dioxide used to inflate the raft are only about twelve inches long and four inches in diameter. By turning the cylinder, carbon dioxide is discharged into the raft, inflating it almost instantaneously, or, in fact, in less than thirty seconds.

A PERMANENT WAVE FOR TREES

Walnut trees with figured grain throughout the entire trunk are extremely rare, and efforts to cultivate them are being made by grafting the top branches of a highly figured tree to seedling walnut roots. It is hoped that this process may result in a tree with the beautiful grain so much desired for fine furniture and veneers. It is said that only about one in the half million walnut trees cut each year is an "unusual prize" as a source of the best and most fancied wood. The cause of the curly grain is somewhat of a mystery. Its occurrence at the stump has been attributed to the swaying of the tree in the wind or to the crowding of the wood laid on an inside curve of the tree.

SLEEVES FOR TROUSER LEGS LATEST STORM GUARDS

Waterproof protectors for trouser legs, which can be slipped on in a few seconds and carried in the pocket when not in use, have been introduced in England. They are simply pulled on over the shoes, button in front and keep the trousers dry from the knee to the shoe top. An elastic band holds them in place at the top, as shown.



Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information.

ARTISTIC BRICK BUILDINGS SHOW GERMAN SKILL



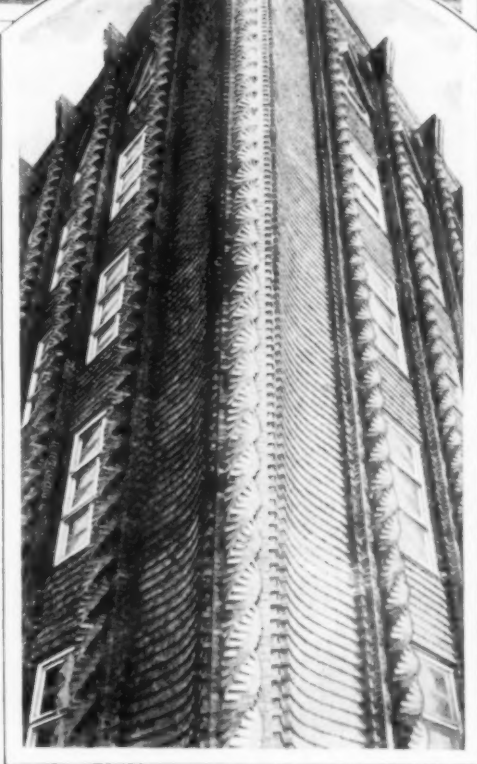
Courtesy Chicago Art Institute

Unique Effects with an Old-Style Material; Examples of Recent Brick Architecture in Germany

Since about 1100 A. D., when monks from Italy started making brick churches in Germany, Prussian craftsmen have excelled in the art of brick manufacture, and evidence that their skill has not declined with the years is seen in modern structures of the material being erected in Germany. The illustrations shown are all in the modern German style and utilize brick to advantage in emphasizing the plain, angular designs and broad surfaces.

FLORAL CLOCK AT CANDY STORE HELPS DRAW TRADE

From an old clock, a French merchant has devised an effective advertising display to attract customers. The dial of the instrument is of parchment, the hands are in the form of large bees and the hour markings are different flowers. As the clock ticks away, the "bees" pass from flower to flower, suggesting the gathering of sweets in which the merchant specializes.





Enjoying a Merry-Go-Round in the Swimming Pool; While Some of the Bathers Push the Platform with the Handles, Others Endeavor to Cling to the Rim

BATHERS' PUSH WHEEL ADDS SPORT TO SWIMMING

Bathers at a municipal natatorium in Davenport, Iowa, have fun on a push wheel that shoots persons seated on it into the water after it has attained sufficient velocity. Beneficial exercise is received in rotating it, and the riders have sport in trying to stay on as long as possible, although a final ducking is almost certain.

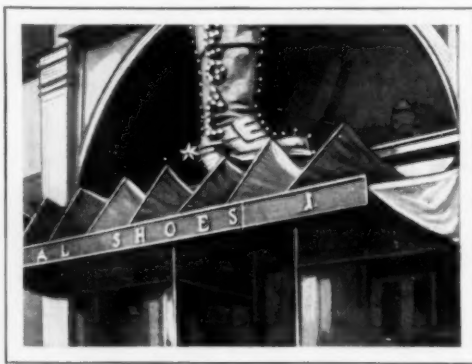
SUGAR WAS USED AS MEDICINE IN EARLY AGES

Humanity apparently has had a "sweet tooth" for ages, but sugar was first used as a medicine by the Arabian doctors about the seventh century A. D., according to a history of the substance prepared by the Pan-American Union. From those early times, and into the Middle Ages,

sugar was confined mainly to medicinal purposes and could only be afforded by wealthy persons. Today, America yearly consumes about 118 pounds per capita.

AWNING IS ADJUSTED TO SUN TO PROTECT GOODS

Store awnings in strips that can be turned to admit more or less sunlight, as the time of day or position of the canopy require, have been introduced as an improvement over the one-piece variety. The strips are less likely to hold water when the awning is down in time of rain and are not so liable to be ignited by cigaret or cigar stubs tossed from above, as there are gaps between the bands to allow objects to drop through. The strips can be turned to shield the contents of the display window and yet not exclude so much light that the merchandise cannot be plainly seen.



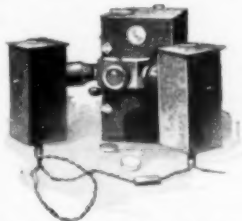
Sectional Awning, Set Angularly like Skylights, to Shield Goods without Excluding All the Sunlight

STEM REMOVER AIDS GRAPE-CANNING INDUSTRY

Development of a new phase of the canning industry is promised in the introduction of a unit which removes the stems from seedless grapes. It is said to have an output of five tons in a nine-hour day and to do the work at a cost of less than \$4 a ton. The grapes are dumped into a hopper and, as they pass through the outfit, they are caught by revolving brushes and pushed through a network of small, upright steel pins. Thus the bunches are broken up. The small stem is removed by passing the grapes over small rubber cylinders arranged in pairs. Canning of grapes has been done on a small scale for several years, but the excessive cost of stemming them by hand workers hitherto has prevented the widespread development of the industry.

MOVIE CAMERA AND PROJECTOR TAKE PICTURES ON PAPER

Motion pictures on film or paper are taken with a camera recently introduced in England. Combined with it, is a projector showing the photographs. The paper film is projected by reflected light with the aid of two special lamps attached to the outfit and is said to give sharpness and definition on the screen in no way inferior to the film. The camera can be loaded in daylight, the projector shows pictures over six feet high and the set is inexpensive.



Courtesy Clyde Brown

Lorado Taft Finishing Model of the Lincoln Statue Which Has Been Erected at Urbana, Ill.

ABRAHAM LINCOLN AS LAWYER SHOWN IN LATEST STATUE

How Lincoln probably looked while pleading a case in court is seen in the latest notable Lincoln statue, made by Lorado Taft for Urbana and Champaign, Ill. It was recently unveiled near the courthouse and in front of the hotel, which stands on the site of the old inn where Lincoln stopped when his business took him to the "twin cities." The figure is of bronze and the monument is ten feet high.

"SICK" FLOWERS ARE REVIVED BY ARTIFICIAL SUNLIGHT

At a fashionable London restaurant, a "sunlight lamp" is used to treat sickly potted plants. A wild orchid bloomed in eight hours after exposure to the health-giving rays and a faded bouquet, worn by a woman, was placed under the light to revive it.

The Most Dangerous Hour



By RUSSELL M. ARUNDEL

THE clocks of a thousand cities chime five each afternoon. Stores and offices pour out millions of tired, homeward-bound workers, and in the crowded streets children start one final hour of play before dinner. America's most dangerous hour has arrived.

Ambulance drivers inspect their mounts to see that everything is in readiness; hospital attendants give the operating rooms a final look-over, and in garages, the wrecking cars are wheeled to the front. For the next sixty minutes the bulk of the day's traffic accidents will happen. More lives will be snuffed out, more people will be injured, and more automobiles destroyed than in any other hour of the day—more in fact than in several of the early morning hours combined.

Some place between the Atlantic and the Pacific, some one is being killed or injured in a traffic accident at the rate of one victim every forty-two seconds of the day. But when the statistics are plotted, the chart shows that, instead of an even distribution of deaths and injuries, they reach their peak in that one crowded hour, when senses have been dulled by a hard day's work, and reach their minimum just before dawn when most people are home in bed.

Three times as many casualties result-

ing from highway accidents occur in a single year in the United States than were suffered by the American forces during their entire participation in the World war. During 1926, approximately 25,302 persons were killed and 759,060 were seriously injured in these accidents. An estimate issued by the American Road-builders' association lists the principal causes as inattention; children playing in the street; speeding; adult jay-walking and violation of the traffic laws. Of the total number of accidents occurring last year approximately 11,183 were caused by motorists; 10,805 were the result of improper conduct on the part of pedestrians and 3,314 were caused principally by physical conditions.

Research has uncovered many peculiar facts in regard to the causes and results of highway accidents. The knowledge of these facts has given national organizations interested in the public-safety movement a basis upon which to work and is expected to bring a noticeable reduction in accident casualties within a few years. Paramount among the conclusions that have been drawn from statistics collected from various rural districts and municipalities are:

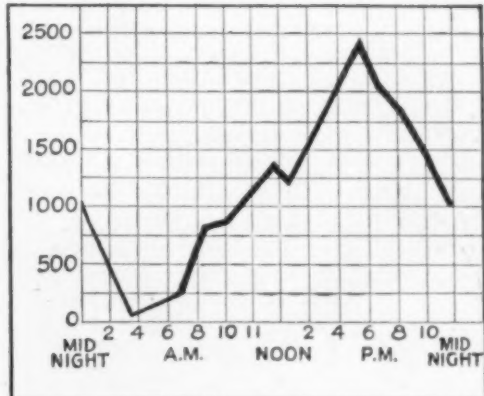
That the largest number of accidents occur between five and six in the after-

noon, when business men and workers are returning hurriedly to their homes. At this period of the day, congestion on the streets and highways is at its height.

That the accidents involving pedestrians are increasing at a rate much greater than the rate of increase of other types of accidents. In Massachusetts, collisions between automobiles have actually decreased, while the calamities involving pedestrians have nearly doubled since 1921. This seems to indicate that the American motorist is becoming adept in the art of dodging other vehicles but is unable to cope with the problem of foot traffic.

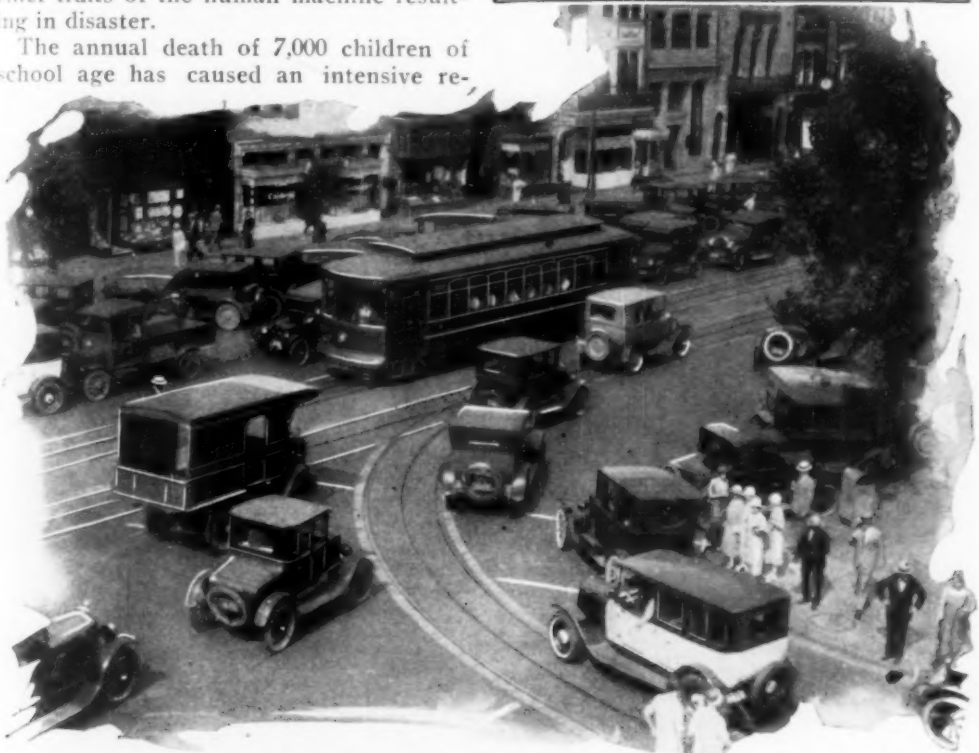
Less than five per cent of all accidents are the result of faulty mechanism of vehicles or improperly designed roads and streets. The human machine is responsible for the remaining ninety-five per cent of the accident total. Carelessness and incompetency have been found to be the chief traits of the human machine resulting in disaster.

The annual death of 7,000 children of school age has caused an intensive re-



Courtesy American Roadbuilders' Ass'n

Chart Showing the Time of 28,000 Accidents in New York State, with Their Peak during the Homeward-Rush Hour between Five and Six in the Evening, When They Reached a Total of Nearly 2,500 an Hour; Below Is a Pedestrian Problem—How to Cross a Busy Street Corner Like This without Risk to Life or Limb

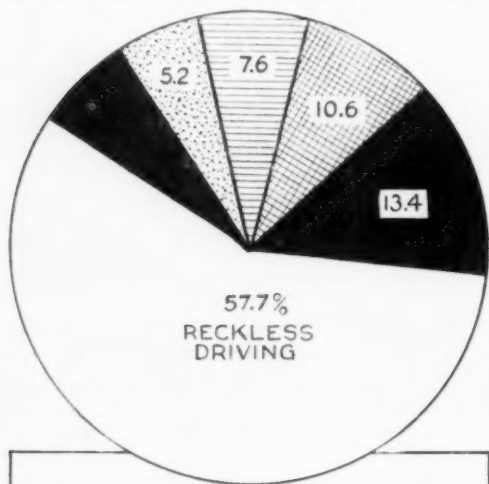


search into the causes of these youthful mortalities. It has been found that more than twice as many children between the ages of six and twelve are killed than in

any other similar group of years between one month and 70 years.

While the total number of accidents resulting from recklessness by intoxicated

drivers is small as compared with total accidents reported, they more often result in mortalities. Drastic legislation in nearly every state has brought the number of deaths from this source to a con-



Reckless Driving Explains the Bulk of All Auto Accidents; Then, from Right to Left on the Chart, Come Careless Minor Accidents, viz., Carelessness of Both Drivers; Careless Pedestrians, Faulty Equipment and Miscellaneous Causes; Below Is the Result of Approaching a Narrow Bridge at Too High Speed; Bridges, Embankments, Sharp Curves and Blind Corners Are All Heavy Contributors to Motor Deaths

siderably lower level than in the year 1921.

A great mass of data has been collected by organizations investigating highway accidents to show that the outstanding single mental condition giving rise to casualties is fatigue which, in turn, causes carelessness, recklessness and a general decline in the ability of a driver or pedestrian to act speedily and accurately.

In the child problem, general inattentiveness has been found the chief cause of fatalities and injuries. The child at play is a bundle of trembling nerves and, in the joy of the game, is almost unconscious of any world but his own. He may run into the street and, being there, continue his pleasant pastime without regard to the motorist.

Thoughtlessness and poor judgment are the cause of more than forty per cent of all accidents. These classifications include jay-walking, inattention, confusion, inexperience and recklessness.

Various national organizations inter-





Photo by V. M. Pierce, U. S. Bureau of Public Roads

The Train Won This Race; at Right Is a Chart Showing the Ages of Highway-Accident Victims

ested in the highway-safety problem have outlined a series of objectives which are now being put under way, as follows:

First, the education and regulation of pedestrian traffic, as well as motor-vehicle traffic.

Second, the adoption of a standard code of motor-vehicle laws in every state of the union.

Third, education in safety and accident prevention will be incorporated in the schools, both public and private.

Fourth, motorists will be asked to protect the design and materials of their automobiles by periodic adjustment and replacement.

Fifth, a comprehensive program of street widening and the elimination of grade crossings will be carried out throughout the nation.

"Co-operation of motorist and pedestrian in behalf of public safety can save thousands of lives during the next few years," according to the report of the American Road-builders' association.

"Ninety-five per cent of all accidents are the result of failure of the human machine, rather

YEARS

0-10

10-20

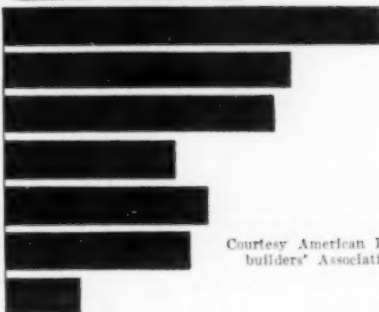
20-30

30-40

40-50

50-60

60-



Courtesy American Road-builders' Association

than faulty mechanism or engineering. No amount of rules and regulations will eliminate these accidents unless they are embodied as a portion of the simple code of courtesy and caution."

TRIGGER GUARD FOR SHOTGUNS PREVENTS BRUISED FINGERS

Taking some of the bumps out of shotgun shooting is the function of an improved trigger guard recently introduced. It permits inserting the entire hand within the frame so that when firing a double-barreled gun, the recoil is not likely to bruise the second finger, an injury frequently experienced with the usual piece if it is not held sufficiently tight.



With All the Fingers inside the Trigger Guard, the Gunner Is Less Likely to Suffer Injuries



Doughnut Mold in Operation; Serving Breakfast from the Electric Grill, and Close View of the Triangular Doughnuts

DOUGHNUTS COOKED AT TABLE IN ELECTRIC MOLD

Fresh, hot "triangle" doughnuts at the breakfast table, cooked as they are needed, are now possible in an electric mold of aluminum. It is operated from a lighting socket in much the same way as a waffle iron and can also be used for baking muffins and small cakes. Another table convenience is an aluminum griddle for cooking eggs, and frying bacon, ham or hot cakes. It has a roomy cover for keeping the food warm and, since no grease is required, may be employed at the table while eating. Both articles are of attractive appearance with a decorative base and high polish. The ware is of cast aluminum, and one can cook without water in other utensils of the same material, so none of the beneficial ingredients of the foods are lost.

SEWAGE GAS FUEL DRIVES ELECTRIC GENERATOR

Large sums of money are spent to get rid of sewage, but in the Birmingham district, England, the material is utilized, at one disposal station, to furnish gas for operating an engine that drives an electric generator. The gas comes from the bacteria that are active in the waste. It is collected in concrete containers which float on the surface of some of the receiving tanks, and is then piped away for use

in an internal-combustion engine. It is said that more than enough is obtained to operate the 150-horsepower engine at the plant with highly satisfactory financial results. The gas, as it arrives at the engine, has no offensive odor.

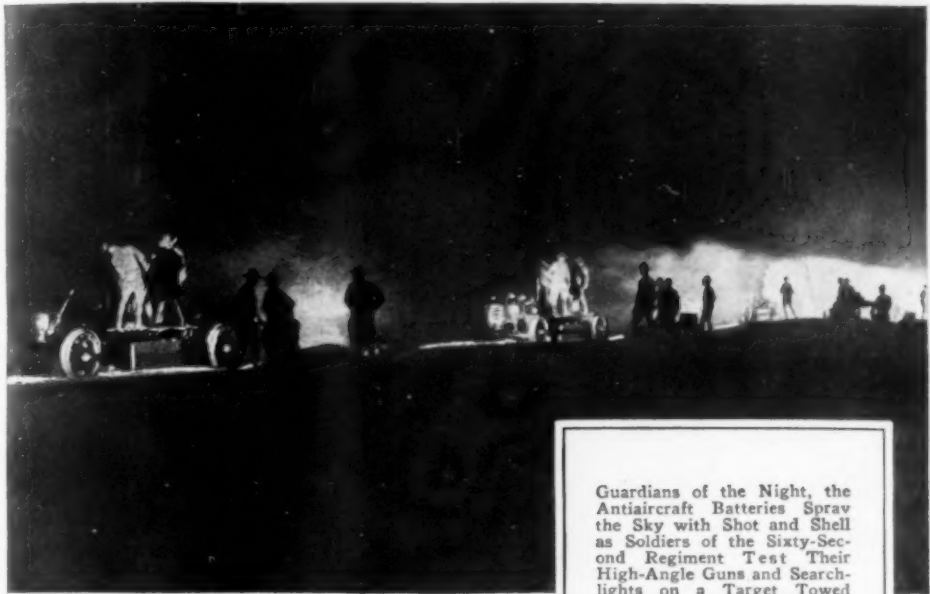
CURVED STREET-TRAFFIC GUIDE SAVES EXTRA POLICE



For Traffic Regulation in Curved Street; the Center Guide Tells if There's Anything around Corner

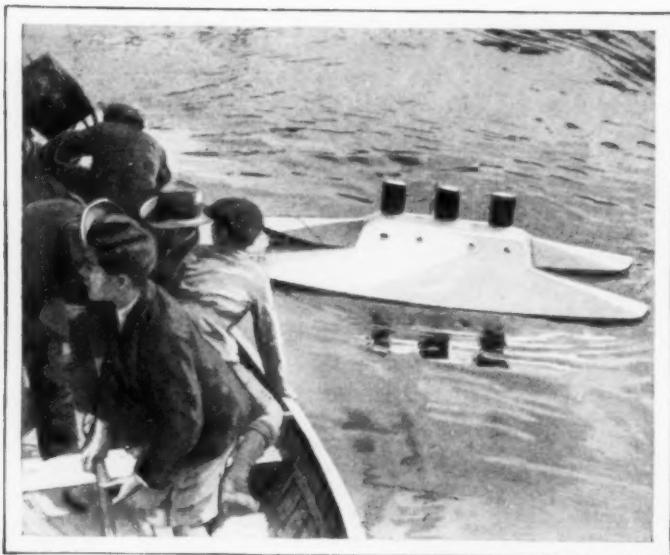
Three policemen were formerly required to regulate traffic in a London street, but since the installation of a special signal device, only one has been needed. The unit is operated by a control at the center of the street and shows, at either end, whether the course is clear for more traffic, thus saving communication of the "all-clear" signal by hand. The device has proved so successful that it is planned to install it at other places where suitable.

BLANKETING THE SKY WITH A CURTAIN OF DEATH



Guardians of the Night, the Antiaircraft Batteries Sprav the Sky with Shot and Shell as Soldiers of the Sixty-Second Regiment Test Their High-Angle Guns and Searchlights on a Target Flying behind a Plane Flying over Long Island; the Night Maneuvers Offer a Thrill for Spectators, But a Bigger Thrill for the Pilot Who Has the Long Canvas-Cone Target Hitched to a Cable a Thousand Feet behind His Ship





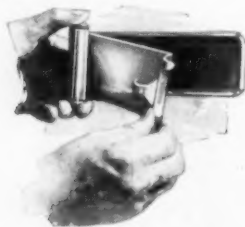
Model of Glider for Rapid Trips across the Atlantic; the Craft Is to Have Three Motors and They Will Steer It

GLIDER STEERED BY MOTORS TO CROSS ATLANTIC

Tests with a small model furnished engineers data for the construction of a hydroglider to cross the Atlantic from France. The craft was designed to be steered by speeding up or slowing down one of the three motors instead of by the usual guiding gear. Each engine develops 500 horsepower. The ship is supported on the water by two pontoons, each more than seventy feet long.

GLARE SHADE FOR AUTO MIRROR AIDS SAFER DRIVING

Disturbing reflections from headlights in the rear-view auto mirror are quickly stopped simply by pulling a little roller shade over the glass. It is made of transparent material, so that it does not curtail the service of the mirror and is attached to a spring roller so that it quickly rolls up again when the little hooks that hold it to the edge are released. The curtain can be adjusted in a second with one hand, is made to fit different sizes of



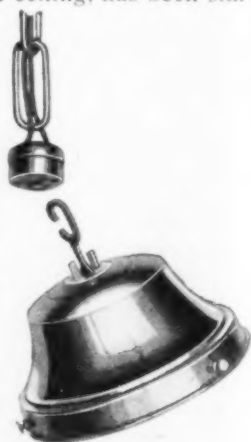
mirrors and can be attached in a minute or two. A similar aid for the driver has been introduced in a windshield shade on a roller so that it can be pulled down, when needed, or kept out of the way.

AIR DRIERS SPEED OUTPUT OF MONEY

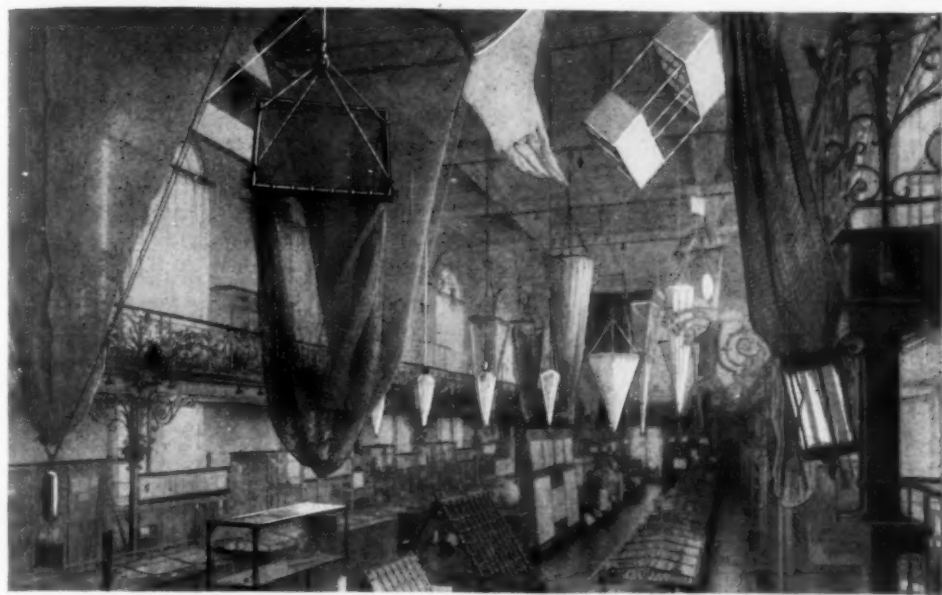
Thousands of pounds of air are blown into big cabinets at the bureau of printing and engraving, where sheets of paper money are hung up to allow the ink to dry. The driers look like big safes and are kept locked during the process. From 150 to 200 are in constant use, and the large sheets of \$5, \$20 and \$100 bills are placed on racks, where they are "baked" for three hours.

PLUG IN CEILING-LIGHT SOCKET AIDS IN CLEANING LAMPS

The task of cleaning electric-light fixtures hung from the ceiling, has been simplified with a separable plug and hook-connecting unit, permitting the quick detachment of the fixture and its readjustment with a minimum of trouble. The plug is a simple adaptation of the usual type, and the hook supports the weight of the fixture. The janitor can easily remove globe, bulb and all, clean them in a convenient working position and return them with less labor and less likelihood of breakage.



Highways built by the ancient Romans were from eleven to fifteen feet wide.



Part of the Marine Collection and the Nets and Traps of the Late Prince of Monaco, Who Utilized His Gambling-Casino Fortune to Pursue His Deep-Sea Studies

Monaco—Home of the Ocean's Story

Mysteries of the Deep Are Shown at "Bottom of the Sea" in World's Smallest Country

By FRANCIS DICKIE

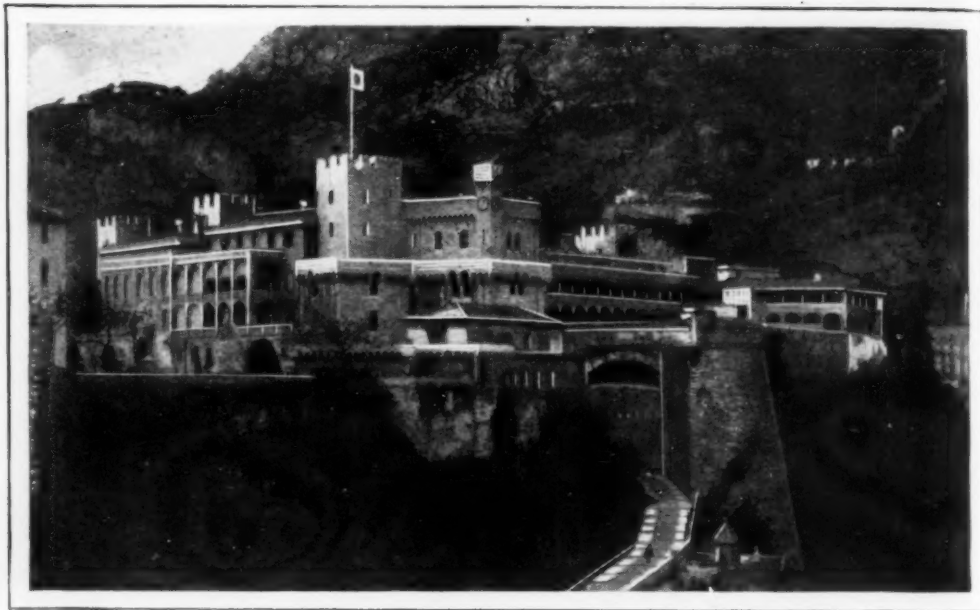
I SPENT nearly an entire day recently in the company of hundreds of different kinds of the ocean's creatures, at the "bottom of the sea," situated in the smallest country in the world, which covers only about three square miles.

Built upon a hill overlooking the Mediterranean, Monaco is the home of the wonderful Museum of Oceanography, which is one of the outstanding places of interest in Europe, and which not only houses a unique collection of live sea creatures, but a still rarer gathering in bottles of forms of ocean life from immense depths, first made known to the world by the findings of the late ruler, Prince Albert I, who devoted the better part of his years to scientific research.

In the deep, dark basements of the museum has been constructed a reproduction of the bottom of the ocean in great tanks, where are collected hundreds of peculiar

fish, great turtles, octopus, tiny sea spiders and other sea life, strange and rare for human eyes to look upon as they move in their natural element. From a spacious entrance hall you descend until you come into a long passageway dimly lighted by electric globes, hidden within the shells of sea urchins, which throw a faint rosy light along your pathway. On either side of several long passageways are glass tanks. As you start along the dusky corridor, the impression of being a part of the ocean's bed is strongly felt. In the long line of tanks there are hundreds of strange and rare crabs, sea anemone, and fish of vivid and varied hues, red, yellow and green predominating.

The tanks are lighted from above. The first sight that startles the visitor is, however, not the fish, but apparent jets of smoke pouring from tiny tubes among the imitation rocks in all the fish tanks. These



Palace of the Princes of Monaco; the Late Prince, Who Died a Few Years Ago, Was One of the Greatest Authorities in the World on Undersea Life and Owned a Marvelous Collection

jets, in reality, are fresh sea water poured out continually in order to keep the creatures alive.

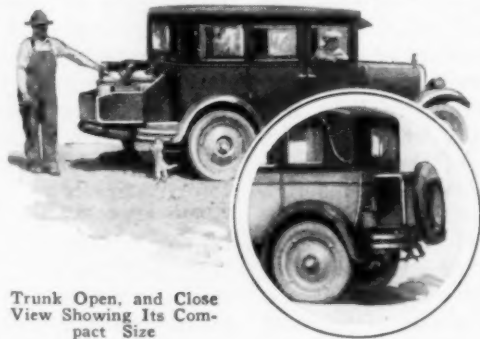
One of the strangest forms of sea life contained in these tanks is the Spirographis, a kind of worm which builds out of its own body tubes about a foot long and as thick as small gas hose. The tubes project out from the rocks. From the end of the tubes the worm extends a flower-like spiral plume that waves backward and forward, gathering minute sea life for its nutriment.

The largest form of marine life contained in the aquarium is the conger eel. The most amazing thing in connection with them is that they swim backward with as much speed as they do forward. But while the live fish and other sea life are, of course, the most interesting, and the visitor emerges from the depths with a feeling of actually having been at the bottom of the sea, the collection of fish

preserved in glass bottles on the main floor of the building is much more extensive and represents some very rare findings made in years of cruising and fishing at great depths. For this work special nets were required. In the enormous east hall on the first floor, the entire space is given over to an exhibition of the instruments used in gathering sea life at depths as great as 19,680 feet.

FOLDING AUTO-LUGGAGE TRUNK SERVES AS TRAILER

Constructed of steel, a folding auto-luggage carrier can be extended to hold such bulky articles as milk cans, tents or produce and, when closed, occupies no more space than a small chest. It easily accommodates 350 pounds of weight, is built for an extra tire and is especially suited to the needs of traveling men, merchants and farmers. The top is readily detachable.



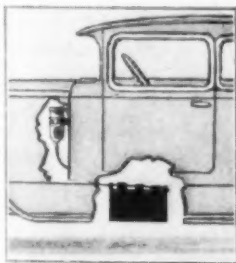
Trunk Open, and Close View Showing Its Compact Size

SAILORS' PETS FORM ZOO COLLECTION

Nearly all of the specimens in the zoological gardens at Portsmouth, England, have been collected by sailors. One of the most interesting spots in the gardens is the place where the birds are kept, hundreds of rare species being sheltered in an environment as nearly like their natural surroundings as possible. Beside the stream where the ducks like to paddle is a willow grown from a cutting taken from a tree on the island of St. Helena, where Napoleon was banished, and there are also trees planted by the present king and queen of Britain before they came to the throne. The gardens are cared for by a number of naval pensioners, who are assisted by sailors in their spare time.

AUTO BATTERY FILLER KEEPS WATER AT RIGHT LEVEL

Distilled water is supplied to the automobile batteries whenever needed from an automatic filler recently introduced. It consists chiefly of a glass container to hold the water and a feed line to the batteries. When the water level reaches a certain point, a "capillary attraction arm" is lowered into the tank and the liquid flows into the cells. At high level, the water raises a float and causes the arm to ride free and clear of the water. The tank requires little attention except filling from time to time.



SUGAR FROM WOOD

Dried sawdust, treated with chemicals, yields glucose and other products, but whether the process will be commercially practical for the making of sugar in any large amounts, is doubtful. From other by-products, alcohol suitable for motor fuel is obtained.



Nozzle Which Breaks the Force of the Fire Spray So That It Will Do Less Damage to Interiors

SPRAY NOZZLE ON FIRE HOSE TO REDUCE DAMAGE

Powerful streams of water from fire hose often do more harm than good, especially when the blaze is slight. To remedy this trouble, a member of the Fort Worth, Tex., fire department has devised a nozzle that can throw a spray or a condensed stream. It is said to be more effective when combating a fire at close range and is especially suitable for interior fires.

HAND-SIZE VACUUM CLEANER SIMPLIFIES HOUSE WORK

Weighing but three pounds, and easily operated with one hand, a small vacuum cleaner now on the market saves getting out the larger unit for such tasks as brushing up crumbs or ashes, and, since it can be applied to curtains, furniture and clothing, it has a wider range of usefulness. The regulating switch is in the handle, and the cleaner runs on either direct or alternating current at modest expense. For cleaning lampshades, table covers, upholstery and other surfaces, it saves the labor and damage often occasioned by the use of a brush, and, of course, prevents the dirt from flying about the room.





Giving the Loop Thriller a New Twist; German Acrobat Rounding the Circle While Standing on His Head in Special Car

LOOPING THE LOOP ON HIS HEAD BERLIN ACROBAT'S THRILLER

While standing on his head in a special car, a German acrobat slides down a runway and loops a loop at the bottom at a high rate of speed. To help him hold his position, he grips a bar inside the car which is held to the track with flanges.

FIRE PREVENTION IN THE HOME SHOWS GOOD HOUSEKEEPING

Eliminating fire hazards in the home, as far as possible, is especially important in the winter. Edward Reilley, assistant chief of Chicago's fire insurance patrols, warns against risky methods of thawing out frozen water pipes, allowing piles of newspapers or other inflammable material to

accumulate in the basement, placing ashes in wooden containers and using flexible hose or like conduits for gas. Rigid pipe should be employed wherever possible, to avoid leaks and the likelihood of explosions and fires. A common practice but a dangerous one is to place tissue paper over electric-light bulbs for shade. The paper is likely to ignite and cause a blaze. In spite of constant warnings, housekeepers will persist in throwing kerosene on fires or kindling to expedite the cooking. Not long ago, a wrong can, one containing gasoline, was used and eight persons were burned to death. Leave the electric wiring to the electrician. If changes have to be made, keep lighted matches or candles out of the closets. Oil-soaked mops are a common cause of fires and should never be left in a place where they

are likely to generate heat and ignite. Fires without apparent cause in many cases are due to a pile of oil or paint-soaked rags carelessly thrown into a corner closet or other inclosed space.

BRUSH CLEANS BETWEEN TEETH WITH REPLACEABLE HEAD

Bristles in a recently introduced toothbrush are shaped to clean thoroughly the interstices between the teeth and when the head becomes worn, a new one is quickly attached to the bakelite handle. By adjusting the nut that holds the brush, the bristles may be turned to any angle.



WEIRD ARCHITECTURE HELPS TO SELL ICE CREAM



Southern California Has Taken the Lead in Producing Weird and Novel Roadside Stands, of Which These Are Examples

Strange Beasts and Birds, Enormous Mushrooms, and Replicas of Milk Cans, Ice-Cream Cones and Other Artificial Objects Are to Be Seen on Every Hand by the Tourist



Even Gigantic Figures Molded of Concrete, Whose Spreading Skirts Shelter the Stock in Trade, the Clerks and the Customers, Sprout Up, with Their Gay-Colored Awnings, along the Concrete Highways

ALASKA REINDEER HERDS TO SUPPLY FUTURE MEAT



Courtesy Lomen Bros.

Seal-Hunting and Fishing in Alaska Are Still Necessary, but Reindeer Meat Has Increased the Natural Supplies of Food



Reindeer raised by Alaskan Eskimos may take the place of the vast cattle herds of the vanishing west as a source of meat, while the success of the herds has converted the natives from fish to meat eaters. The United States government imported the first reindeer from Siberia in 1892, landing them at Teller, later made famous when Amundsen's dirigible, the "Norge," landed there after its flight across the North Pole. In the next ten years, a total of 1,280 reindeer were brought across the Bering sea, and the original 1,200 now have more than 600,000 descendants in the vast herds that feed on the scant moss and grass of the far north. One of the largest reindeer companies operates five cold-storage plants in Alaska, where the animals are slaughtered and the meat prepared for shipment to the states. Besides furnishing meat for other lands, reindeer have proved life-savers for the natives. They are displacing dogs as sled animals, have made it unnecessary to hunt fish and seals for food, and are providing material for fur clothing independent of polar bear and seal skins.

CLOCKS STOP IN HIGH BUILDINGS BECAUSE OF SWAY

When a grandfather clock in a tall Chicago hotel refused to run, the owner was perplexed, for it was in perfect order. A clockmaker explained the apparent mystery. The building stands in an isolated spot where it receives the full force of the winds and sways slightly, especially in the upper stories. When this movement is in the right direction with reference to the swing of the pendulum, the clock stops, the craftsman explained. He said that he had been kept busy adjusting clocks because of this difficulty. Where it was practical, a simple remedy was found simply by turning the piece at such an angle that the vibrations would not affect the pendulum. Another method was to put on a heavier pendulum and adjust the springs so that the slight sway of the building would not stop the mechanism. In skyscrapers the sway is sometimes perceptible to a person standing at the top.

CAFE IN FORM OF LARGE SHOE RECALLS NURSERY RHYME

One of the latest novelties in restaurant architecture in California is a cafe building in the form of a large shoe, to suggest a nursery rhyme. An automatic "Mother Goose" flies in a circle over the structure, which has the advantage of ample lighting and ventilating facilities, because of the peculiar shape of the exterior.



Shoe Cafe Building in California City. One of Its Numerous Oddities in Architecture



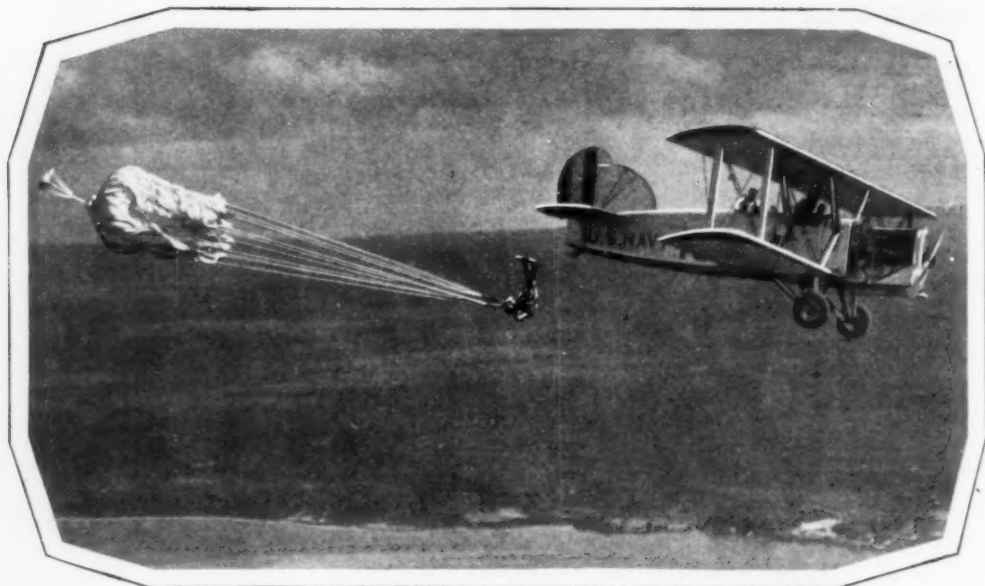
Taking Extra Copies of Fingerprint Records for Police Files; the Duplicating Apparatus in Use

FINGERPRINTS ARE DUPLICATED WITH MACHINE

Fingerprint experts of the Baltimore police department are saving considerable time and work by using a rapid duplicator for making copies of the impressions used in keeping track of suspects and identifying criminals. The apparatus is the invention of one of the members of the force, and is said to be superior to older photographic and other methods.

BETTER AND CHEAPER STEEL SEEN IN NEW PROCESS

Not far from the spot where the Bessemer process for making steel was developed in England, is being constructed an experimental furnace to test a new method for refining the product. According to reports, it will result in the production of high-purity steel at less than one-half the cost of the present material, which is far from being chemically pure. No tall blast furnaces will be needed and cheaper grades of coal can be used, while low-grade ore, that cannot profitably be handled by present processes can be smelted.



Tumbling Headfirst from a Plane, the Parachute Jumper Is Jerked Upright as the Silk Umbrella Fills with Air; at Bottom of Page, a Seat-Pack Chute Which Takes the Place of a Cushion

Dummy Flyers Help Make Air Safe

By R. BACHE

DUMMY aviators are importantly helpful in trying out new ideas for parachutes. They afford just as good safety tests as live men, and, in case of accident, nobody is hurt. A fall of a few thousand feet or more doesn't bother the dummy.

The typical dummy used by aeronautic experimenters of our army and navy is made on a strong wooden frame, covered with canvas, and stuffed with any kind of material that happens to be handy, an essential requirement being that it shall weigh 180 to 200 pounds. Thus its weight corresponds to that of

the heaviest airman. It has a neck but no head; the legs and arms are mere stumps. The parachute equipment is fastened

upon it with a harness of straps, exactly as it would be attached to a man.

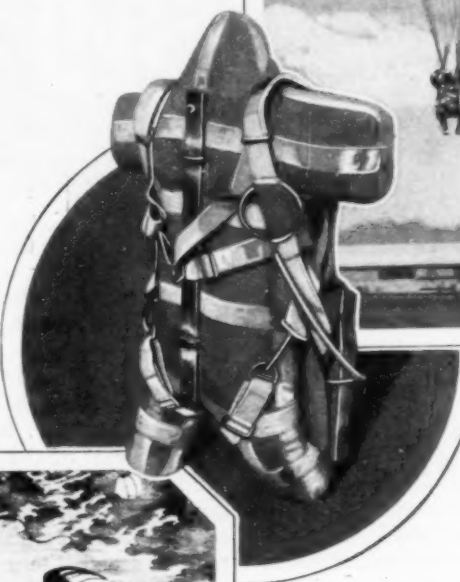
The equipment is a "seat pack," secured to the lower part of the dummy's back. This kind of pack, used as a seat cushion by an aviator, removes all weight and bulk from his person, save for the harness. It is a canvas envelope containing a parachute of light and very strong silk, twenty-four feet in diameter, carefully folded in a particular way, and weighs eighteen pounds.



When the dummy is dropped experimentally from an airplane far aloft, the rip cord connected to the pack is simultaneously jerked, releasing the parachute. But the first thing to emerge from the canvas envelope is a small "pilot chute," thrown out by springs. Catching the wind, it exerts a pull which yanks the big parachute out of the pack, and thereby the parachute is enabled to expand quickly.

It is fully opened by the time the dummy has fallen 150 feet. Then, the expanded umbrella having caught the resisting air, it floats downward toward Mother Earth at a rate of thirteen feet a second.

The loftiest height in the sky from which a parachute jumper has ever leaped was twenty-six thousand feet, or nearly five miles. It took him a little over half an hour to reach the ground, but he alighted safely. The first parachute drop from a flying machine was made in 1912, at St. Louis, by Capt. Berry. The



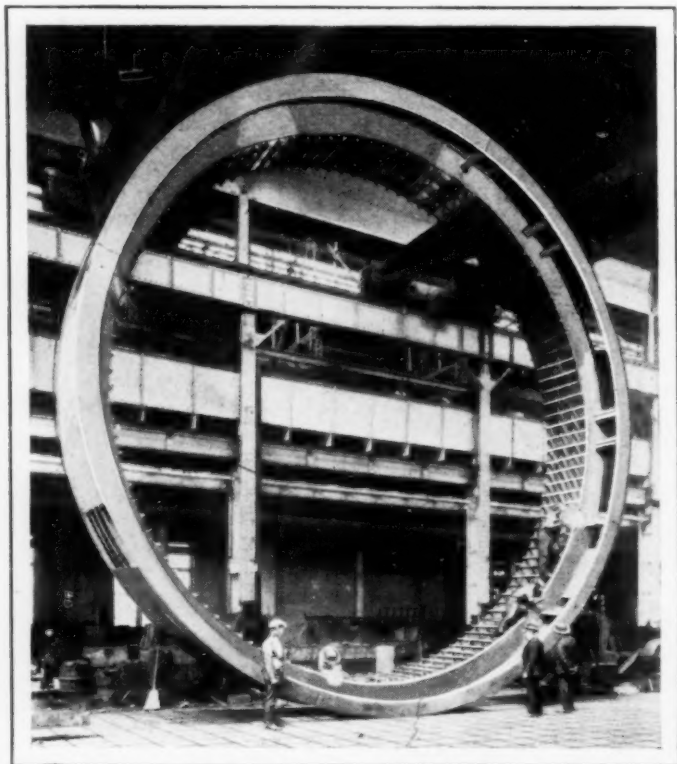
chute was folded and stuffed into a cylindrical-conical metal container. In the following year, the first "knapsack" parachutes were developed, with a rip cord to open the pack.

The seat pack is designed for flyers who do not move about during flight. Another type is the "lap pack," which rests in the lap of the airman. It is especially for use by gunners and observers. A gunner usually has the most available room directly in front of him and below the waist line.

To learn how to use a parachute requires no natural aptitude beyond the ordinary, and very little training. The aviator, when he jumps from aloft, holds in his hand a ring to which the rip cord is fastened. All he has to do is jerk it, and the rest of the business takes care of itself. The sensation of floating downward is described as being rather agreeable than otherwise.



With Knees Drawn Up to Absorb the Shock, the Flyer Prepares to Land. Top: a Test Dummy, Center, and an Old Sketch of Garnerin's First Jump in England in 1802



Electrically Welded Frame for One of the 50,000-Horsepower Generators Being Installed by Philadelphia Power Company

GIANT "HOOP" FOR GENERATOR IS MARVEL OF WELDING

What is said to be the largest piece of electrical machinery ever made from structural steel and electrically welded has been completed in the frame for one of the 50,000-horsepower generators for a Philadelphia company. Four of these huge units are to be installed in this plant, which will be the largest electricity "factory" in the United States except the power development from Niagara falls.

TINY FISH FANS ITS YOUNG TO SUPPLY OXYGEN

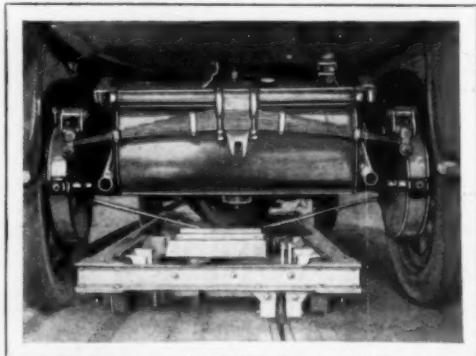
Fish placed in water that has been boiled to drive out the oxygen usually die in a short time, showing how necessary the element is to the preservation of their lives. The little stickleback fans the nest in which the young are hatched with its fins to afford an abundant oxygen supply and another species exercises the same

care, both parents taking their turn doing the fanning.

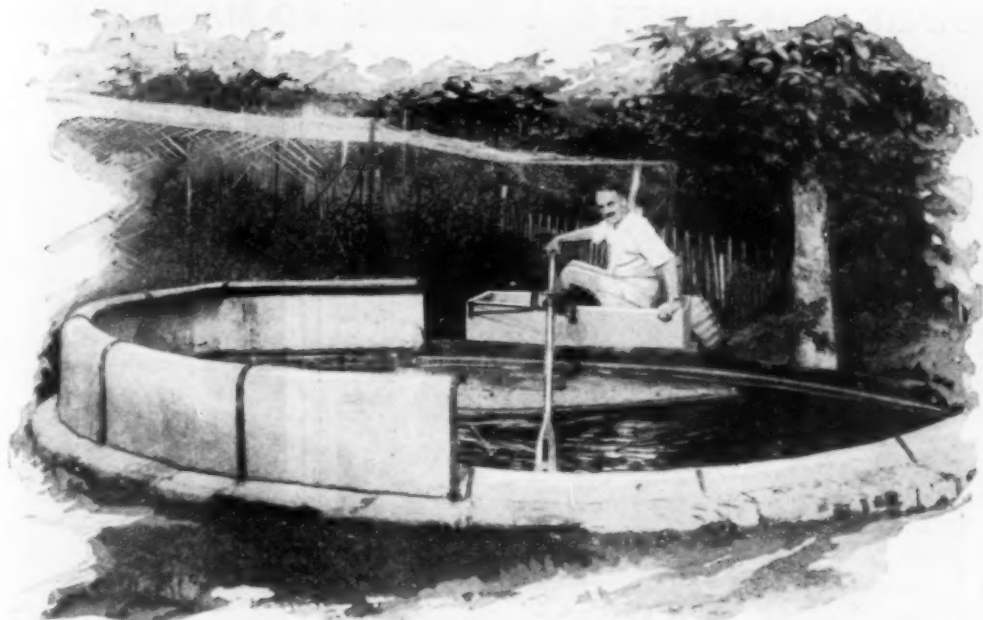
ELECTRIC HANDS MOVE CARS IN TALL GARAGE

Space for parking 1,052 cars is to be provided in a twenty-eight-story garage for New York City's crowded business district. It is to be within a few feet of one of the entrances to the Grand Central terminal, and is planned to afford a maximum of storage space within the limits of the lot. After a driver has surrendered his car and received a check for it, an electrically operated truck rolls from an elevator, is stopped under the auto, the rear axle engaged in a rubber-cleated coupler, and then the car is taken back to the elevator, and run to

the desired floor, being left in its space by a reversal of the method that was pursued at the first. The little trucks are governed by push buttons in the elevator, so that the operator need not leave his post or touch the auto to store it. Elimination of ramps and useless aisles, high-speed elevators, and street-level delivery and acceptance are other features.



One of the "Electric Hands" That Move Cars; Truck Adjusted under Auto to Slide It on or off Elevator



Rowing Practice in His Yard; British Oarsman in Stationary Boat near Tank in Which He Can Keep in Training with Real Strokes; Splash Guard around Rim at Left

ROWING DRILL IN ONE-MAN TANK GIVES OARSMAN PRACTICE

To keep himself in training, a British oarsman has a private tank just large enough for one oar. He sits in a stationary "boat" and sweeps the oar through the water as though in an actual race. The boat has a sliding seat, similar to those in the usual racing hull.

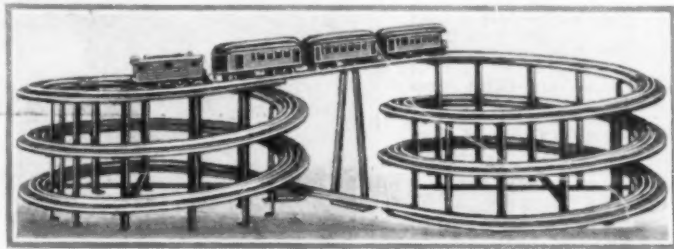
INSECT WEATHER PROPHETS

If spiders are busy spinning their webs, fair weather may be expected, but if they are resting, the fact is an indication of impending storms or wet weather, some naturalists say. The reason is that the spider, knowing that its prey will not be abroad during rains or other unfavorable conditions, does not trouble to make its nest at such times, but prepares it for catches during fair weather. Bees are able to tell approaching storms and in threatening intervals will not venture far from their

hives. The noise of the screech owl at night is also claimed to be an indication of fair weather.

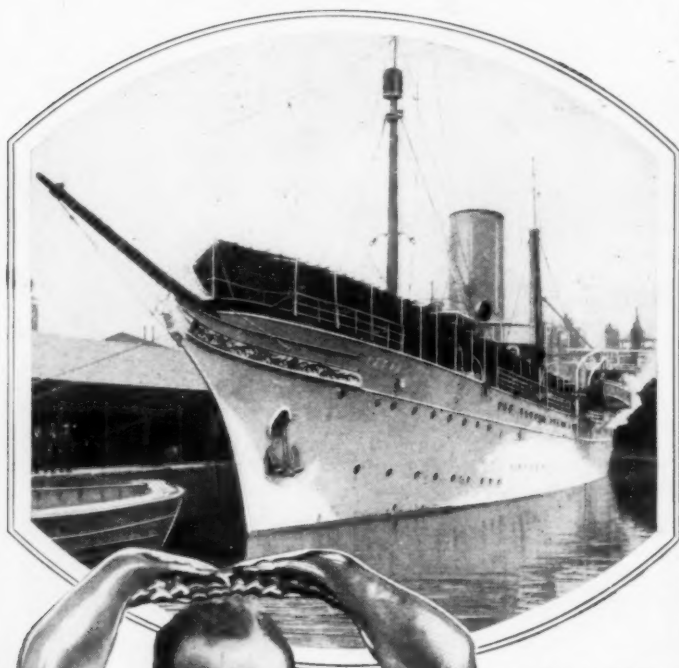
ENDLESS TRACK FOR TOY TRAIN NOVEL WINDOW DISPLAY

Designed especially for window display, a spiral tower for an electric toy train, permits continuous running in smaller space and adds to the interest in the operation. By means of transformers, the train ascends on a current of nine volts and comes down on five and one-half volts, in order to make sure that it will not run off the track. For home-play purposes, the outfit can be operated with but one transformer.



Adding Interest to the Window Display; the Double-Spiral Track for Toy Electric Train Occupies Small Space

SHARK SHIP HUNTS SEA TERRORS TO MAKE SHOES



A Shark Ship, Built from a Yacht That Served in the American Navy during the War, Has Returned from Australia to London, after a Successful Season Hunting the Terror of the Seas to Turn His Hide into Shoes, Luggage His Fins into Delicacies for Chinese Epicures, His Carcass into Oil for Fine Watches, and the Odds and Ends into Fertilizer; Above Is the Ship, the "Istar," and a Shark Skin Ready for Tanning

Turn His Hide into Shoes, Luggage His Fins into Delicacies for Chinese Epicures, His Carcass into Oil for Fine Watches, and the Odds and Ends into Fertilizer; Above Is the Ship, the "Istar," and a Shark Skin Ready for Tanning

© P. & A. Photos

Huge Nets, Planted by a Fleet of Ten Motorboats, Are Used to Catch the Sharks; the Big Fish in Their Fright Dash Around and Struggle Until Their Gills Close and They Suffocate; Thirty Tons of Sharks Are Often Handled Daily; Above Is a Shark Jaw and, at the Right, a Group of London Children Getting Acquainted with the Teeth of the Man-Eater



EXCELSIOR BUILDING BLOCKS NEW HOME MATERIAL

Building blocks of compressed packing excelsior, impregnated with a mineral cement which makes them practically fire-proof, are being used successfully in a new form of home construction. The blocks, four by eight by sixteen inches, are each equivalent to eight ordinary bricks in volume, but, weighing only three pounds, are less than one clay brick in weight. Each block is pierced by two four-inch holes, and when they are laid in overlapping rows, as are bricks, the holes match. After three rows or courses are piled up, steel reinforcing clips are inserted, and the holes filled with concrete. The clips are equal to four courses, and each pouring ends one below the top, so that a continuous bond is obtained. The finished wall is a series of four-inch reinforced concrete columns, spaced four inches apart, and surrounded by the compressed-excelsior blocks. At the floor levels a four by eight-inch reinforced-concrete beam is worked in, and the next wall started on top of it. Laboratory tests show the material is equal to four inches of cork in insulating value; that it is a sound deadener and that a reinforced wall built of it will carry a load of 16,000 pounds per running foot. No skilled labor is required in laying the walls, as the blocks are simply piled on top of each other, the steel reinforcing dropped into the holes, and the concrete poured from an ordinary coal scuttle. No lath is required on the inside, plaster being applied direct to the blocks, the fibers of which furnish a good bond, and stucco is applied in the same way on the outside. Owing to the mineral cement with which the blocks are impregnated, they will not support combustion.

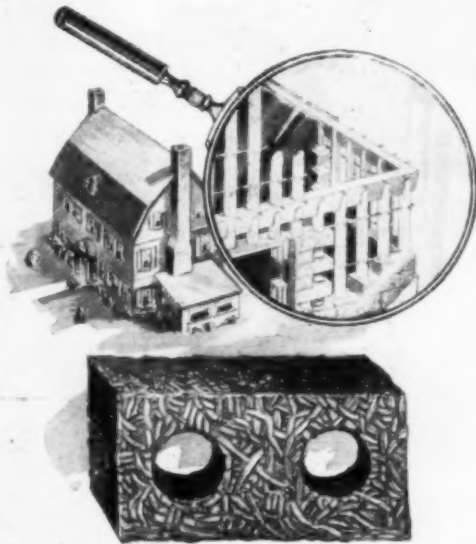


At Left, Fly Footprints and Microscopic Enlargement of Same; at Right, Showing Germ Growth

MENACE OF FLY'S FOOTPRINTS REVEALED BY MICROSCOPE

That the fly is a spreader of dirt and disease has long been known, but the microscope reveals a particular reason why the insect should be killed. Its footprints are scarcely visible to the unaided eye, even when materials make the marks plainer, but examination of the tracks a few hours after they have been formed, explains the hazard of allowing the fly to

walk across articles that should be kept clean. The microscope shows how tiny disease germs in substances carried by the fly's feet, have developed. A few hours after the photograph was taken, some of the germs had developed tiny balls of spores which were carried away in the air to seek lodgment and possible growth. Where flies have been eradicated, a marked decrease in disease has been observed.



Detail of Construction with the Blocks, Showing Concrete Section and Close View of Excelsior Unit

New Ways to



Serving Pitcher That Hides the Condensed-Milk Can; Pours Directly from the Container and Is Easily Washed and Sanitary

Long-Handled Vacuum Cleaner Can Also Be Used for Drying Hair as Shown at Upper Left; in Opposite Corner, Cleaning Draperies with Aid of Handle



Sharpened like an Ordinary Knife, This Bread Cutter Has Saw Teeth That Maintain an Effective Edge and Are Said Not to Catch Cloth While Washing



To Simplify the Task of Preparing Fish and to Save Time, the Clamp Holds It by the Tail While the Scaler Is Being Used



Avoid Home Drudgery

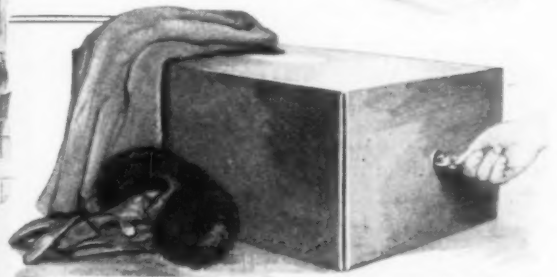


String Beans Are Cut in Uniform Lengths by This Outfit, Especially Adapted for Canning Large Quantities

Useful for the Children: a Step Covered with Oilcloth and Firmly Balanced So They Can Reach the Wash-bowl; Note Face on Side of Handle Grip



Fork at Right Has Knifelike Tines for Cutting, and, at Left, a Convenient Holder for the Garbage Bag



Here Is a Folding "Cedar Chest" for Many Uses; It Is Made of Paper, Treated So as to Keep Out Insects

CHART TO TEACH TYPEWRITING SAVES STUDENTS TIME

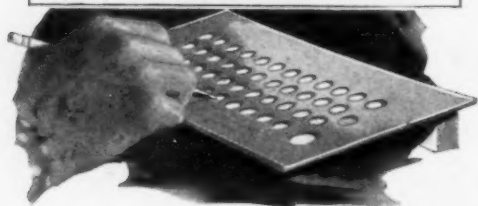
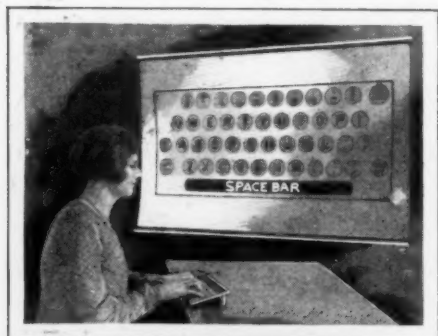


Chart in Use and Close View Showing Perforations That Take Place of Typewriter Keys

Paper keyboards, with perforated tops to guide the fingers, have been introduced by a woman inventor to help teach typewriting. The charts make it unnecessary to use the real machines at first, so that the student can devote his entire attention to learning the position of the keys and is not distracted by the mechanical operation of the typewriter. In practice, the subject learns the correct hand and finger positions with the chart guides and then, to test his skill, writes the name of the character on the piece of paper under the openings. According to reports, results with this guide have been successful and it is recommended especially for correspondence schools.

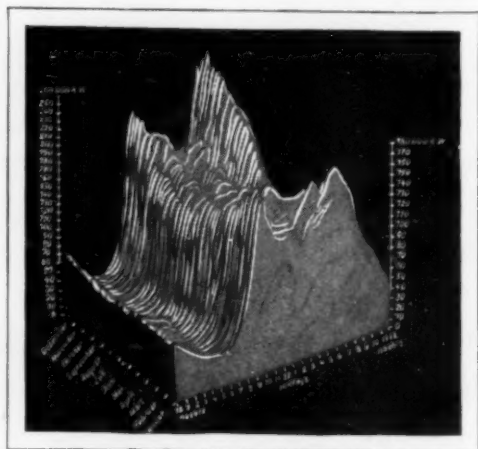
VOICE STARTS AND STOPS TRAIN BY RADIO CONTROL

Visions of what vast possibilities of service still lie in the power of radio were shown to visitors at a recent engineering exhibition in London, at a model-train display. The engines started instantly as a man said "Off," and when the word "Stop" was pronounced, they obeyed as quickly, and also reversed or went forward at spoken commands. The secret of the performance was that the vibrations

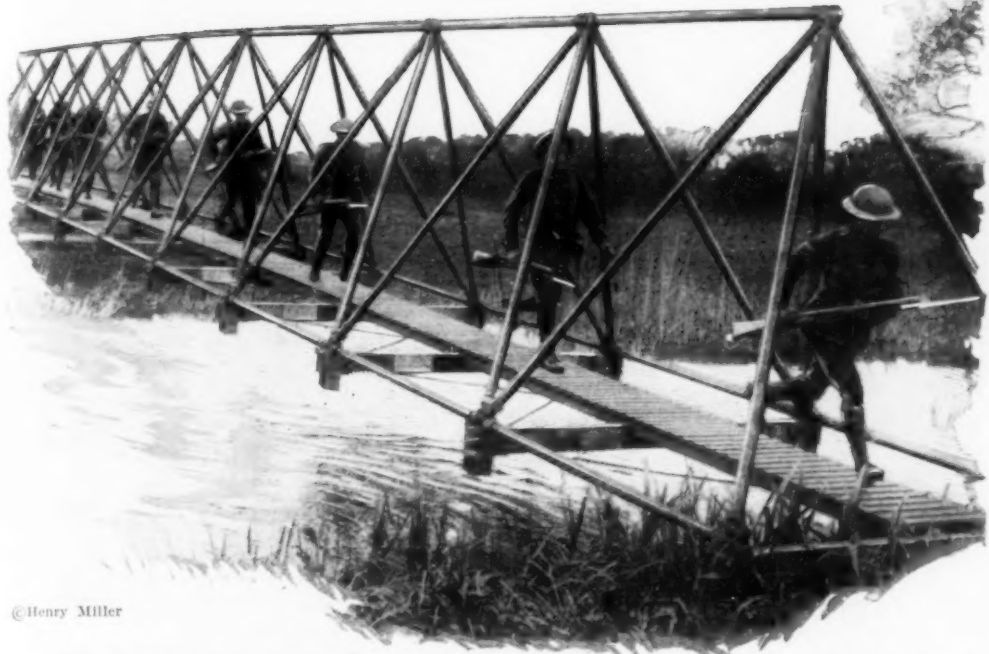
of the voice, passing through a microphone, affected sensitive controls which released electric current to cause the proper movements. During one of the demonstrations, a collision was avoided. One of the tiny trains ran off the track on a sharp curve. Another was rushing toward it, but the operator saw the impending disaster, shouted "Stop," and the train halted. While the system, as now developed, could not be practically adopted in commercial railroad operation, engineers point out that it holds vast promise in that direction as well as in the performance of other tasks, such as opening doors and windows and doing other duties that ordinarily require the direct muscular effort of some person. The dream of a day when a housewife can sit comfortably in her chair and deliver vocal orders to the oven door to open, the furnace draft to close, etc., is not impossible of realization, radio experts believe.

ELECTRICAL PEAKS AND DIPS SHOWN BY SOLID MODEL

In a German electric station a complete record of the load fluctuations for every day of a whole year is built up in solid form by cutting out the daily graphs and arranging them side by side, as shown. Scales are arranged on two sides, indicating kilowatts, and along the base indicating months and days, and hours of the day and night. The whole gives an easily comprehensible view of the year's output.



Model of Graphs to Show Electric-Load Fluctuations of German Station; Scales Printed at Sides



©Henry Miller

Crossing the Pipe Bridge; Soldiers on Maneuver Using the Portable Viaduct Which Is Quickly Assembled from Lengths of Piping and Is Strongly Braced

PORTABLE FOOT BRIDGE OF PIPE AIDS ARMY DRILLS

Portable bridges made of piping are being used by the British army instead of the usual wood and rope units. They are stronger and more easily assembled, being especially suited for drill maneuvers.

SEARCH FOR OIL LEADS TO SEA ON CALIFORNIA COAST

Oil wells, drilled in the surf of the Pacific along the California coast, have been producing for some time, and now various companies are making plans to sink their shafts farther out to sea in the hope of tapping more abundant supplies of "black gold." The problems involved will tax the ingenuity of engineers, but are not considered so difficult as to balk the attempts to obtain the liquid wealth below the waves. Often the oil-well derricks and machinery weigh hundreds of tons. It will be necessary to build strong foundations for this equipment. Some of the wells are planned for areas where high

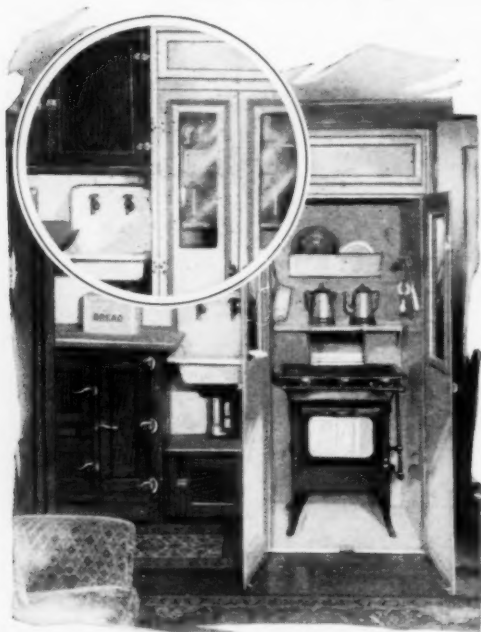
tides will wash across the derrick floors part of the day. One concern has been granted permits to dig wells a quarter of a mile from shore, if it is mechanically possible to do so. Engineers estimate that it will cost approximately \$25,000 to construct each of the bases for the derricks and difficulties, not known in land operations, are expected in drilling, but if the oil is present in as large quantities as the preliminary soundings indicate, it will pay to "buy the ocean and pump it dry," in the opinion of some of the experts.

PIPE-CLEANING SET IN HOLDER CARRIED LIKE PEN



Contained in a holder which is carried in the pocket, a pipe-cleaning set now on the market is kept from soiling the clothing and in position for use at any time. It consists of two tools, one for the bowl and the other for the stem.

CABINET CONCEALS COOKSTOVE AND REDUCES ODORS



Stove Concealed in Cabinet; Inset Shows Appearance of the Unit When the Doors Are Closed

For the small home or apartment, a metal cabinet has been devised to inclose the gas cookstove, shielding the rest of the room from odors, excess heat and smoke, and adding to the appearance of the cooking quarters. The doors have louvers at the base to admit cool air from close to the floor. This sweeps up through the cabinet and out into a chimney duct at the top.

SHALE MAKES CONCRETE LIGHT WITHOUT STRENGTH LOSS

The use of burned shale or clay in place of sand and stone in concrete, for buildings and bridges, has resulted in a lighter material without a sacrifice of strength, engineers declare. Ordinary concrete weighs about 145 pounds to the cubic foot, but the shale mixture only ninety-five pounds. The material is about the same as that employed in the manufacture of brick. It is heated to a high temperature until it becomes plastic, this process expanding the mass and causing a large number of small pockets or air cells to form, owing to the escape of gas. This

light stuff is then crushed and used instead of sand for mixing with the cement. Its aid in building was illustrated recently in Kansas City, where six stories were added to a structure originally intended for but four more. Use of the lighter cement enabled the engineers to erect two extra stories without hazard.

FURNITURE HEAVIER IN SUMMER

Wooden furniture absorbs moisture, consequently, in moist seasons, is heavier, as a general rule, than it is in winter when the house is heated. A bureau, weighing 200 pounds, may be twenty-four pounds heavier under average summer humidity as compared to its normal weight when the furnace is going and the air in the rooms is drier. These changes occur in spite of paints, enamels and other finishes, tests by the United States forest service have shown. The coatings are none the less useful, for they prevent sudden checking and swelling that would result were the wood not so protected.

SOFT RUBBER AS UPHOLSTERING SUBSTITUTE FOR SPRINGS

In place of springs, sponge rubber is being used for upholstering automobile seats and other articles. The material is said to hold its shape, give the covering longer wear and to be more comfortable than other kinds. It is strong and easily shaped to give uniform resiliency.



© Keystone View Co.
Rubber Upholstering for Chair Bottom; Its Soft, Spongy Texture Is Revealed When It Is Squeezed



For Faster Trips between Hamburg and London, the Ten-Passenger Flying Boat in Action; Its Two Motors Afford a Speed of 150 Miles an Hour

FLYING BOAT THAT CARRIES TEN LINKS HAMBURG TO LONDON

One of the latest units in aerial travel between London and Hamburg is a ten-passenger flying boat. It develops a maximum speed of 150 miles an hour, has two motors, aggregating 1,300 horsepower, and when loaded weighs 23,100 pounds. The wing span is eighty-five feet. A crew of three is required to operate the ship, which is fitted with running water, electric lights, and radio-receiving and sending apparatus. It can land or take off from ground or water with equal facility.

CANARIES THAT CAN SING JAZZ GAIN IN POPULARITY

Roller canaries, with classical musical educations, are giving way to the chopper, a songster with shorter, brisker notes more like those of the jazz melodies and other compositions popular today. According to a bird dealer, the chopper is a twelve-to-one favorite over the roller in the markets. Owners have also noticed that frequently a jazz phonograph record will stimulate their canaries to sing when other means fail. Canaries are being imported into the United States at the rate of several thousand a week, many of the most valuable kinds coming from the Hartz

mountains in Germany. Because of their tendency to fight, the males have to be shipped in individual cages, but 100 females can be placed in a single cage.

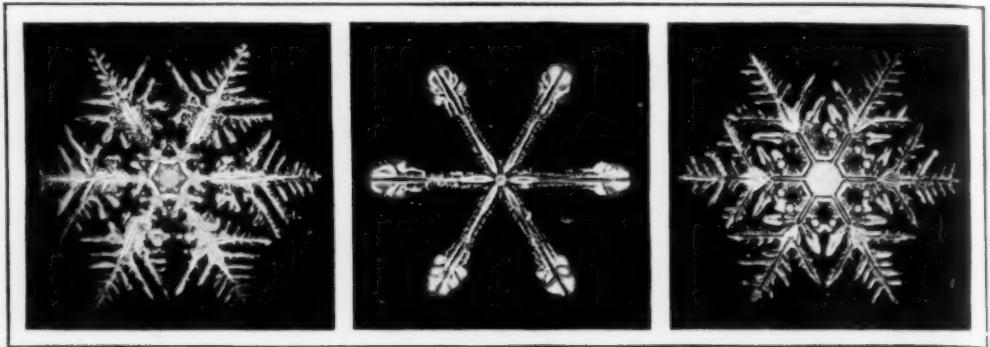
STOP WATCH FOR FOOTBALL TO END DISPUTES

Seconds are precious when the football score is tied and one team is within inches of the goal line. A stop watch, designed to simplify the task of allowing for inter-



missions, time-out intervals and other irregularities, has been introduced this season. The dial records seventy-five minutes, for four quarters of fifteen minutes each and a fifteen minutes' intermission between halves. There are

really two watches, one that records the time of playing and the other, the time taken out. By pushing a lug, the operator sets one mechanism to operating and stops the other. Markings show the official when to notify the teams to get ready to leave the dressing rooms and indicate the number of minutes remaining to play.



Icy Jewels of the Winter Storms

Billions of Perfectly Symmetrical Snowflakes, Falling in Each Storm, Furnish Vast Field for Nature-Made Designs

By W. A. BENTLEY

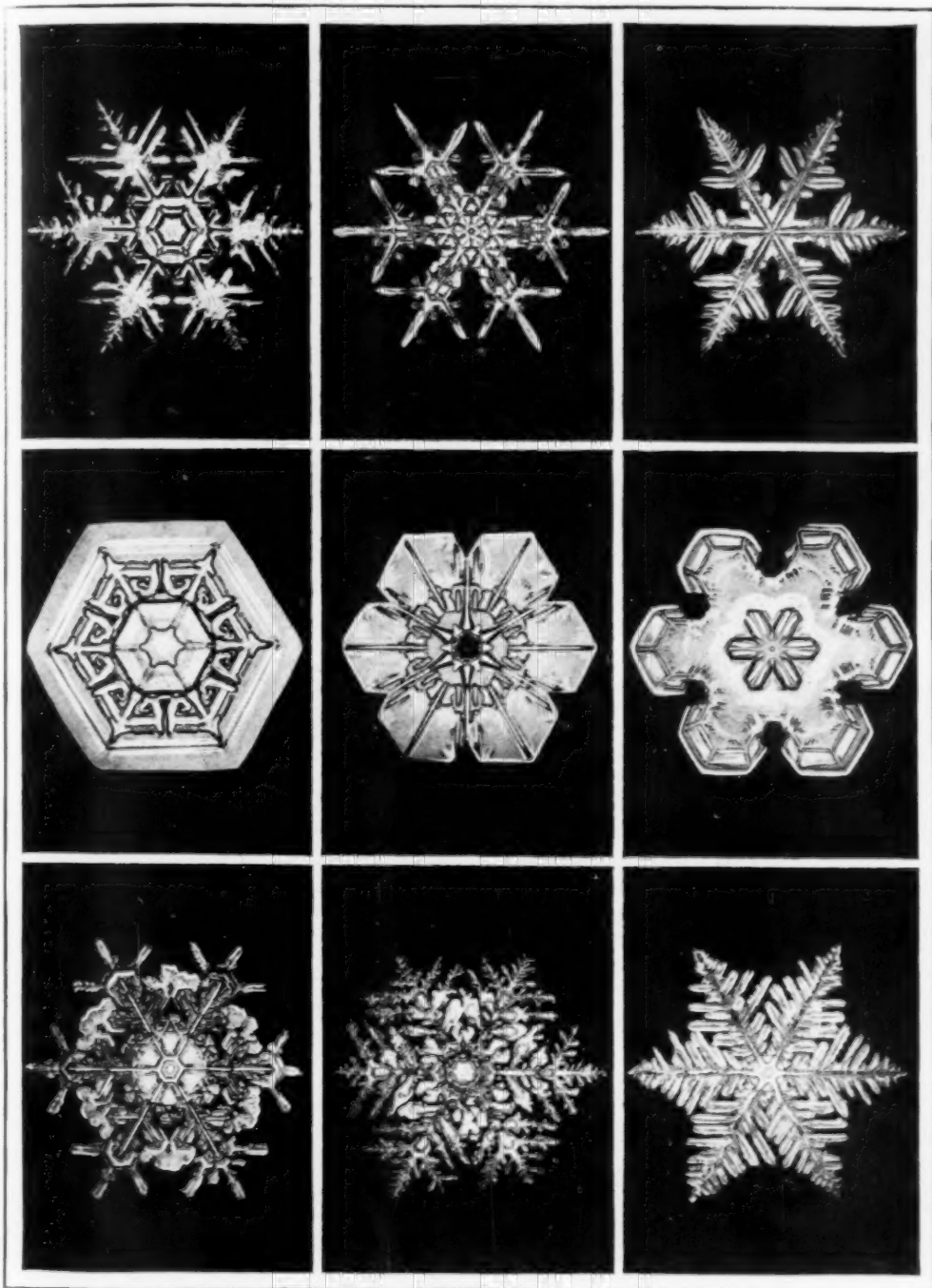
FORTY-FIVE years ago my mother presented me with a small microscope. Searching for something to examine under it during the cold winter of Vermont, I hit upon a snow crystal, and for nearly half a century I have been looking at magnified snowflakes. Larger microscopes, and then a camera attachment, to permit permanent record of the most perfect designs, were soon added to the equipment and, in the nearly half century since, I have photographed more than 4,700 different specimens.

Studying snowflakes may appear a peculiar sort of hobby to occupy one for the greater part of a lifetime, but I find it just as fascinating today as I did when I looked through my first small microscope and discovered that a snow crystal was a work of art, a formation of which no two are ever alike. Collecting snowflake likenesses is a pursuit rewarded by rich returns. Yet it must not be assumed that it is an easy task. It takes skill, patience without limit and no little hardship to get results worth while.

When good snowflakes are falling, the true lover of them forgets cold, hunger, business, exposure, all else but the marvelous glittering gems the storm clouds are showering down upon his waiting board. With keen gaze, ever roaming about over the blackboard held to receive the glittering hosts from cloudland, the

collector stands out in the storm, brushing off every few moments, the flakes alighting thereon, until one or more promising specimens are secured. Quickly, then, the board is taken indoors, into a very cold room having outdoor temperature. At one side of the window and facing it, is the photo-microscopic camera (a microscope and camera combined). At the other side and also facing the window, is an observation microscope, having a cold glass slide. The blackboard, sprinkled over with snowflakes, is taken first to the observation microscope, and a few of its most promising snow jewels removed from it. This is accomplished by pressing very gently the point of a sharp wooden splint upon the face of the snow crystal until it adheres to it. It is then jarred off onto the glass slide. A nervous or unsteady hand spells disaster, for the least pressure crushes the flake.

From now on, the utmost haste must be used, because evaporation soon wears away the crystals. One brief glimpse of each is taken, holding the breath meanwhile, and if a masterpiece is revealed, it is pressed down flat upon the glass slide, by means of the edge of a feather, the slide placed on the stage of the photo-microscope, quickly centered and photographed, an exposure of from ten to 100 seconds being given according to time of day, cloudiness, magnification, and power of



Air Bubbles Trapped by Snow Crystals Form the Dark Lines in These Designs

the lens used. The flakes are magnified from sixty-four to 3,600 times.

Location is, of course, all important in

this work; only those living where the winters are severe can be successful. Individual storms vary markedly as regards

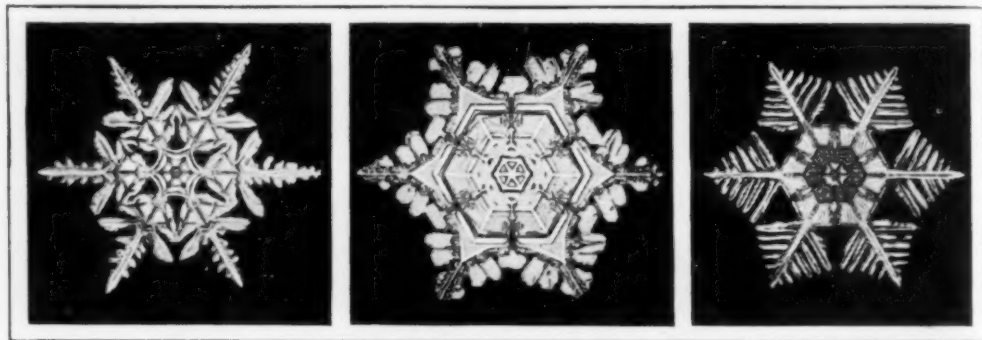
their richness in beautiful snowflakes. A favorable winter may furnish as many as fifteen good snowfalls and 300 or more new photos.

Good snowfalls often occur during, or at the end of, a period of zero weather. Great storms and blizzards not seldom give opportunity of gathering wonderful crystals. Yet, as a rule, less intense snows, when the crystals are of but medium to small size and fall rather scatteringly, are most favorable.

The larger flakes rarely exceed one-third inch in diameter. Often the best ones are tiny bits of pure beauty from one-twentieth to one-fiftieth inch in diameter. The

with other dark features, due to abrupt changes in thickness, give great richness of design to their interiors, and serve to outline the various transitory forms the crystals assumed in cloudland. They assume most varied forms, resembling dots and dashes, lines and other strange characters. Frequently they are arranged in a wonderfully symmetrical manner. The number of divisions a crystal may assume, whether it be a snow or other crystal, is supposed to be determined by the number and arrangement of the atoms that group together to form it.

The tiny magnetic poles of these crystals attract other atoms to them and establish



Three Examples of the Perfect Symmetry of Snow Crystals; They Probably Are Built Up Layer by Layer from the Center, Until All the Branches and Petals Are in Place

percentage of perfect crystals in a favorable snowfall varies greatly. Sometimes all will be so rarely beautiful as to make selection a bewildering task, while again one may search all day long to find one or two perfect ones.

Snow crystals are never formed as a result of the freezing of raindrops or of visible clouds. Hail and granular snow result thereby. The making of the true snow crystals is far more complex. Each cloud-born jewel is the product of a process that goes on in one of the rarest laboratories in the universe, the thin air in which we live, and through the assembling of the unseen atoms and molecules of which all crystals are built.

The snowflake is doubtless built by stages from its center outward. And as it grows, and its branches and other adornments unite, it bridges over and imprisons tiny quantities of air, in the form of minute tubes. These look dark when viewed visually or photographed, and, together

lines of growth, called axes, and the bodies grow mainly outward from them. Minor variations in form depend upon the number and arrangement of the tiny electric charges that collect upon them and establish secondary or third-degree axes, and upon their rates of growth and the temperature. Rapid rates of growth tend to produce open branching crystals; slow rates of growth, solid ones. In the case of snow crystals, the branchy ones usually form within the lower, warmer, wetter clouds, because there is more material there for rapid growth, while the more solid ones form at higher, colder, drier altitudes. Not seldom they are wafted upward and downward within the clouds, and have both of these characteristics of growth impressed upon them.

Exceptionally beautiful crystals, when photographed, are used by schools, museums, lecturers, art-craftsmen, silk manufacturers, metal workers, interior decorators and other designers.

WHY HOT-WATER PIPES FREEZE MORE READILY THAN COLD

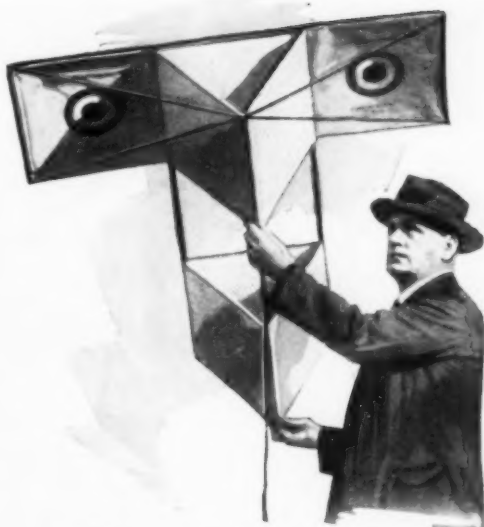
Housekeepers are sometimes puzzled at the tendency of hot-water pipes to freeze more easily than those that carry cold. The apparent mystery is explained by Leon McCulloch, research engineer of the Westinghouse laboratories. By means of a special testing apparatus he found that the freezing is due to a wall of water established by dropping temperature. Water is densest at thirty-nine degrees Fahrenheit. In a closed pipe, when the temperature falls toward thirty-nine degrees, that part which is being cooled becomes denser and then lighter below the thirty-nine-degree mark. Water that has not been cooled above the section exposed to the cold remains lighter, so that between the two areas of lesser density is a "wall" of dense water around the thirty-nine-degree region. This wall naturally limits the circulation, so that the exposed area is more likely to freeze. In the cold pipe, circulation permits the contents to remain more nearly at thirty-nine degrees, and the restricting wall is not present.

AUTO MAP LIKE ROLLER SHADE TAKES UP LITTLE ROOM

Attached to the windshield with rubber vacuum cups, an auto map rolls up like a shade when not in use, and is always in handy position. It occupies but little room, does not obscure the view when shut and is protected from dust and the weather in its holder.



For Greater Convenience in Reading the Map While Driving; It Is Mounted on Roller on Windshield



Perry Hale's Monoplane Kite: It Requires No Tail and in the Air Closely Resembles a Real Plane

KITE SHAPED LIKE MONOPLANE MADE BY BLIND MAN

Fashioned on the lines of a monoplane, a new type of kite has been introduced by Perry T. W. Hale, all-American football star of 1900, who was blinded in an explosion some twelve years ago. It requires no tail and is said to be extremely popular with kite enthusiasts.

BIG GARAGE IN ELECTRIC LINER LATEST TRAVEL AID

Passengers on the electric ship "California" may take their automobiles with them at a minimum of trouble and risk, for the vessel has a garage with a capacity of 140 cars. The autos are loaded without hoisting, through side ports, and may be checked like baggage. The "California" uses electricity for almost everything except broiling steaks in the kitchen. Charcoal is employed for this, but the ship's propellers, clocks, elevators, steering apparatus and many other units are run with current generated by huge turbo-generators. The vessel is 601 feet long and has a beam of eighty feet. When it passes from a cold into a warm climate, the electric current is switched from the stoves to fans that drive cooled air over brine pipes. It is the largest commercial liner built under the American flag.



Where Carved Images Are Giving Way to Modern Knowledge; Disease "Scarecrows," Once Popular in Korea, Are Being Forsaken in Favor of Enlightened Health and Sanitation Methods

WEIRD IMAGE HEALTH GUARDS ABANDONED IN KOREA

Belief in the powers of weird faces carved on poles to cure sickness is waning in Korea, according to reports from a medical missionary there, many of the old superstitions being replaced by modern health practices. Young men are studying medicine, dentistry and public sanitation and comparatively little homage is paid the wooden "health commissioners" that once were thought to frighten sickness away and cure illness.

MOTOR BONE SAW FOR BUTCHER SAVES TIME AND WORK

Finding that his customers often grew impatient while waiting for him to saw through large bones, a butcher has devised a motorized unit that does the work much more quickly and with less effort. It is a bandsaw, rigged to a rack with a bell-shaped base on the floor. The frame can be adjusted to various heights, the saw is in an upright position, out of the way, when not in use, and a convenient starting switch for the motor is furnished in the form of a small trigger on top of the handle that guides the saw. A pull of the trigger starts the motor.

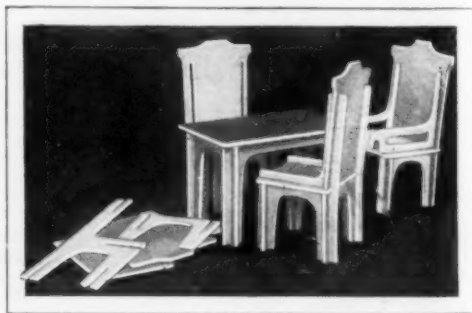
HOTEL TOWELS ARE POPULAR SOUVENIRS

It used to be that hotel guests favored spoons and other table articles when they desired a convenient "souvenir" to take away with them, but the manager of a large Chicago hotel declares that the public's taste has turned to towels, and that 20,000 of them disappear from the principal hostleries there every month. Loss of one towel a month to each room is the average experience, he says, and all sorts are taken, hand towels, those for the bath and all the other varieties. When hotels find towels be-

longing to another in their own laundries, they are mailed postpaid to the name tagged on them, according to a recently established custom.

FURNITURE CHILD CAN BUILD MADE OF CARDBOARD

Amusement and instruction are afforded the child in sets of collapsible cardboard furniture now on the market. The pieces are slotted so that they can easily be fitted together and, when correctly assembled, are said to be strong and serviceable for



Set of Cardboard Furniture, with Chair Taken Apart to Show How the Units Fit Together

play uses. Living-room, dining-room and other sets are furnished.

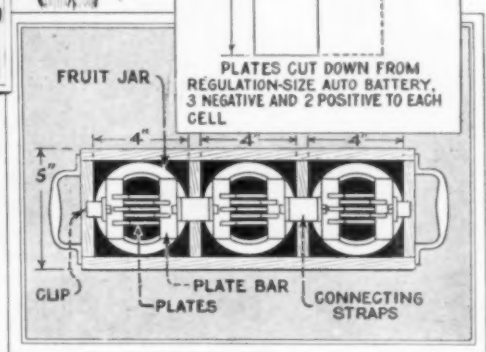
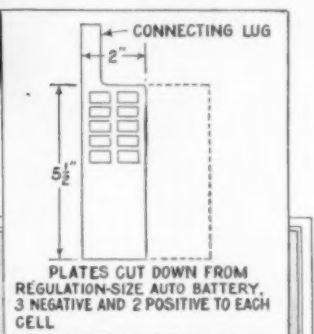
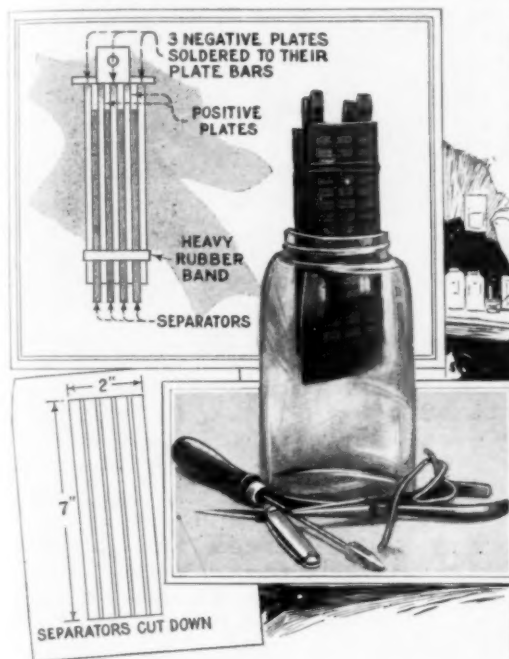
Five Dollars Builds A-Battery and Charger

By LAWRENCE B. ROBBINS

BUILDING an efficient A-battery and charger is not only an easy but an interesting task that many radio fans

spect them for cracks or flaws. Build a wooden case to contain the three jars comprising the A-battery, provided a 6-volt type is required, reducing the dimensions given so as to take two jars if a 4-volt type is to be built. The dimensions for the case

will be found in sketches below and on page 122; $\frac{1}{2}$ -in. wood stock is used for the case and the outside measurements are 14 in. long, 6 in. high and 5 in. wide. The inside par-



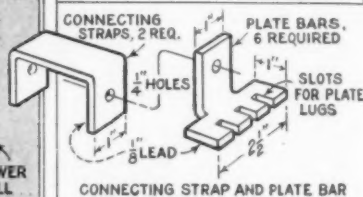
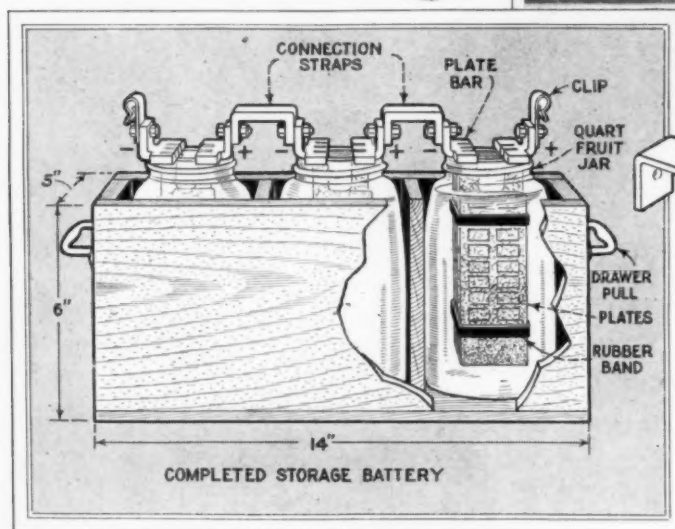
would have undertaken before except for the lack of definite details. The low cost, five dollars; appeals to those with limited pocketbooks, and the interest of the work to the experimenter who likes to do these things for himself. Ordinary quart fruit jars and auto storage-battery plates, easily obtained from the grocery and nearest battery station, respectively, are the main elements in the construction of both units. One, two or three cells can be made up to suit the needs of the builder, depending on the type of tubes he is using in his set. For instance, if the set employs tubes of the 199 type, two cells only will be required. The fruit jars cost about 10 cents each, and the plates from 15 to 20 cents apiece. Fifteen plates in all will be required for a 6-volt three-cell battery, five plates to each cell.

Select three 1-qt. fruit jars and discard the tops, clean them thoroughly and in-

titions are made of the same wood stock, are fitted across the inside at equal distances and reach from top to bottom. The three compartments thus formed are 4 in. square and $5\frac{1}{2}$ in. deep, inside measurement, permitting the fruit jars to fit snugly, with the tops projecting about $1\frac{1}{2}$ in. above the top of the case. The completed case should then be painted inside and out with two coats of asphaltum; when thoroughly dry, screw the handles in position at each end, as shown in the illustration. These handles may be ordinary drawer pulls from the local 5 and 10-cent store, and rubber-headed tacks for feet

may also be obtained from the same place. The plates should measure $5\frac{1}{2}$ in. from top to bottom, disregarding the lug at top, and should be 2 in. wide. Saw out these sections, including the lug, as shown on this page; by following down one of the individual lines separating the columns of paste inserts, a straight cut is assured. To further reduce the cost, a second plate, 2 in. wide, can be cut from the remaining section and a lug soldered to the top, but this is not advised. Three negative

sembled. All positive lugs should be on one side and all negative lugs on the other; snap two large rubber bands around the unit at top and bottom to hold them together. The plate bars, or lug connectors, are made from heavy sheet lead, cut and bent in the manner shown in the illus-



CONNECTING STRAP AND PLATE BAR

plates and two positive plates are required for each cell, therefore, when buying the plates for the three-cell job ask for nine negative and six positive plates. The negative plates come pasted with pure, spongy lead and will have a gray color, the positive plates are a chocolate-brown color, the paste filler used being peroxide of lead. Wood or rubber separators can also be obtained from the battery-service station or garage; these are cut down from standard sizes to 7 in. long by 2 in. wide and four are required for each cell, as shown on page 121.

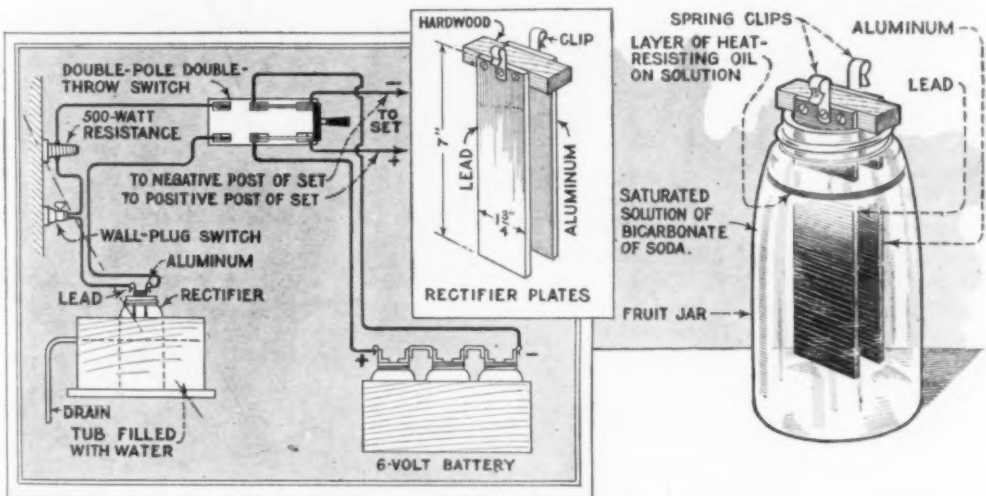
The plates are now assembled, first a negative, then a separator, then a positive plate with the lug on the opposite side, then the separator and so on, until three negative and two positive plates are as-

sembled. The plate lugs are soldered in the slots shown; this operation is simplified by clamping the units in a vise and using a large, hot soldering iron and plenty of solder. Care should be taken not to connect positive to negative plates in any way by dropping solder between them. The upright strip of the plate bar is drilled for bolting to the connecting strap as shown in the sketch; these connecting straps of heavy sheet lead being 1 in. wide and long enough to reach from one jar to the other. The plate bars soldered to the lugs extend across the edge of the jars and support the assembly in each cell; the top view on page 121, at lower right, shows all three units in position, with the connection straps across the partitions connecting the cells in series. When the cells are assembled in the case, the negative plate of one cell should face the positive plate of its neighbor; the connecting straps, drilled at each end, are then bolted to the plate bars with brass bolts and nuts,

well smeared with vaseline after tightening. Bolt a spring terminal clip to each end lug and mark the positive and negative ends for identification; a daub of red paint on the positive terminal is the usual method. The cut-away illustration of the completed storage battery, on page 122, shows the plates clearing the bottom of the jars; this is necessary to provide sediment space. The electrolyte for filling the cells is made by mixing chemically pure concentrated sulphuric acid with chemically pure water. The full-strength acid is mixed with the water to obtain the suitable specific gravity necessary for the battery; the usual proportion is 20% acid by volume. When mixing the acid, never add the water to the acid; pour the correct amount of water in a bottle, pitcher or jar and then add the acid to the water very slowly. Ready-prepared electrolyte can be obtained from the local battery-service station, saving much time and trouble, and the maker is advised to buy his electrolyte rather than make it. Fill each cell so that the electrolyte will come about $\frac{1}{4}$ in. above the tops of the plates; any space between the jars and the case should be filled with corrugated board or similar material, to hold the jars rigid.

The storage battery completed, we are

a strip of hardwood, $\frac{1}{2}$ in. wide, boiled in paraffin; the aluminum electrode is cut from a sheet of heavy aluminum, the thickness of which is not important, but the heavier the better, and it should be as pure as possible to obtain. The lead electrode is cut from heavy sheet lead; both electrodes are 7 in. long by $1\frac{3}{4}$ in. wide; drill three holes in one end of each electrode and fasten to the wood top as shown in the insert on this page, with brass wood screws, the center screw holding a spring-clip connector. Fill the jar with either a saturated solution of borax; a rather dilute solution of sodium bicarbonate, or, better still, a solution of monobasic ammonium phosphate in the proportion of one pound to the gallon of distilled water. In either case, distilled water must be used in making the solution; fill the jar to within about one inch of the top and pour a thin layer of transformer oil or other heat-resisting oil to prevent evaporation or creeping. Set the rectifier jar in a small tub of water that is provided with an inlet and an outlet to keep the water level below the top of the jar by at least 2 in. This is easily done by means of two short lengths of rubber tubing connected to a faucet and drain, the outfit, of course, being placed near the water supply. This



now ready for the rectifier, or charger as it is commonly known; this is made from a single quart-size fruit jar. An electrode support is made for the top of this jar

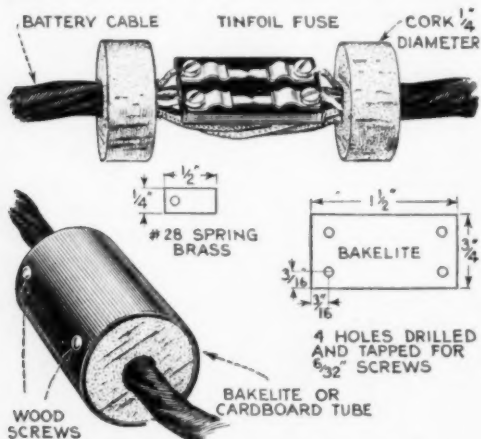
cooling tub need not be equipped for water circulation, but this method is advised for best results. The hookup shown in sketch above is self-explanatory and needs little

comment; the 500-watt resistance may be taken from an electric heater or the heating element from a flatiron may be used. The aluminum electrode is always positive; see that this is connected through the switch so that it goes to the positive terminal of the storage battery. To charge the battery, throw the switch arm over to the connections to the rectifier and turn on the 110-volt a.c. lighting circuit; the charging rate will be about 2 amp. an hour. When the charge is completed, throw the switch arm over to the opposite side, connecting the battery with the receiving set,

and turn off the current. Ten to twelve hours will be sufficient to charge the battery even from a low hydrometer reading. Keep the rectifier as cool as possible and occasionally scrape off the white coating that forms on the aluminum electrode if a solution of borax is used. We have prepared a large blueprint showing the various steps in the construction of both units and suggested hookups. This may be obtained from Popular Mechanics radio department, 200 E. Ontario st., Chicago, for 25 cents, to cover cost and mailing. Specify blueprint No. 126.

Homemade Fuses on Battery Cable

When a set of radio tubes are accidentally burned out or the batteries are short-



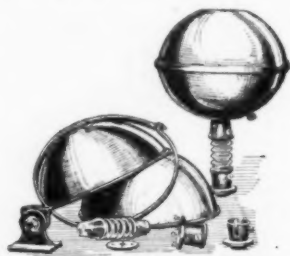
Any Radio Owner Can Provide Protective Fuses in the Battery Cable

circuited and discharged, the radio owner begins to think of safety-first methods and ways of preventing these expensive accidents. In the drawing is shown a fused battery cable. This will give protection to the tubes and it is easily and quickly made. About 1 ft. from the end of an ordinary battery cable, the braided covering is removed, leaving the insulated battery wires exposed for about 2 in. In the center of each of two large bottle corks, a hole is drilled to permit the corks to slide over the cable. They are then fastened on the cable with glue at the place where the braided covering was removed, the exposed battery wires being

between the two corks. For the fuse base, a small piece of bakelite is cut and drilled as shown in the drawing. Small brass clips, to hold the fuses, are fastened to the base with screws. These clips make it easy to renew the burned-out fuses. The B-negative and A-positive leads are cut and connected to the fuse clips. Fuses are made from the tin foil that comes wrapped around candy and chewing gum. It is cut in strips, $\frac{1}{16}$ in. wide, for the A-battery fuse, and about $\frac{1}{32}$ in. wide for the B-battery fuse. A bakelite cardboard tube is used for a cover; this slides over the corks and protects the fuses from accidental breakage or from being short-circuited. The cover is held in place by small wood screws.—R. J. Williams, Chicago.

Ball-Antenna Kit

It is claimed that radio reception can be improved considerably by using a ball antenna of the kind shown in the illustration. This outfit comes in a kit and can readily be assembled and installed by anyone. It consists of a

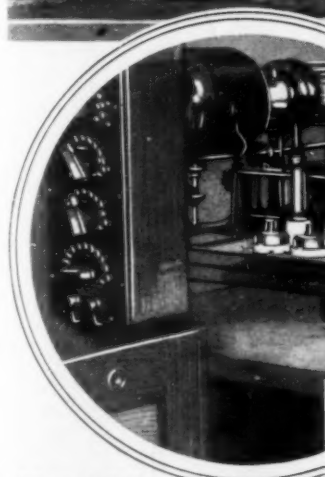


bracket, glass insulator and a hollow aluminum ball, 10 in. in diameter. Being non-directional, several of these can be installed on an apartment roof without interference. Selectivity is another advantage claimed for this type of aerial.

Facts and Fads for Radio Fans



Left, Radio-Testing Laboratory Perched on Top of 125-Foot Tower Overlooking Atchison, Kans., Is Designed to Get Away from Earth Disturbances While Testing and Improving Circuits; Right, Graham McNamee and Phillips Carlin Announcing a Bridge Game



©Harris & Ewing

Above, New Radiophotogram Machine Installed in the Office of Naval Communications at Washington, D. C., Sends Photographs of Naval Messages in Facsimile Instead of the Usual Dots and Dashes; No Radio Operator Is Necessary; Philip G. Cronan, of the U. S. N., Looking Over a Specimen Message; Right, British Radio Alarm Designed to Ring a Bell When SOS Signals Are Received



SELECTIVITY Feature of Aero-Dyne Six

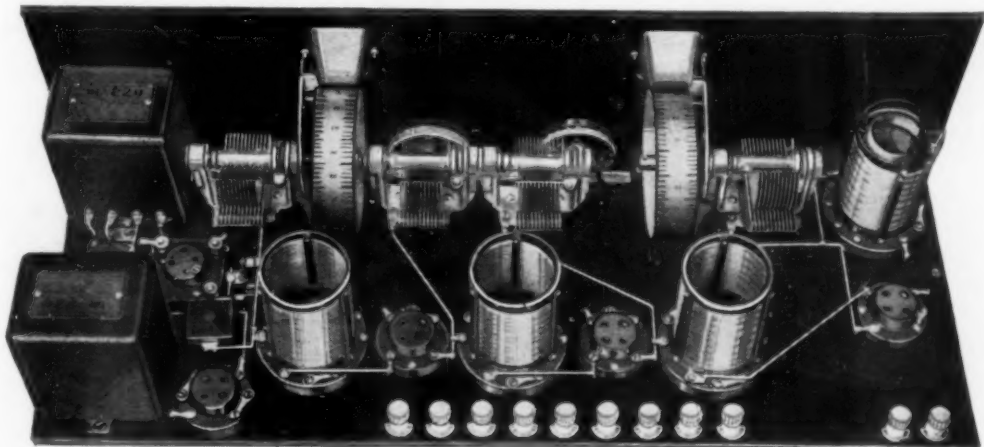
By FRANK L. BRITTIN

SELECTIVITY, achieved with a minimum of controls, has been the aim of circuit designers for some time, in a set of the tuned r.f. type. In the six-tube set described in this article, selectivity and sensitivity have been attained by the use of specially designed coils and a well-balanced circuit without adding any more controls than absolutely necessary. These coils are similar in construction to the low-loss coils employed in the 15 to 550-meter set described in the November, 1926, issue, but are of the stationary instead of the plug-in type.

The set employs three stages of r.f. amplification, and has two controls of the modern drum type, facilitating easy operation of the set. A separate tuning condenser is used for the first r.f. stage, permitting perfect tuning, regardless of the length of aerial used. The detector and two stages of transformer-coupled a.f. amplification, with power-tube equipment in



the last stage, complete the circuit. If all tuning controls were grouped for operation with one dial, an ideal condition would be realized, but, if this is done, it would be difficult to obtain perfect matching of the tuning units over the entire waveband. It would be possible to bring the receiver into perfect resonance at one wavelength on the dial, but on turning the dial to other wavelengths, this would not be true. Another point taken into consideration by the designer was the matching

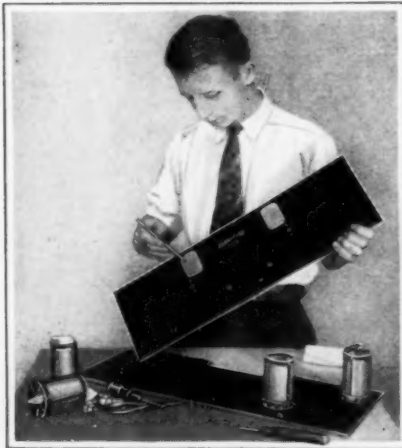
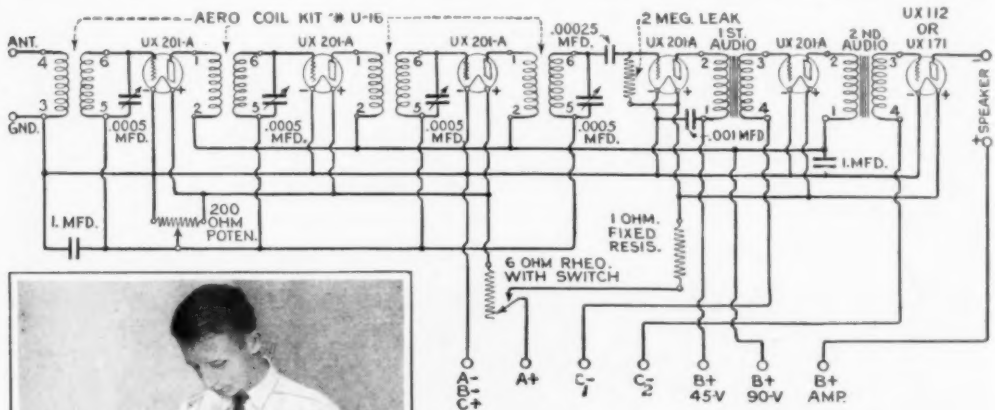


Rear View of Completed Set, Showing Simple Arrangement of Parts and Method of Wiring above Subpanel

of the coils. It was found that in the common practice of testing coils at only one wavelength of the broadcasting band, two or more coils might be perfectly matched at the wavelength at which they were tested, and yet, at some other wavelength, would be hopelessly out of tune. By testing the coils at both the upper and lower ends of the band, the coils so matched would be in close agreement over the entire band, therefore these coils are supplied in matched sets, tested at both 250 and 500 meters. The condensers used are constructed in such a way that they can be assembled in the receiver and either a long control shaft, or insulated, flexible couplings substituted for the regular shafts without disturbing the accuracy of the units. Small neutralizing or balancing condensers, made by the same manufacturer are very useful for equalizing the units of the multiple-tuning condenser, and may be fastened directly to the socket binding posts or to the condensers, simplifying the wiring connections. The audio stages consist of two heavy-type a.f. transformers, together with a power tube, mak-

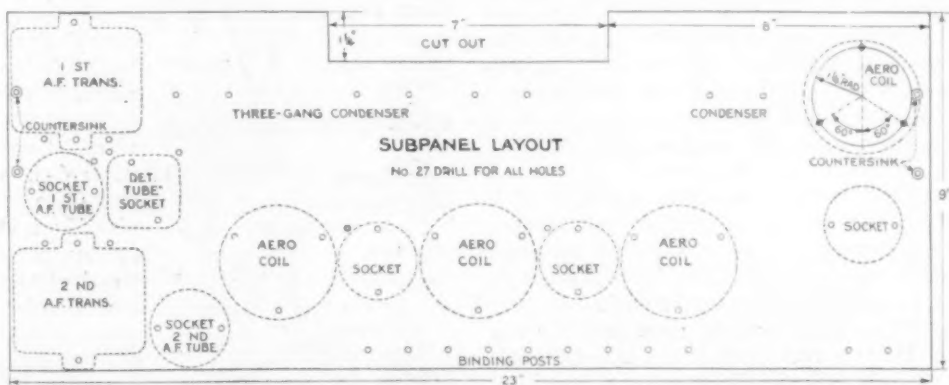
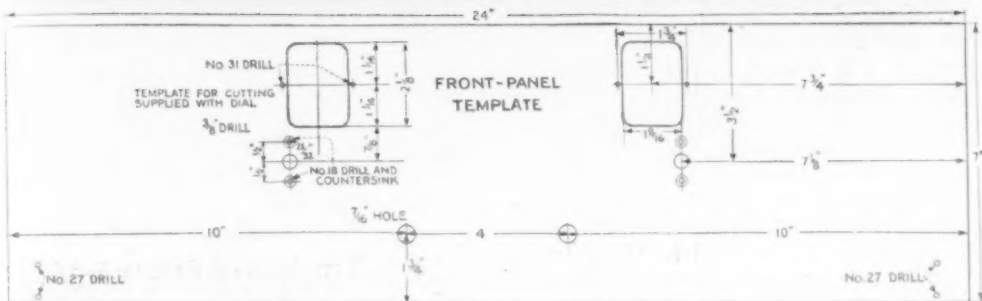
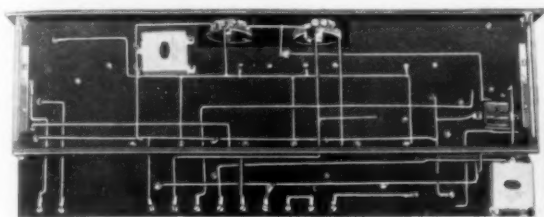
ing possible beautifully rounded reproduction of the bass notes. Drilled and engraved panels are available; however, for those who wish to drill their own, full-size drilling templates of the diagrams appearing on page 129 have been prepared.

The wiring diagram on page 126 shows the simple arrangement of the instruments with the coil bases and sockets marked for position. Note, in the photo on page 129, that the subpanel is cut away at front to make room for the rheostat-switch and the potentiometer. Mount the instruments on the front panel first, as shown in the photos on this page. The brackets are then screwed to the underside of the subpanel, and the subpanel assembly completed. No. 14 round, tinned-copper busbar wire is used for wiring throughout the set. It will be noted that the last coil at the right, mounted close to the front panel, has a hinged primary which allows a very close adjustment of the coupling for aeriels of various electrical characteristics, and different selectivity requirements. In each case, the No. 6 terminal of the coils is mounted as close as possi-



Above, Schematic Diagram; Lower Left, Front Panel Drilled, Showing Holes for Drum Dial Windows; Right, Front View of Assembled Panel

ble to the grid terminal of the tube socket to which it is to be fastened. It will also be noted that, in many cases where a lead should go through the subpanel, a special hole has not been drilled, but the lug has been joined to a soldering lug placed under a near-by mounting screw and the circuit picked up from the screw under the subpanel, thereby simplifying the operation. The underside view of the subpanel, shown on this page, gives the



Upper Left, Underside View of Subpanel, Showing Supporting Beam; Right, Assembling Coils on Subpanel; Below, Drilling Template for Front Panel and Subpanel Layout

method of wiring and the location of all the fixed condensers except the .00025 grid condenser, which is mounted directly on the socket terminal above the subpanel. This photo shows another detail, which should be mounted at this time—the bar which is mounted across the brackets at

the rear as a supporting beam for the subpanel. It consists of a strip of panel material, 3/16 by 1 1/8 by 23 in., and is fastened to the rear ends of the subpanel brackets by means of four short machine screws. This bar increases the rigidity of the assembly, thus assuring the continued per-

fect alignment of the condensers. Where the under-subpanel wiring runs from back to front, small holes are drilled to pass the wire, making possible permanent sepa-

turn on the filament switch; this is done by turning on the rheostat, which also turns off all the tubes in the set when turned to the extreme left. When tuning

MATERIAL LIST

- 1 front panel, 3-16 by 7 by 24 in.
- 1 subpanel, 3-16 by 9 by 23 in.
- 1 Aero U-16 kit of four coils.
- 2 S-M drum dials.
- 2 S-M, type 220, a.f. transformers.
- 4 Hammarlund .0005 mfd. condensers.
- 1 Benjamin, or similar type, spring-suspended socket.
- 5 S-M No. 511 sockets.
- 2 Tobe, or similar type, 1-mfd. fixed condensers.
- 1 Carter, or similar type, .001-mfd. fixed condenser.
- 1 .00025-mfd. grid condenser, Carter or similar type.

- 1 Yaxley, or similar type, switch-rheostat, 6 ohms.
- 1 Yaxley, or similar type, potentiometer, 200 ohms.
- 1 Yaxley, or similar type, fixed resistance, 1 ohm.
- 1 Polymet EZ, or similar type, gridleak mounting.
- 1 Tobe, or similar type, 2-meg. gridleak.
- 11 X-L, or similar type, lettered binding posts.
- 10-in. round brass rod, 3/4 in. in diameter, or 3 Hammarlund insulated flexible couplings, busbar, No. 14 round, tinned-copper type, machine screws, nuts, etc.
- 5 doz. soldering lugs, long, round-hole type.

ration and neat arrangement of the various leads. After wiring as much as possible of the subpanel without the front panel, prepare the front panel for mounting. Care should be taken in the mounting that the driving mechanism of the drum dial is placed in the collar of the bracket before the panel is faced up to the subpanel assembly, after which the front panel may be pulled up with screws through the brackets. Now, with a screwdriver inserted to spread the lips of the drum driver, the dial may be slid along the condenser shaft and into the aperture and the drive mechanism released on it. At the same time the dials should be turned so as to read 100 with the condenser plates all the way in, and the dial locked in place on the shaft. The remainder of the wiring to the potentiometer and switch-rheostat may now be completed and the receiver tested.

All sockets of the receiver are to be supplied with UX-201A or CX-301A tubes, except the power-tube socket located nearest the back edge of the subpanel; this tube may be UX-112 or UX-171, as indicated in the schematic diagram. Note that the C-battery necessary for the UX-112 is 9 volts and, if the UX-171 tube is used, 27 volts of C-battery are required.

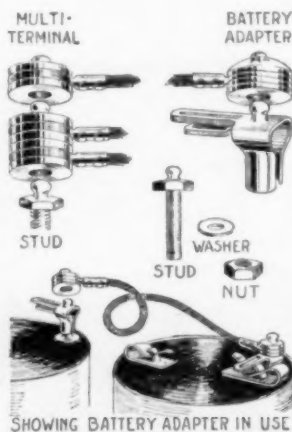
Due to the careful matching of the units, the set will not require any major adjustments for efficient operation over the entire waveband or, if any slight balancing is found necessary, this may easily be done with the small balancing condensers mentioned. Connect the A, B and C-batteries in the manner shown in the diagram on page 126, also the aerial and ground, and

for a station, keep both dials in step and when the station is located, adjust the left-hand dial independently for loudest and clearest signal; the volume is then controlled by the potentiometer.

An enlarged blueprint of the wiring diagram, shown on page 126, together with full-size drilling templates of the front and subpanel, may be obtained from Popular Mechanics radio department, 200 E. Ontario st., Chicago, for 25 cents. Specify blueprint No. 125.

Snap Terminals on Battery Leads

Good electrical and mechanical connections are the features claimed for the "snap" type of battery terminal shown in the illustration. Small round-head studs are provided on the receiver instead of regular binding posts, and the terminals snap tightly on these studs. A multi-terminal can also be obtained.



for use when two or three leads must be connected to the same stud. Vibration does not loosen these fasteners, as is the case with leads that are attached to the common type of binding post.

Helpful Hints

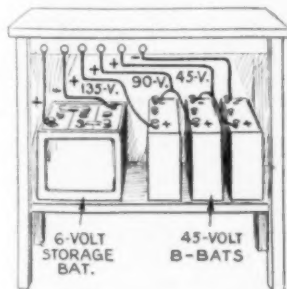
from

Radio Experts

THESE valuable kinks have been written especially for Popular Mechanics Magazine by prominent radio experts. They represent not merely ideas, but practical advice from the best technicians in the profession on methods that will help make your set more efficient in operation, more convenient to handle or easier to build.

Battery-Testing Kink

Here is a simple timesaver any radio owner can make at little or no cost which is especially useful to those set owners who have their batteries installed in a console or radio table-type cabinet where it is difficult to get at them to take a voltmeter reading. To make such a reading is required once in a while to determine the condition of the batteries and, in most cases, it is necessary to drag the cabinet away from the wall and reach into a crowded battery compartment, with the possibility of pulling a wire loose or short-circuiting something. I have eliminated

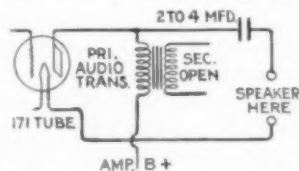


all of this trouble with my set by drilling a few $\frac{1}{8}$ -in. holes in the side panel of the radio table close to the top and about 1 in. apart; into these holes I

bolted some old nickelplated switch points taken from my scrap box. To these I fastened flexible leads inside the cabinet, connecting them to each battery in turn, as shown, so that by putting my voltmeter across any two points I can determine their condition.—H. G. Nebe, chief engineer, Station WSMB, New Orleans, La.

Output Impedance for Power Tube

With the popularity of the 171-type of power tube, I think the readers of Popular Mechanics magazine might be interested in knowing how easy it is to make an output impedance to keep the B-battery d.c. from passing through the windings of the loud speaker. Not until I had burned out one such winding did I wake up to the fact that something should be done. For the audio choke I used most anything that passed enough current and still offered a fairly high impedance. I am now using



the primary of an audio transformer, as shown in the diagram. The output impedance both protects the speaker and improves the tone.—C. R. Yarger, chief engineer, Station KFNF, Shenandoah, Iowa.

Bunched Leads for Sharp Tuning

The set builder who wants selectivity should bunch all leads possible, when wiring the set, and branch each lead off as it comes to its terminal point. This is a simple thing to do, considering the fact that all leads start from the terminal strip to different parts of the set. After bunching, they can be tied or laced with string at various points and fixed with a little collodion if desired. There is one thing that is very important when wiring a set in this manner and that is, that the leads from the grids of the r.f. tubes and detector should be as far away from the other wiring as possible. This also applies to the plate leads from the same tubes to the r.f. transformers; these leads must be kept clear of the grid leads. The sketch illustrates the idea, and of course it is understood that the aerial lead must also be kept clear of the other wiring. When you wire a set and string wires all over the subpanel it is highly probable that they will be energized and create a much longer field than if they were bunched together in the manner described. Use stranded insulated hookup wire and try out this method when wiring your set. I have found it highly successful.—M. M. Paggi, chief engineer, Station KFWO, Avalon, Catalina Island, Calif.

Superheterodyne Kink

In superheterodynes that employ the tuned-plate, tuned-grid type of oscillator, which is subject to spurious oscillations of a frequency other than the frequency to which the coils are tuned, the following

simple remedy can be applied. We have found that a small choke coil inserted between the grid condenser and the junction of the grid coil and the grid tuning condenser effects the remedy. The choke coil need not be of special construction; a simple one may be made by coiling the busbar, at the point just mentioned, five or six times around a form 1 in. in diameter.—Wm. M. Perkins, engineer for Aero Products, Inc., Chicago, Ill.

Power Tubes Used As Detectors

One of the most valuable kinks that has come to my attention within the past few months has been the use of UX-120 and UX-171 tubes as detectors, with negative grid bias. The greatest trouble with detector tubes today is the fact that they are unable to handle the tremendous amount of current impressed upon them by radio-frequency amplifiers. Hence, the detectors distort and

chatter, due to their inability to handle the necessary current.

In a set using 199-tubes, cut out the grid condenser and leak, and apply 22 volts to the plate of a UX-120 used as the detector tube. From 3 to 6 volts of negative grid bias are required when using this tube. The 171-type is used in the same manner in sets employing the large tubes with from $4\frac{1}{2}$ to 7 volts negative grid bias. Outside of the small additional filament-current drain, there is really less drain on the B-batteries. Far more volume and better quality can be obtained with tubes of this type as detectors, and the idea is easily applied to any set.—R. V. O. Swartwout, chief engineer, Station WCAO, Baltimore, Md.

Loose or broken connections cause trouble both in manufactured and home-built sets; after checking tubes and batteries all wiring should be carefully examined.

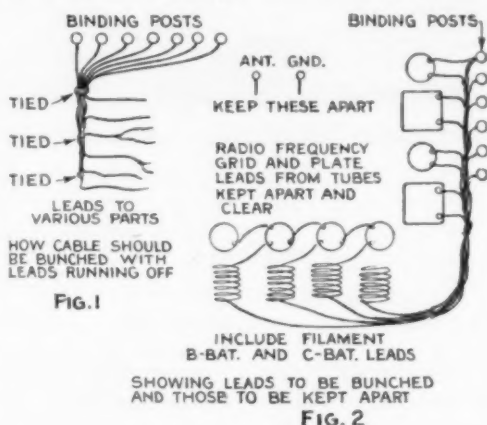


FIG. 1

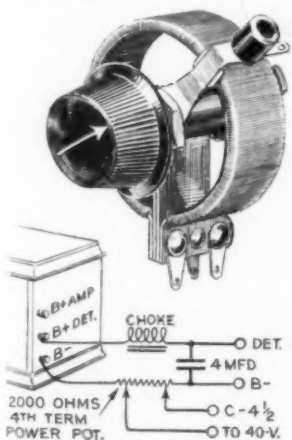
FIG. 2

Fixed Midget Condensers Easy to Wire

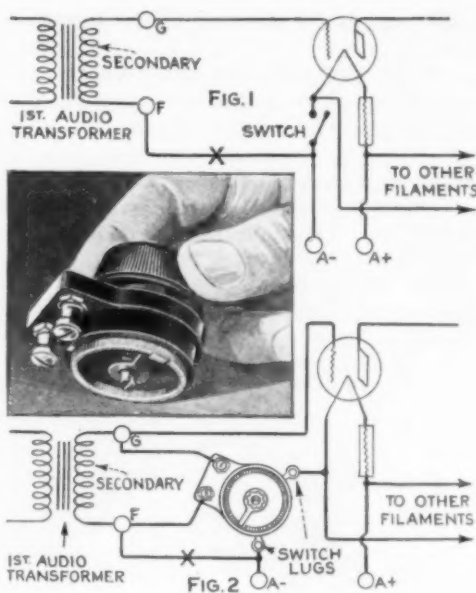
Half the usual size and one-quarter the weight of the average fixed condenser, the midget condensers now appearing on the market are easier to wire. Besides, the builder is often at a loss to find a convenient place to mount fixed condensers in the restricted space below the subpanel. The midgets are provided with presoldered lugs, making quick soldering possible with a minimum of heat. They are said to be tested at 1,500 volts, and rated as safe for continuous operation at 1,000 volts, d.c. The marked capacity is guaranteed to be within 10 per cent.

Resistance C-Bias for B-Eliminator

Many of the commercial circuits, using B-eliminators, dispense with C-batteries entirely and use the voltage drop across a resistance to provide C-bias. Such an arrangement is entirely feasible when the B-eliminator gives a sufficiently high voltage output, so that part of this voltage can be utilized for the C-bias. Care must be used, however, or motorboating will develop due to coupling in the resistance. This is common to the plates of two or more of the tubes in the set. A simple instrument for regulating C-voltage is shown in the illustration.



This choke can be of the commercial types, or the primary of an old audio transformer can be used. The four-terminal power potentiometer shown is connected as in the diagram, permitting the use of a C-bias potential of from $4\frac{1}{2}$ to 40 volts.



Controlling Tone and Volume

There are many sets now in use without a suitable volume control; in others, rheostats or similar devices, which are no longer in good condition, have been used for this purpose. The little device shown in the accompanying photo is said to be capable of an extremely delicate shading, from soft, whisperlike music up to powerful volume with remarkable clarity of tone. In Fig. 1 we have a circuit diagram showing the usual circuit connections before the instrument is installed. In Fig. 2 we show the instrument connected, to improve the quality and afford a means of controlling signal volume. The instrument is available in two types, one combining a filament switch and one without; the switch type is shown in the diagram. When turned as far as possible to the left, the A-battery is off. When a C-battery is desired, the circuit is broken at the point marked X, C-positive is connected to A-negative, and C-negative is connected to F-negative of the transformer secondary.

Popular Mechanics' radio department offers its information service free to all readers of our magazine. We will be glad to help you with your radio problems, and will promptly answer all inquiries directed to this department.

Efficient Radio Ground Easily Installed

An efficient radio ground, having a "discharge area" several times as great as a driven ground, is now available. Its walls are of heavy sheet copper, rolled into the shape of a truncated cone. A 20-ft. length of heavily enameled lead-in wire is provided, and its connection to the ground proper is made by two heavy spot welds. There are no other soldered or bolted joints and, thus, no electrolytic action is possible. The interior is filled with pure



grain charcoal, which absorbs and holds moisture. The device itself, the cap being removed when it is installed, acts as a reservoir for water, providing the lowest possible resistance. Compact and convenient to handle, the unit is installed in a hole bored with an ordinary post-hole auger, no large excavations are required, and the earth adjacent to the ground need not be disturbed. The sketch shows, at the left, the comparatively small area a driven ground exposes to the moist earth and, at the right, the much greater area for discharge obtained with the new type.

Trouble-Shooting Kinks

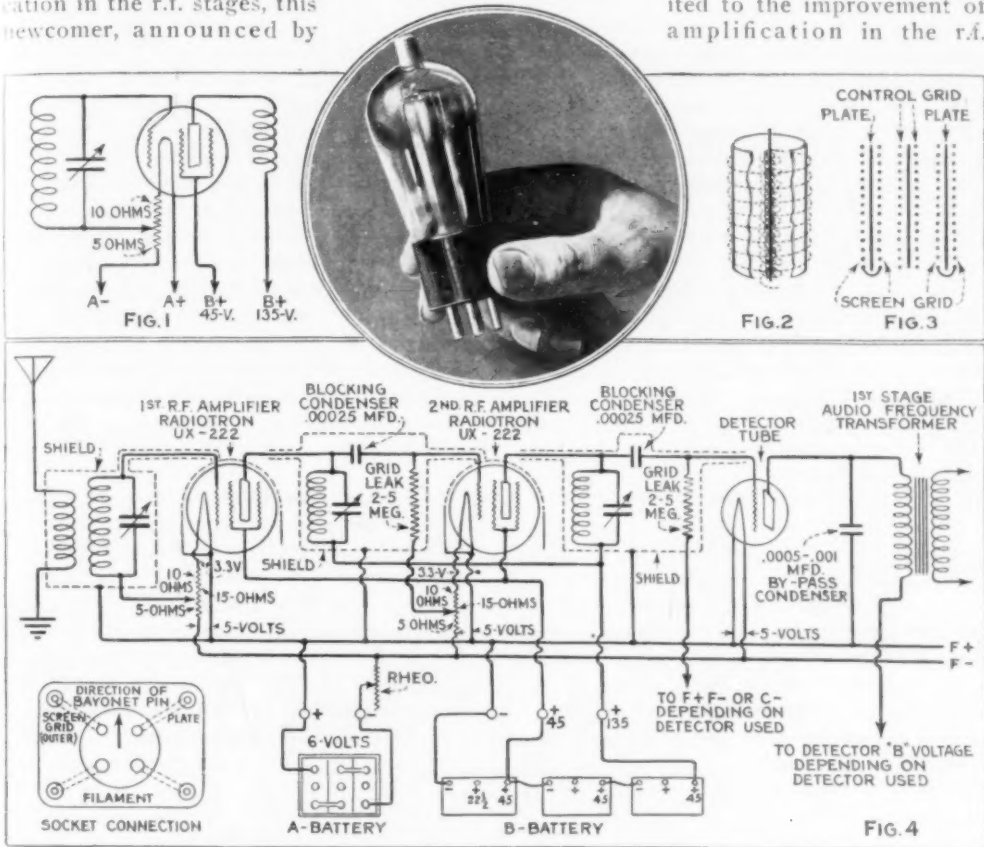
When trouble appears in the set, investigate carefully, and the chances are that you will quickly find the cause. First examine the batteries, as run-down batteries are the cause of such troubles as the set suddenly losing volume or developing

noisy reception. Test the polarity and voltage of all batteries, including C-batteries, and replace any that are defective. Tune in the strongest local station, and if the volume from the loud speaker is still weak, tap the tubes with the fingernail to determine whether or not the amplifiers are operating; if not, a ringing sound will be heard in the loud speaker. Examine all battery connections, and clean any terminal connections that appear to be corroded. If the battery tests have been made and show no trouble either in lack of voltage or defective connections, the next step is to substitute tubes of known efficiency. Try a pair of phones in place of the loud speaker. If no sound is heard in them, remove the tubes from the set and disconnect the A-battery; then, with a pair of headphones in series with a 22½-volt B-battery, test the grid-to-filament circuits. This is done by putting the terminal of one of the headset leads on the grid contact of the socket, the other phone terminal going to the 22½-volt battery, while the other lead from the battery is put on the filament contact of the socket. When the contacts are made on the sockets, loud clicks should be heard in the headset, except in the detector-tube socket. Because of the high-resistance grid-leak here, a very weak click will be heard or, perhaps, no click at all. Test the transformer windings in the same manner. The secondary terminals are marked F and G, and the primary terminals P and B. If the trouble has not yet been located, replace the tubes in the sockets and put the set in operation. If it is possible to raise a station weakly, press down on each tube successively, and you may find one that is not making good contact in its socket. The remedy is to remove all the tubes and disconnect the batteries, at any rate remove all the tubes; then, with the fingernail or a notched stick pull up all the socket springs to insure a good contact between them and the tube prongs. Polish the ends of the latter and also switch and jack contacts, as corrosion at these points often means the difference between good and poor reception. Finally, look over the ground and aerial connections, or loop connections if a loop is used, and, if the trouble still persists, call in a reliable radio-service man.

New Tube Is Self-Neutralized

The tube shown in the photo is one of the few really new developments in the radio field for some time. Designed to give much greater amplification in the r.f. stages, this newcomer, announced by

6. The B-voltage is 135 maximum, the filament voltage is 3.3, just .3 volt more than that required for the 199-type tube, and the amperage needed is .13. The new tube is at present designed for battery operation only. Its use is limited to the improvement of amplification in the r.f.



Insert, Photo of the New Tube, Showing Control Grid Connection at Top

Mr. Elmer E. Bucher, of the Radio Corporation of America, is to be known as the UX-222. The tendency to oscillate just short of the point where maximum signal strength is attained has been the outstanding fault of the standard tube. While oscillation is very desirable and necessary in generating the broadcast carrier wave, its presence in the receiver amplifying circuit renders the standard tube useless as an amplifier until oscillation is suppressed. The voltage-amplification factor of the new tube, due to its unusual construction and methods of application, is said to be from 30 to 150 without a squeal; the average r.f. amplifier gives an amplification of

stages, and it is not adaptable to present-day sets. Each stage of r.f. must be thoroughly shielded, as shown in the circuit diagram, and three tubes should be used to obtain maximum results. The tube has two grids in addition to the usual filament and plate, the extra grid being said to make the circuit more stable by preventing feedback. No neutralizing methods are required in the receiving circuit when the four-element tube is employed. Hence, the construction is simplified and the set is more easily controlled without the customary howls and squeals. The point on which the greatest interest is focused is the amplification factor, which is 30 to 50

in circuits of the tuned r.f. type and to 150 when used in sets of the superheterodyne type. The circuit for the grid return and necessary grid bias is shown in Fig. 1. The screen grid inclosing the plate, and connected to the prong in the base ordinarily connected to the grid in the standard tube, is led to the 45-volt tap of the same B-battery that supplies energy to the plates of the standard tubes in the set. The regular grid, which now becomes what is known as a "control" grid, is connected to a terminal at the top of the tube, and its outside connection is made as shown in Fig. 1. The plate voltage recommended is from 90 to 135 volts, preferably the latter.

Figs. 2 and 3 show cross sections of the elements in the tube. In Fig. 2, the heavy vertical line in the center represents the filament; the narrow solid spiral encircling it represents the control grid, similar in character to the grid of a standard tube.

Light-Sensitive Tube

Designed to fill the need for a rugged light-sensitive valve, or photo-electric cell, which can be used conveniently in apparatus by experimenters and manufacturers interested in television, talking motion pictures, alarm systems, color sorting, etc., this new tube replaces many of the make-shifts formerly used by experimenters. The cell is mounted in a spherical bulb, 2 in. in diameter and 5 in. in over-all length, the lead-in wires being brought out to a standard Edison screw base, as shown in the photo. The internal construction is designed to utilize all those features which are best calculated to produce a cell which is free from "spurious" or "dark" currents and from "lag"

or "fatigue," in laboratory parlance. It is also said to be free from the influence of temperature and to be highly sensitive to

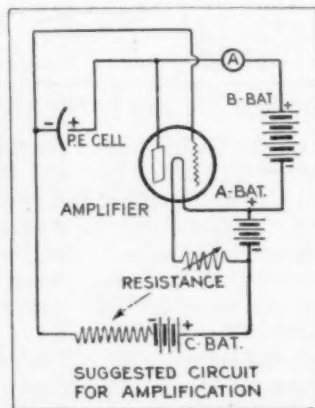
The dotted spiral that incloses both these elements represents the inner screen; the circular plate is shown broken away to expose the inner elements. The outermost dotted spiral is the outer screen. Both inner and outer screens are connected, thus shielding the plate on both sides. Fig. 3, also a cross section, shows the various elements in their relative positions. In Fig. 4 we have a suggested typical screen-grid r.f. amplifier circuit, consisting of two stages of r.f., employing the new tubes and a standard detector tube.

Just what the future holds in store for this new tube remains to be seen, but experimenters are very enthusiastic about it and are looking forward to its early release. At the time this article is written no definite release date has been announced by the manufacturers, although samples have been supplied to several experimental laboratories for the purpose of circuit development.

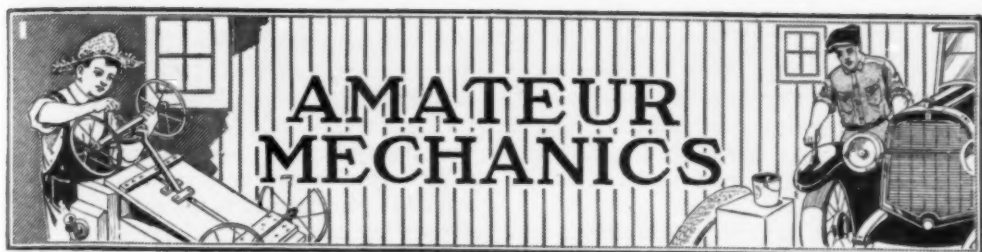
light change over the entire spectrum. The active medium used is potassium, on the surface of which is formed a film of colloidal potassium hydride. This surface is said to have a sensitivity almost a hundred times as great as the pure potassium. Further sensitivity is obtained by the presence of neon gas. The anode is a small disk placed edgewise toward the window, so that no shadow is cast upon it. With a

single step of amplification, as shown in the diagram, a deflection of 30 milliamp. has been obtained with a 100-watt lamp as a light source. In this circuit a UX-112 is used as an amplifier tube with a 90-volt B-battery, 6-volt A-battery and an 8-volt C-battery. A fixed resistance of 10 meg. is used in the grid circuit.

Technical information in the nature of formulæ, laws, and constants relating to specific problems will be furnished by the manufacturer.



Left, Light-Sensitive Tube; Right, Diagram for Using the Tube with One Stage of Amplification



Skate-Sailing Is Thrilling Sport

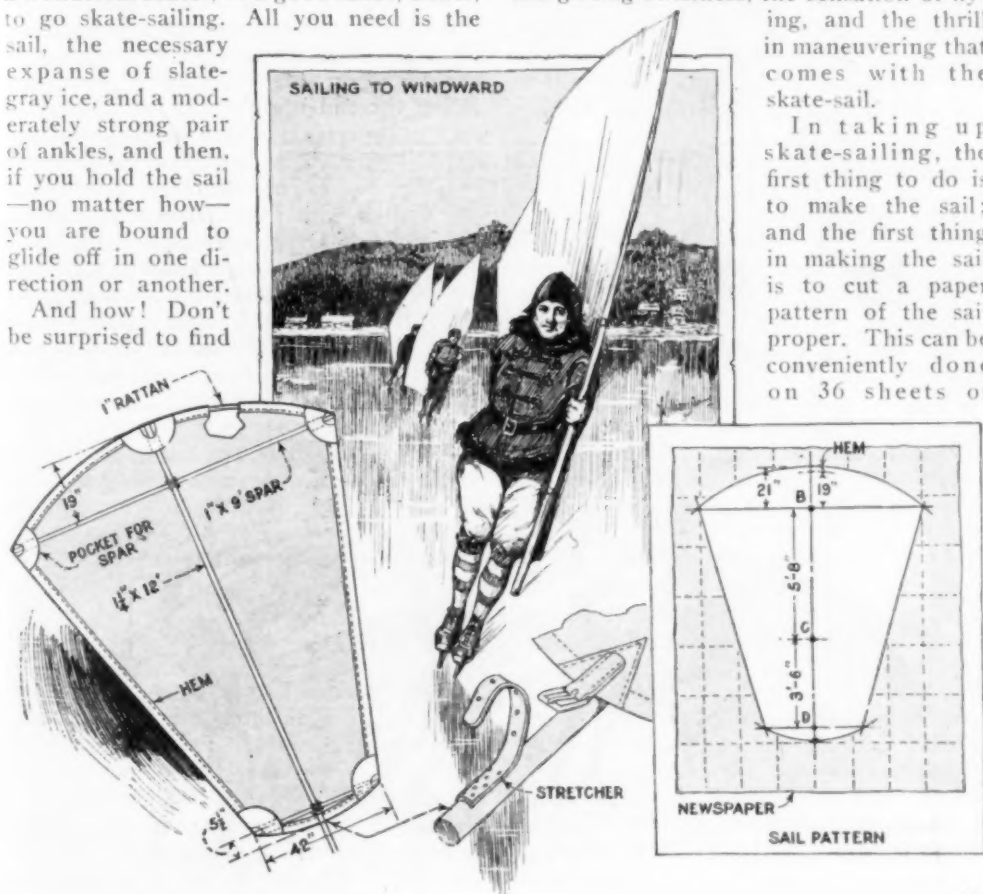
By SAM BROWN

SCUDDING to leeward with the speed of an ice yacht, tacking to windward with all the nautical nicety of a center-board skiff, feeling the tug of fifty square feet of taut canvas veering into a spanking breeze—that's the thrill that comes with the skate-sail. You don't have to be a wonderful skåter, or a good sailor, either, to go skate-sailing. All you need is the sail, the necessary expanse of slate-gray ice, and a moderately strong pair of ankles, and then, if you hold the sail—no matter how—you are bound to glide off in one direction or another.

And how! Don't be surprised to find

yourself "sailing" all over the ice on some portion of your anatomy other than your feet. But don't let that discourage you. Skate-sailing, like skiing and skating, is a sport that comes bump by bump, but it is only through experiencing these beginner's mishaps that you can later enjoy the gliding swiftness, the sensation of flying, and the thrill in maneuvering that comes with the skate-sail.

In taking up skate-sailing, the first thing to do is to make the sail; and the first thing in making the sail is to cut a paper pattern of the sail proper. This can be conveniently done on 36 sheets of



newspaper, pasted together as shown in the pattern drawing. Down the center of this pasted sheet, draw a heavy black line. On this line, close to the top, mark a dot to represent the sail top. From this dot, measure down on the line the distances indicated, and make dots B, C and D.

Draw lines at right angles to dots B and D, the upper one 9 ft. long, and the lower 42 in. long. Now, fasten a piece of string to a thumbtack, and insert the tack through the paper at the dot C. Fasten a pencil onto the string at the proper distance to draw an arc through the ends of the 9-ft. line, and then, still using the point C as a center, swing another arc through the ends of the 42-in. line. Draw lines connecting the intersections of the cross lines and arcs, and you will have a full-size pattern of the skate-sail.

The actual sail is then sewed together, using this paper pattern as a guide, and allowing 2 in. all around for hem. Material for the sail can be either 3-oz. zephyr cloth, 3-oz. duck, Egyptian cotton, balloon silk, or any other light, strong material.

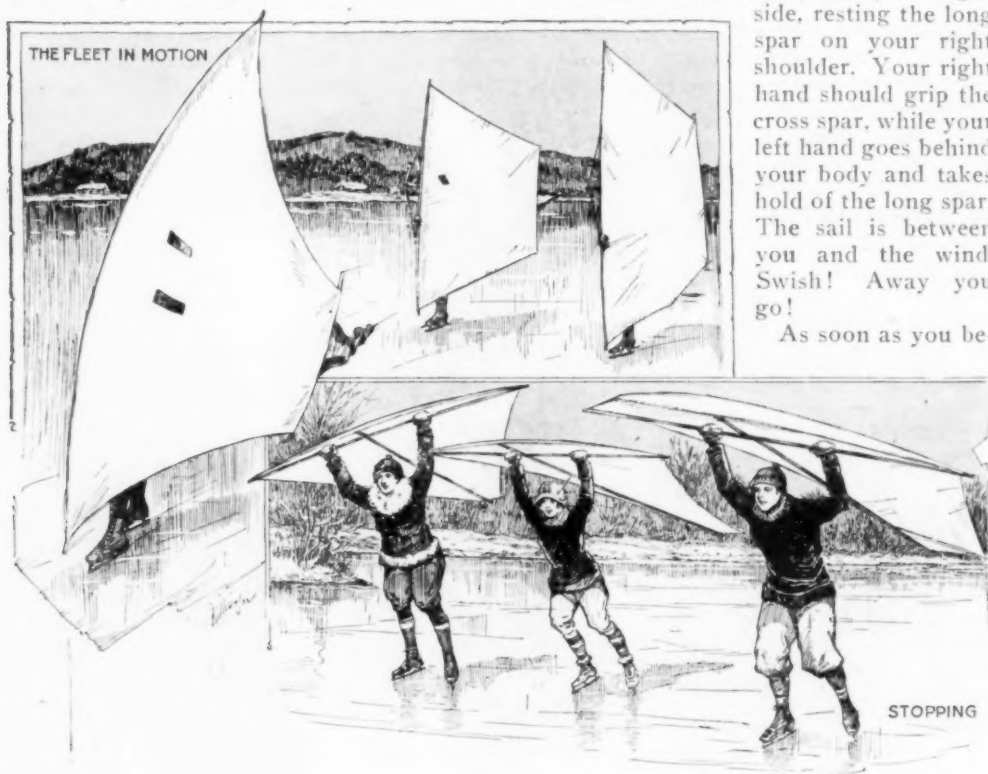
Next in order come the spars. These should be cut from spruce, to the dimensions shown, and should be shaved down so that they taper slightly from the center to the ends. Pockets of light leather or very heavy canvas should be sewed to the sail to receive the ends of the spars. A stretching harness is made from straps, as shown in the sketch, and fastened to the sail at the lower end. Both the curved portions of the sail, at the top and bottom, are reinforced by having a length of light rattan inserted in the hem. Leather straps, or strong whipcord lashings, fasten the spars together where they cross.

So much for the sail. The other part of your equipment is, of course, the skates. Have these as long as possible; at least nothing shorter than the regulation 15-in. speed skate.

To learn to use the skate-sail, choose as smooth a stretch of ice as possible, and a day with a fairly stiff breeze. Hold the sail at arm's length over your head, both hands grasping the cross spar, and skate out on the ice. Face the wind. Bring the sail upright against your right

side, resting the long spar on your right shoulder. Your right hand should grip the cross spar, while your left hand goes behind your body and takes hold of the long spar. The sail is between you and the wind. Swish! Away you go!

As soon as you be-





gin to feel that you are exceeding the speed limit, or your legs begin to vibrate from the rough ice, swing the sail flat over your head, and you will very soon come to a stop.

One of the first things you will learn in navigating with the skate-sail is that the sail must never be held as a point-blank target to the wind. Why not? Simply because the skate-sailor travels faster than the breeze. To illustrate: Suppose there is a 17-mile wind blowing. The inexperienced sailor, thinking to take full advantage of this, holds the sail directly at his back, presenting a point-blank target to the breeze. Of course he goes off like a shot, and gradually increases speed until he is going about $21\frac{1}{2}$ miles per hour. What happens, then, to the 17-mile-an-hour breeze? It cannot keep up with the sailor, and the result is that there is a sudden vacuum behind the sail, which is often of such intensity as to cause the sailor to lose his balance.

The correct way to sail before the wind is to hold the sail at a very slight angle away from the breeze, so that you zigzag down the wind instead of scudding directly before it. You go just as fast, and, because you are running more or less across the wind, you eliminate the disturbing factor of artificial "air pockets."

When you travel this zigzag course to the right, the sail is carried on the right shoulder, and with the right foot forward. When you desire to veer off to the left, the sail is rolled across your back, keeping the tail end low, so that the long spar



ACROSS THE WIND

comes down on your left shoulder, while your foot position is changed so that the left foot is to the fore.

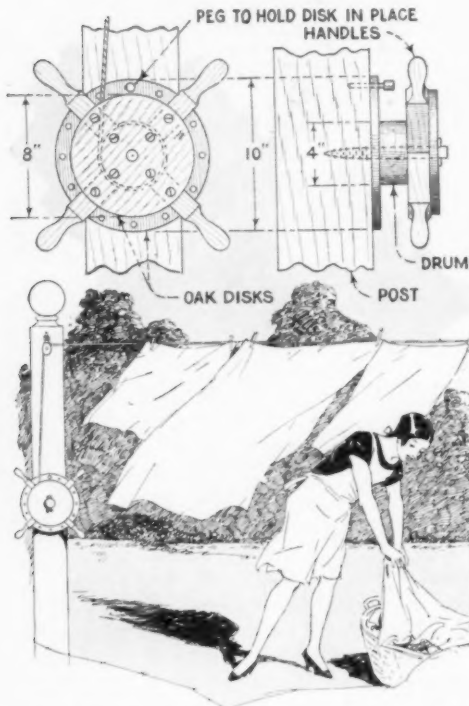
You will speedily learn that you can go directly across the wind, that is, at right angles to it, by slanting the sail a little and leaning against the wind. When sailing in this manner, your skates, biting into the ice, act in the same capacity as leeboards on a sailing canoe, and prevent you from "drifting."

By slanting the sail still more away from the breeze, you will find yourself practically going against the wind. That is, the breeze will be coming direct from the north, and you will be sailing northeast. This is nautically known as "beating to windward," and your northeast course is called a "tack." After you have covered a fair distance on the northeast tack, you start on the northwest tack, and by alternating these two directions you eventually arrive at your destination, due north.

In beating to windward, it is necessary,

when changing tacks, to alter the position of the sail, so that it is always between you and the wind. To do this you swing around into the wind, which frees the sail from your body, then quickly lift the sail, flat, over your head, and lower it on the opposite side to carry you off on the next tack.

Detachable Clothesline Reel



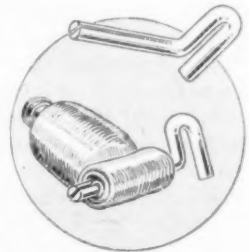
Simple Homemade Clothesline Reel Which Holds the Line Taut and Secure

The clothesline reel shown in the illustration was designed by a woman who knew just what she wanted in the way of such a device. It can be adjusted to hold the line at the proper tension, is simple to make and can be instantly detached from the pole and carried in the house to keep the line dry in damp weather. The reel consists of a hardwood drum, 4 in. in diameter. On the back of the drum a hardwood disk, 10 in. in diameter, is fastened. Two hardwood handles, crossed and mitered at right angles, are fastened across the front of the drum, as shown. Over the handles a second hardwood disk, 8 in. in diameter, is attached. Disks, han-

dles and drum are concentric with each other. A $\frac{3}{8}$ -in. hole is drilled through the exact center of the assembly and small holes 1 in. apart are drilled around the edge of the 10-in. disk. A lagscrew is driven into a convenient clothes pole 4 ft. from the ground, the head is filed off and a small hole is drilled through the end for a cotter pin. A pulley is also fastened to the top of the pole above the bolt. With the clothesline reeved through the pulley and run through holes in the other poles, the reel is placed on the bolt and the cotter pin inserted to prevent it from coming off. Then the line is reeled in until tight and a steel pin is inserted through one hole in the back disk into a hole in the pole. This holds the line taut. By removing the cotter, the reel can be instantly removed.—L. B. Robbins, Harwich, Mass.

Squeezing Paste from Tubes

A large percentage of paste used in tubes, such as toothpaste, shaving cream, glue, etc., is wasted, as it cannot be entirely squeezed out with the fingers alone. A device such as the one shown in the drawing will prevent this waste and can be made as follows: A short length of metal rod is slit down one end with a hacksaw, $1\frac{1}{2}$ or 2 in. being sufficient for the average tube. The other end is turned over and bent to form a handle. The slitted end of the rod is slipped over the flat end of the tube and the handle is turned. This will force all of the contents from the tube. When the tube is entirely rolled up, the crank may be pulled out and used for other tubes.—L. J. Flugel, Chicago.



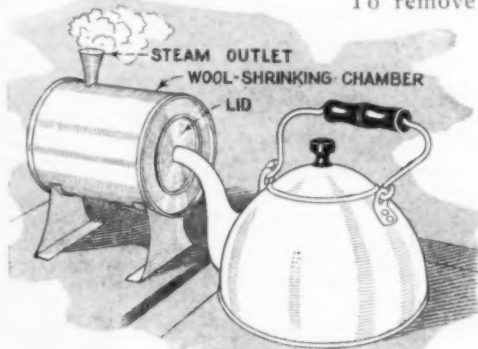
☛ The life of a floor broom can be increased considerably if it is given the following treatment every week: Dip it in a pail of hot soapy water, dash up and down several times and set it some place where air will circulate about it for some time. By doing this the fibers will not break off so easily.

Lamp for Locating Short Circuits in Auto Electric Systems

When locating short circuits in the electrical system of a car, it will be found that if short wires are soldered to the metal ends of a burned-out fuse, and then connected to a lamp of the 6-volt type, an exceedingly useful test lamp can be had. By placing this lamp-bridged fuse in the fuse clips there is no danger of damage to the wiring system of the car, and it will light until the short circuit is located and remedied.—Philip S. Mentz, Jefferson Barracks, Mo.

How to Shrink Darning Wool Before Doing Repairs with It

After studying the effects that laundering has on woolen goods, an English expert declares that the greatest deterioration occurs where the garments have been repaired, due to the fact that the wool used in the repair had not been shrunk prior to use. In tests conducted, it was found that stockings, jumpers, pull-overs and the like, when made of wool, were effectively cleaned without damage, but the places repaired by darning showed the new wool about to break away from the surrounding edges. An easy way of shrinking wool is to take a clean tin can, complete with the lid, punch or cut a hole in the latter large enough to receive the end of the kettle spout, and another hole on the top as a steam escape. Now insert the new darning wool in the can, close the lid and connect it to the steaming kettle for a few minutes when the wool will be thoroughly steamed and, after drying, will be shrunk to the same degree as the garment about to be repaired. Two brackets or feet may be attached to the steaming chamber to hold it more steadily if desired.—George H. Holden, Chesterfield, England.



Method of Shrinking Wool Prior to Using It for the Mending of Clothing



Strips of 1-In. Wood Attached to Baby Chair Prevent It from Tipping

Non-Tipping Baby Chair

A baby usually tries to climb out of his chair, which often causes it to tip over. To prevent this I nailed strips of 1 by 1-in. wood across the legs of the chair, as shown in the drawing. If these strips extend something like 5 or 6 in. beyond the chair legs, there will be no tendency of tipping, and the baby may be left safely alone.—Emil Spona, San Francisco, Calif.

Simple Way of Deodorizing Old Rat Trap

To remove all trace of a former rat or mouse victim from a spring trap, simply dip the front section in melted paraffin. This method eliminates the old trouble of having to wash and scour or burn off the trap in order to get rid of the odor that usually keeps away other mice.—W. P. Glenney, Corona, N. Y.



Blowing Large Soap Bubbles with the Aid of an Old Inner Tube

Blowing Giant Soap Bubbles

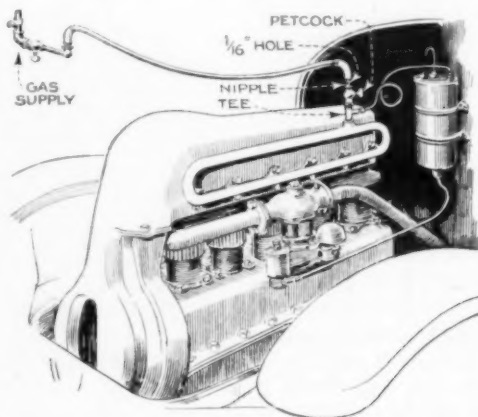
Blowing big soap bubbles is a lot of fun, especially if the novel method of blowing them by means of an inner tube is used, as shown in the accompanying drawing. Make a small slit in an inner tube directly opposite the valve stem. Then push a second valve stem through this slit and take up on the nuts so that no air will leak out. Remove the inner section of the valve and force the end of a length of rubber tubing over the end. Insert the stem of a clay pipe in the other end of the tubing. The tube should be held closed with a spring clothes-pin or clip. Pump up the inner tube with an air pump so that it will be well filled but not so far as to blow out the extra valve stem. Dip the pipe bowl in the solution, and hold it steadily down on a table, bowl up. Then release the air from the inner tube by easing up on the spring clip. When the bubble has formed and is growing nicely under a small stream of air, leave the clip in that position. In this way the bubble will grow without jarring or shaking and reach its maximum size. Use a good

soap solution into which a little glycerin has been dropped.—L. B. Robbins, Harwich, Mass.

Natural Gas for Starting Automobile

I have had several cars of the same make and somehow none of them could be started easily in cold weather. The trouble was, however, readily overcome by connecting the natural-gas house line to the intake, as shown in the illustration. Set the choke and turn on the gasoline line for starting and also turn on the gas. A few turns of the engine is all that is necessary to start it. This method saves both battery and temper. The gas connection may be made at any convenient place so that

it will suck through the manifold. A convenient way to do this is to replace the elbow on the intake, on the vacuum-tank suction tube, with a tee; into this screw an ordinary gas cock, and above this a nipple, onto which the rubber tube from the house line can be forced. Note the small $\frac{1}{16}$ -in. hole in the nipple to allow air to be taken in with the gas.—Louis F. Busch, Cincinnati, Ohio.



Using Natural Gas to Aid in Starting Auto during Cold Weather



WITH the hull carved to shape, as in Fig. 19, the next step is the erection of the bulwarks. Cut a rabbet on each side of the quarterdeck, as shown in Fig. 18, and a similar one on each side of the after end of the foc's'le head. These rabbets should be about $1\frac{1}{4}$ in. long and a stout $\frac{1}{8}$ in. deep; the bottom of the rabbets should be cut in line with the deck edge. Before going any further, it will be well to mark in the deck planking. Mark center lines down the decks, and, with the dividers, lay off the planks on either side of the lines, $\frac{1}{8}$ in. wide. Rule pencil lines lightly along the decks, defining the planks. Cut a strip of wood 1 in. wide and $\frac{1}{8}$ in. thick, make one edge

when ruling and scoring the lines; the flexible wood will lie closer to the deck than a regular straightedge. Now take a putty knife or similar tool, and score in the planking lines as shown in Fig. 25. A scribe will do for this job, but the point must be slightly rounded, else it has a

tendency to follow the grain of the wood, and produce crooked "planks." The putty knife, used as shown, is an excellent tool for the job. After the deck lines have been scored in, stain the decks slightly with light-oak wood dye, made very light with turpentine. The object here is to get a deck that will look weather-worn yet "clean." The deck should be very slightly brownish-yellow. Don't leave the decks white; ships' decks were

SHIP-MODEL PRIZES

FEW hobbies enable the amateur to produce such beautiful work with so few tools and such inexpensive material as ship-model building. To encourage such a worth-while and pleasant pastime, Popular Mechanics Magazine offers the following awards for the best models of the "Flying Cloud" made from plans published in this and subsequent issues:

- First, \$100 cash and gold medal.
- Second, \$50 cash and silver medal.
- Third, \$25 cash and bronze medal.
- Five awards, \$10 cash and bronze medal.
- Five awards, \$5 cash and bronze medal.
- Bronze medals also will be awarded for excellence in workmanship.

The contest is open to everyone, regardless of age or sex. The conditions are very simple, and full details will be supplied to every reader addressing the Editor, Amateur Mechanics Department, Popular Mechanics Magazine, 200 E. Ontario st., Chicago.



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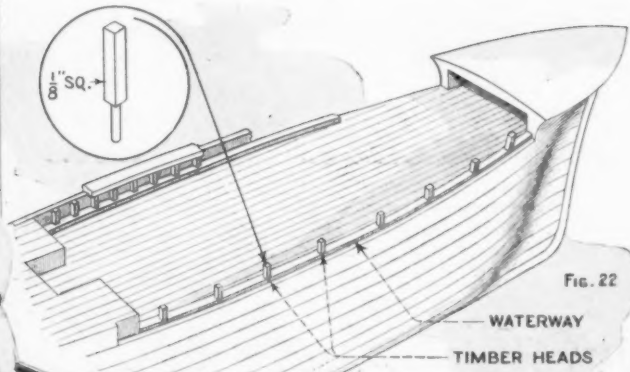


FIG. 22

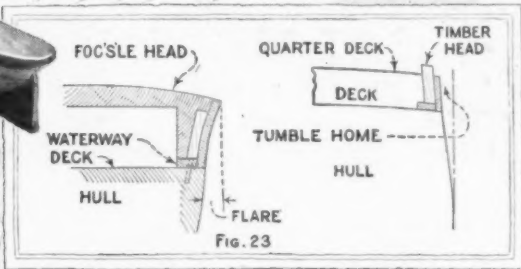


FIG. 23

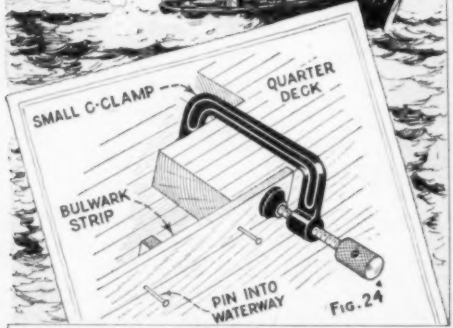
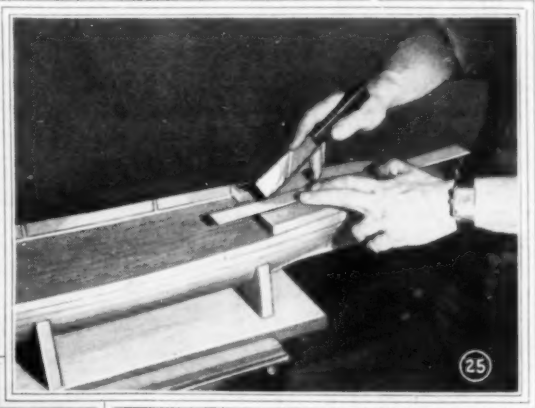
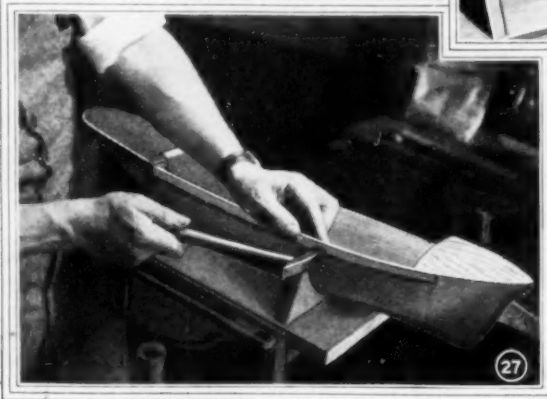


FIG. 24



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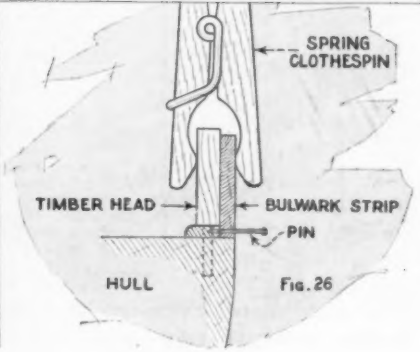
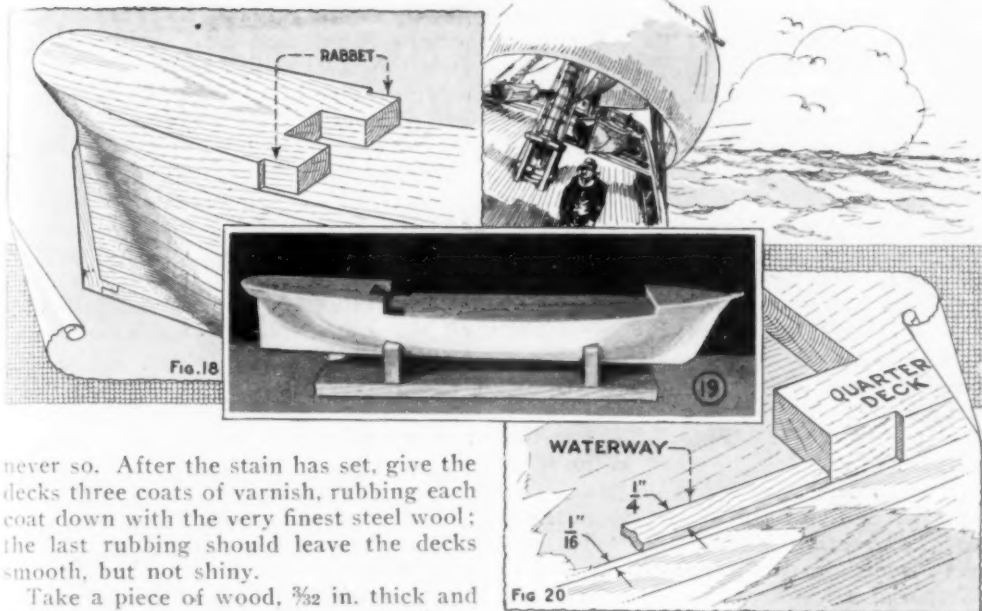


FIG. 26



never so. After the stain has set, give the decks three coats of varnish, rubbing each coat down with the very finest steel wool; the last rubbing should leave the decks smooth, but not shiny.

Take a piece of wood, $\frac{3}{32}$ in. thick and about 3 in. wide, and cut it to length, so that it will fit snugly between the after end of the foc's'le and the forward edge of the quarterdeck, just back of the rabbets. Hold the strip down on the deck, projecting over the edge of the hull, as in Fig. 21, and run a pencil around the hull as indicated, to mark the shape of the deck edge on the strip. Cut this edge to the pencil line, and then, with the dividers set to $\frac{1}{4}$ in., run another mark along the strip inside the curved edge. Cut to this line, and you have a waterway strip, $\frac{1}{4}$ in. wide, which is glued to the deck, as indicated in Fig. 20, the outer edge of the strip being even with the back of the rabbets at each end, and an even distance from the edge of the hull all along. A few pins will assist the glue in holding. Fit a similar strip on the other side.

Make some $\frac{1}{8}$ -in. square strips of wood, and from them cut the timber heads, shown in Fig. 22, in the circle. The peg portion is $\frac{3}{8}$ in. long, and the square part 1 in. long. Here we digress a little. Amidships the sides of our model are approximately vertical and the bulwarks correspond. From amidships aft, the upper part of the hull leans inward or "tumbles home" as the nautical term has it, and the bulwarks tumble home in the same degree. From amidships forward the upper part of the hull curves outward, or "flares,"

and the flare becomes more pronounced the further forward we go, and, as the timber heads represent the upper part of the ribs in a real ship, they consequently follow the tumbling or flaring lines of the hull. (See Fig. 23.) So, in drilling the holes for the timber heads through the waterways, the flare or tumble home must be taken into account, and the holes drilled to correspond. When marking off for drilling, make the holes come so that the outer edges of the timber heads will be exactly on the outer edges of the waterways. Only four timber heads with the pegs are needed on each side; the remainder may be dummies, glued on later. There are 23 timber heads on each side, hence the pegged ones must be spaced so that, when the others are glued on, the spaces between all will be equal. Make the pegged heads the second and fifth ones from the foc's'le; one about amidships and the second one from the quarterdeck. Drill the holes and glue the heads in place, on each side.

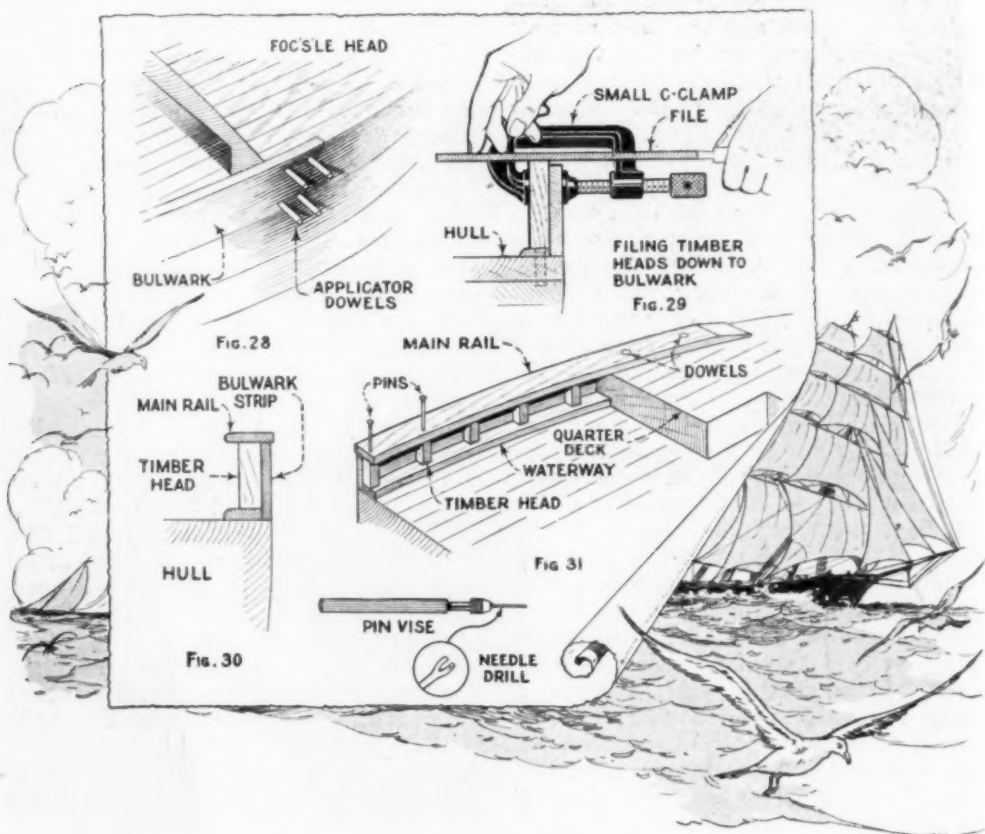
Now cut a strip of wood a stout $\frac{1}{16}$ in. thick, long enough to reach from the outer end of the foc's'le rabbet to the outer end of the quarterdeck rabbet, and about 2 in. wide. Shape one edge very carefully until it fits the deck perfectly from rabbet to rabbet. This strip will form the bul-

wark. Get a dozen or so of wooden "applicators" or iodine-swab sticks from the drug store, for use as dowels. Glue the after end of the bulwark into the rabbet at the quarterdeck, clamping it as shown in Fig. 24; run glue into the ledge formed by the waterway and deck; glue the outer sides of the timber heads, and then proceed forward with the strip, as in Fig. 27, fastening it in place by pinning to the waterway as in Figs. 24 and 25, and clamping it to the timber heads by means of spring clothespins, as in Fig. 26. The timber heads will help spring the thin strip to shape forward and aft. At the foc's'le head, drill small holes and dowel the strip to the hull, Fig. 28. When the glue has set, remove the clamp at the after end and insert some glued dowels. Pins may be used instead of the applicators, but the advantage of the latter is that one can carve right through them, and this is of special value here, since the bulwark should run smoothly along with the hull

lines, and this usually necessitates some carving, filing and sandpapering at the ends. Now trim the top of the bulwark down until it makes a smooth curve from end to end with the sheer of the foc's'le and quarterdecks, and file the timber heads down, clamping them as in Fig. 29, while filing. Cut off and glue in place the remaining timber heads, clamping them to the bulwark with spring clothespins, spacing them equally and filing them down level with the top of the bulwark. Round off the inboard edges of the waterways, as in Fig. 30.

For work of this kind, get some packages of ordinary dressmakers' pins, and also a package or two of the very small pins known as "Lills." These are about $\frac{1}{2}$ in. long, and are essential.

It is wise, at this time, to paint the inside of the bulwarks, since they are hard to get at later. Give them three or four coats of white japan color, thinned with turps, then a final coat of eggshell-gloss



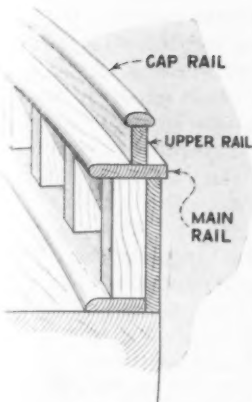
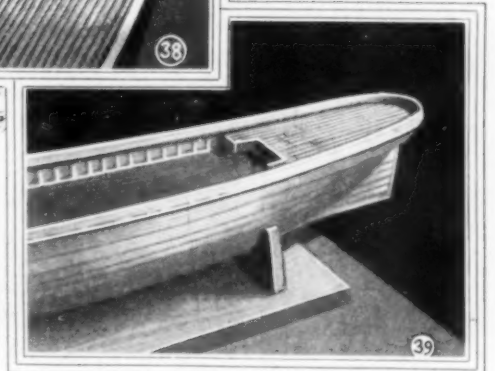
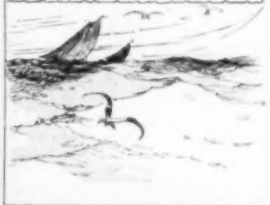
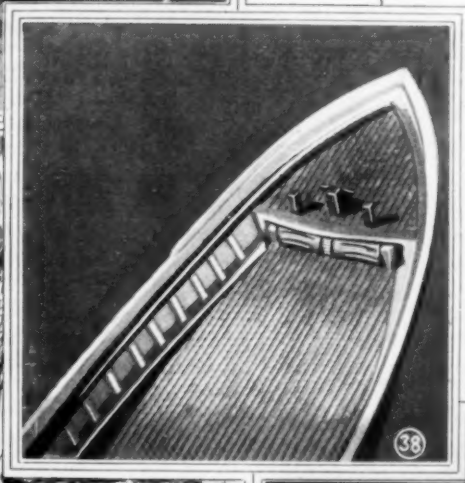
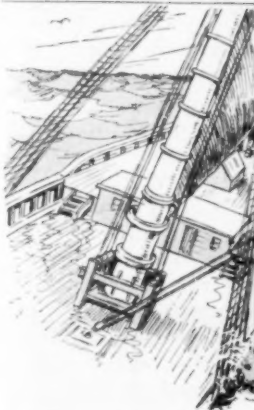
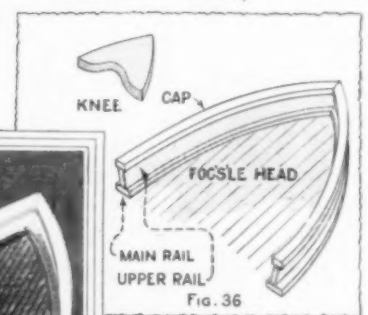
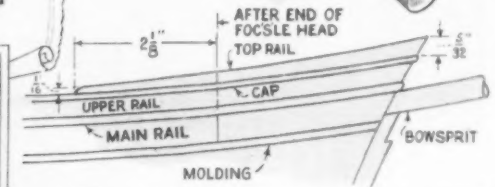
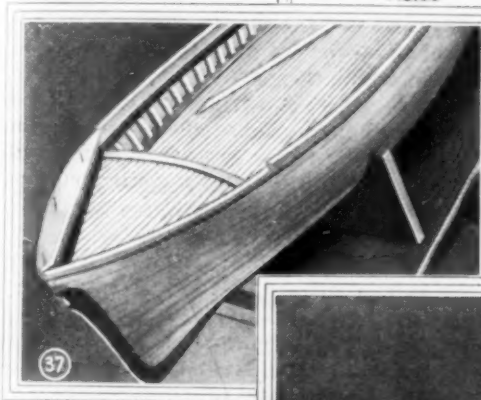
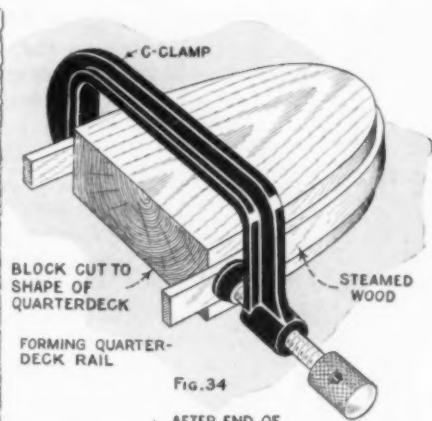
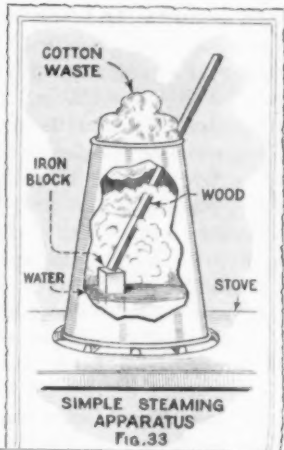
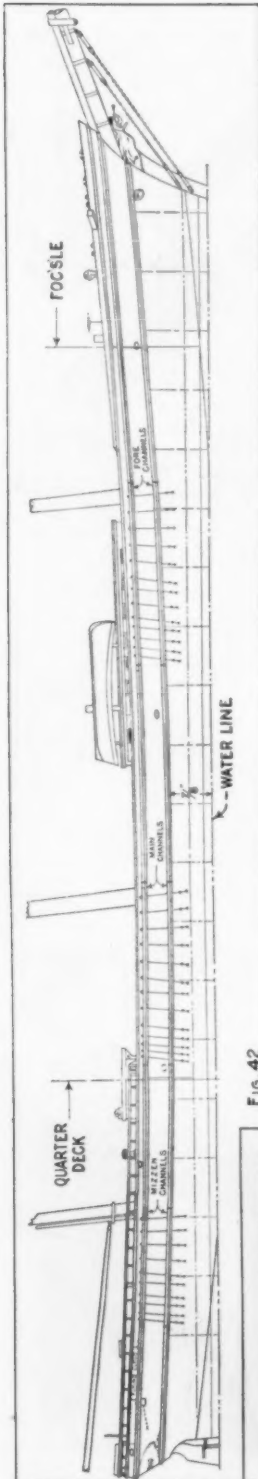


Fig. 32



white enamel. Don't use a full-gloss enamel anywhere on the model. The japan paint is known variously as "colors in japan," "carriage colors" and "japan colors" and they are simply what the names indicate: pigments ground in japan drier instead of in oil. They dry fast and flat. If they cannot be obtained locally, use



artists' oil colors, mixed with turps and japan drier. In addition to the white, a steel-gray will be needed, also a pure green, cream, brown, vermilion and ivory black.

Cut a strip of white pine, $\frac{1}{8}$ in. thick, $\frac{3}{8}$ in. wide and 16 in. long, for the main rail. Starting 3 in. back on the quarter-deck, glue and dowel the strip down as in Fig. 31, allowing the outer edge to project $\frac{1}{16}$ in. over the hull edge. Carry the strip forward, gluing and pinning it to the timber heads and the bulwark, and keeping the projection $\frac{1}{16}$ in. over the latter; pin into every timber head. The strip may be a little hard to bend at the forward curve, but patience will do it. It should end, forward, $2\frac{3}{4}$ in. back of the foc's'le, just on the curve. Scarf or bevel the ends as shown in Fig. 31. Take a wide strip of wood, of the same thickness as the rail, lay it down so that it reaches from the forward end of the rail to a point beyond the bow, Fig. 37, and mark the curve of the bulwark and foc's'le deck on it. Trim to this line, mark $\frac{3}{8}$ in. inside the trimmed edge and cut the inner curve. Glue, pin and dowel this to bulwark and foc's'le deck to form the continuation of the main rail. Cut the portion of the rail running around the quarterdeck in the same manner, then file and sand the joints. Fig. 45 shows part of the rail around the quarterdeck cut and ready for gluing.

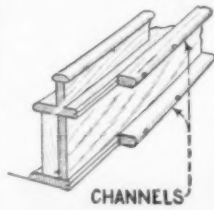


Fig. 43

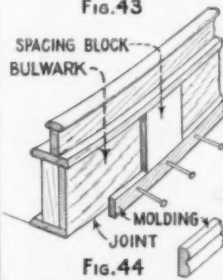


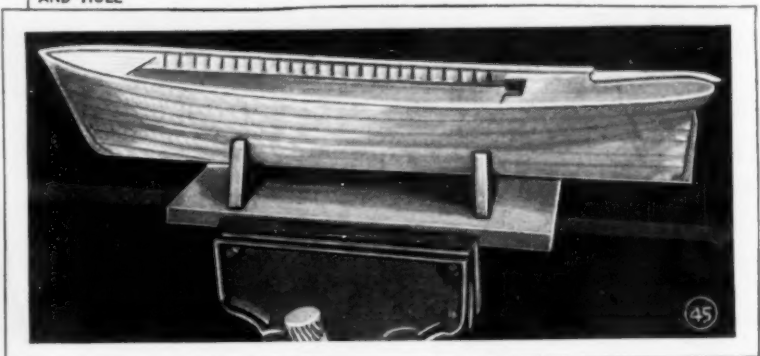
Fig. 44

FITTING MOLDING OVER JOINT BETWEEN BULWARK AND HULL

Above the main rail, as shown in Fig. 32, is an upper rail (sometimes called topgallant rail) and a cap or cap rail. The upper rail is formed from a piece $\frac{3}{16}$ in. wide and $\frac{3}{32}$ in. thick, glued and pinned to the main rail, $\frac{1}{16}$ in. back from the outer edge of the latter. Make the midship portion the same length as the corresponding part of the main rail, and scarf the ends for joints like the main rail. The upper rail around the quarters and the stern is best bent to shape as shown in Figs. 33 and 34. The receptacle used for steaming the strip should be deep enough so that the center will be thoroughly pliable, and the wood should be steamed until this will be attained. It is then clamped

around the quarterdeck cut and ready for gluing.

Fig. 42

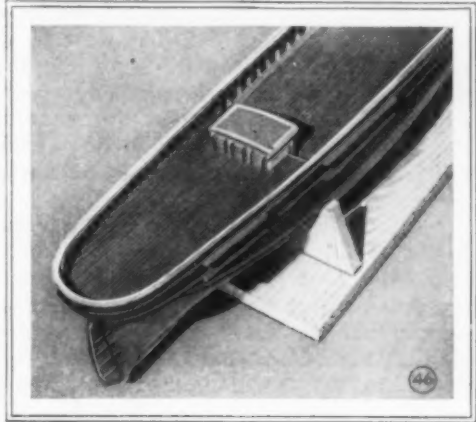


around a piece of wood cut to the same shape as the quarterdeck, and left for twenty-four hours to dry. Since the upper rail on the foc's'le head should carry out the flare of the hull, it is best to cut it from a wider piece of wood, in the same manner as the main rail was fashioned, then carve it carefully on the outboard side to follow the flare of the hull lines, carving the inboard side afterward until the strip is of the proper thickness. The forward end of the first portion glued on should also be flared as it approaches the foc's'le, so that it will make a fair joint with the foc's'le rail. This may be accomplished by beveling the underside slightly, so as to make the top lean out. The flare at the bow is a little too extreme to make this easy to do with the foc's'le rail, hence the advice to cut this from a solid piece. A small knee, Fig. 36, is cut and fitted in the joint at the bow, down on the waterway, and the bow ends are glued and pinned to this.

When pinning small pieces like this, use the "Lills," and where there is danger of splitting the piece, screw a small C-clamp on the wood at the point where the pin is to be driven, and drive the pin down between the jaws of the clamp. The secret of driving these small pins straight is to use a very light hammer, and only the lightest blows; they will bend at once if struck hard. Where possible, a leading hole should be drilled for the pin, to help in keeping it straight. If small drills are hard to obtain, get a package of assorted needles, choose the size you want for the drill, and snip the eye off, leaving two little projecting prongs, as shown in Fig. 31. Take a three-cornered oil slip and sharpen the prongs in the same way as a flat drill is sharpened, slip the needle drill into a pin vise, and you will have the handiest drill possible for fine work. The modeler should have two sizes of the pin vises; one holding a drill around No. 65, the other the small needle drill. The larger drill will make leading holes for the larger pins.

When gluing the various pieces forming the bulwarks and rails together, be sure that both surfaces to be glued are well coated with the glue, but do not apply too much; then, when the pieces are pinned together and before the glue has

set, run over the joints with a sharpened toothpick or similar tool and remove the surplus glue. Nothing looks worse than to see blobs and beads of glue in the joints,



and it is only a matter of a second to remove the surplus while the glue is still soft.

The cap rail is a stout $\frac{3}{16}$ in. thick and $\frac{5}{32}$ wide. The midship and foc's'le portions are easy to bend and apply "cold," using the points of small pins for fastenings, but the after part must be steamed and bent. Use the same block as before. Since it is difficult to bend a thin strip in the direction of its width without having it buckle, cut the piece to be bent $\frac{5}{32}$ in. square, steam and bend it, then, after it is glued and pinned in place, file it down to the same thickness as the rest of the cap. Make scarf joints in the cap as in the other parts. Sandpaper the cap and the inboard edge of the main rail to the shape shown in Fig. 32.

One more rail must be added; the top rail on the foc's'le. This must be as thin as it can be made without splitting in applying, not over $\frac{5}{64}$ in., and better $\frac{1}{16}$ in. Remember that in this scale ($\frac{1}{8}$ in. to the foot) $\frac{1}{16}$ in. represents 6 in., and a 6-in. timber is a pretty "hefty" one. This rail runs from the bow to a point on the cap $2\frac{1}{8}$ in. aft of the foc's'le; it is $\frac{3}{32}$ in. high at the bow and $\frac{1}{16}$ in. high at the after end. Notice, in Fig. 42, that the bow ends of the upper rail and this top rail slope forward, and make allowance for this in fitting. Some readers may find it easier to carve the top rails from the solid in the same way as the upper rail for the foc's'le,

but, with care, they can be formed from thin strips, bent and twisted into place.

After sanding everything smooth, paint the inboard part of the main rail steel-gray all around. (See Fig. 38.) Paint the inside of the upper rail, the cap, the knee and the top rail white. The outside of the upper rail is painted black, and the cap is white all over, thus making a narrow white bead all around the outside of the ship. Do not paint the outside of the rail just yet. Notice the flare of bulwarks and rails, in Fig. 38.

The next step is to apply the molding. Fig. 44. This is a $\frac{1}{16}$ by $\frac{1}{8}$ -in. strip, covering the deck and bulwark joint, and running parallel with the main rail from stem to stern. To insure that they are parallel, use a small block as a spacer between the two when pinning and gluing on the molding, as indicated in Fig. 44, sliding the block along as the molding is fastened. Steam the molding piece for running around the stern. After the glue has dried, cut off and drive in the pins, then take a small triangular or knife file and file grooves right down the center of

both molding and main-rail projection, so as to bead them, then sand until the molding and rail look as in the detail, Fig. 44. This is a small point, but it makes a great difference in appearance of the moldings.

The channels are the timbers on the ship's side that carry the ends of the mast shrouds, and they are shown in Figs. 42 and 43. They are $\frac{1}{8}$ in. thick and $\frac{3}{16}$ in. wide. The fore and main channels are $3\frac{1}{8}$ in. long and the mizzen channels, $2\frac{1}{2}$ in. long. See also Fig. 46.

The foremast comes $2\frac{7}{8}$ in. aft of the end of the foc's'le, and the forward ends of the fore channels are $\frac{1}{8}$ in. forward of the center line of the mast. The mainmast is $8\frac{1}{16}$ in., center to center, from the foremast, and the forward ends of the main channels are $\frac{1}{8}$ in. forward of the center line of the mast. The mizzenmast is $6\frac{5}{8}$ in., center to center, aft of the main, and the mizzen channels are $\frac{1}{8}$ in. forward of the center line, at their forward ends. Glue and pin these on strongly, using large pins, well driven in, at each end. Fig. 44 is one-fourth the size of the model.

(To Be Continued)

Latches Hold Cellar Doors Upright

Many devices have been made for holding outside cellar doors open and in such a position that the opening will be guarded from both sides. However, in most cases these devices are of such a cumbersome nature that they make no appeal to the busy home owner. The trigger lock, shown in the illustration, is free from the usual objections, and can be easily installed by anyone. Upon the inside of each



Handy Latches for Cellar Doors

door, at the points shown, screweyes are placed, through which is passed a $\frac{1}{2}$ -in. rod with a lever attached to the outer end. Two holes are drilled into the siding of

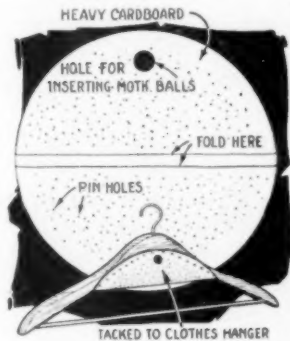
the house directly above the hinged side of each door, and the trigger locks are completed. When the doors are opened, the levers on the underside are pushed forward so that the sliding rods enter the holes in the siding and lock the doors in a vertical position. When released, the levers will not interfere with the closing of the doors.

Locking Ford Car Windows

The older Ford closed cars with the windows controlled by straps have no method of locking the windows. The doors can be locked by the use of locking handles but the window can be opened from the outside by prying the lower edge up from the iron strip on which it rests. A good lock for such windows can be made by drilling a $\frac{3}{16}$ -in. hole through the wood under the window frame, and into the space in which the windows are lowered. When leaving the car, large nails are inserted into the holes and the windows then cannot be dropped. The holes through the upholstery can be given a neat finish by using the parts of curtain fasteners that are clinched into the cloth of side curtains. The ball-headed screws are not used. These fasteners are attached to the cloth either by clinching them into it like an open-car side curtain, or by drilling two small holes, and using two fine wood screws.—E. T. Gunderson, Jr., Humboldt, Iowa.

Garment Hanger Keeps Moths Away

A good moth-proof garment hanger can easily be made from an ordinary wooden hanger by tacking a mothball receptacle on the underpart, as shown in the illustration. This will in no way interfere with the use of the hanger. A sheet of heavy cardboard is cut to a disk, the size of which depends on the size of the hanger. It is bent at the bottom, and a 1-in. hole is cut in one side to insert the mothballs. A number of small holes



also are punched in the disk, so that the fumes of the balls will more easily penetrate the garment.

Spots on varnished surfaces often can be removed by rubbing them well with a soft rag saturated in boiled linseed oil.



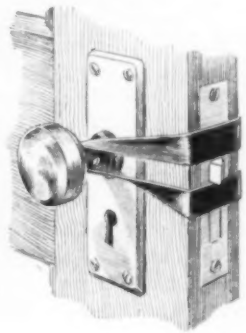
Barrel-Stave Sled Requiring Considerable Skill to Balance It

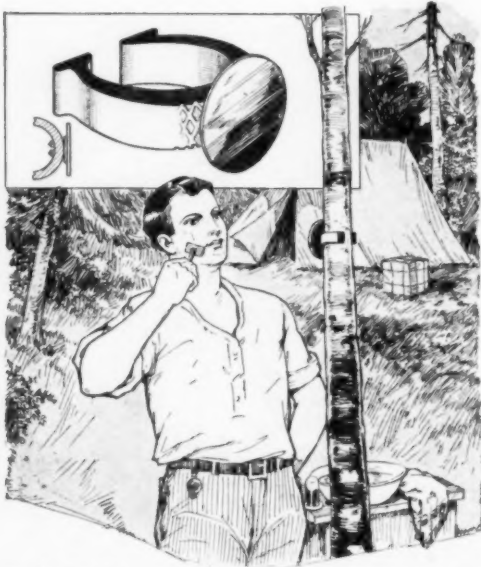
Barrel-Stave Sled

A barrel-stave sled that requires considerable skill to manage and provides great sport is made by attaching a seat well back of the center of the barrel stave as shown in the drawing. On such a sled there is naturally no method of controlling it other than by movements of the body or feet, but once the trick of managing it is mastered, it is controlled as easily as a bicycle when riding without steering.

Door Silencer for the Sick Room

Slamming doors are very annoying to sick persons. The trouble can readily be remedied in a simple manner by means of a heavy rubber band or a section, cut from an old inner tube, that is slipped over the door handles as shown in the drawing. This makes a good silencer and shock absorber, which will be highly appreciated by the patients.—Frank N. Coakley, Buffalo, N. Y.





Handy Shaving Mirror for the Camp Which Can Be Attached to Tree or Post

Campers' Shaving Mirror

Campers in the woods can make a serviceable holder for their shaving mirror that can be instantly clamped to a tree or post as shown in the illustration. Remove the adjusting rod from the back of a round rear-vision mirror used on an auto. The attachments differ somewhat for different makes of mirrors. Cut out a section of a small auto tire, about 3 in. wide, and drill or punch suitable holes through the middle of the tread, into which the mirror lugs can be inserted and pinned from the inside of the shoe. This completes the mirror clamp, which can then be pushed over a small tree at any desired height for shaving and other purposes.

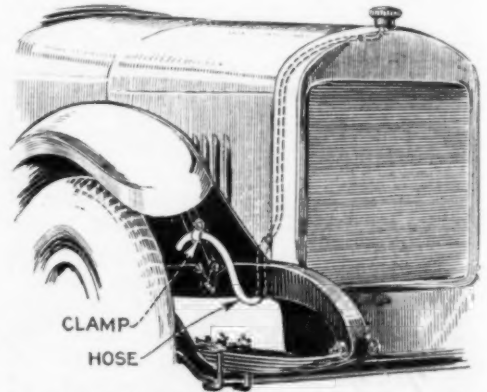
Filing Cabinet Aids in Kitchen

I recently came into possession of a sheet-metal filing cabinet, which had been a piece of office furniture. This cabinet makes a dustless, mouse-proof and bug-proof grocery and food container for my kitchen. The drawers close tightly and are of various sizes, the smaller ones being at the top. The shallow top drawers make excellent storage room for cookies and layer cakes, as they keep in the moisture. The next larger ones hold cereals, corn-meal and bread. The bottom one is for

sugar. While I have to stoop to reach the lower drawer, the inconvenience is compensated for in that it can be shut with the foot. The tight construction of these compartments does away with waste, and they are absolutely clean. I painted the outside to match the color scheme of my kitchen. The filing cabinet is a space saver, too, as compared with the commercial types of kitchen cabinets. It stands 47 in. high, 18 in. deep and 15 in. wide.—Miss Hilda Ellyson Allen, Onawa, Iowa.

Eliminating Alcohol Odors

The odor of alcohol, when used as an anti-freeze solution in the winter, is more or less objectionable, especially in a closed car or in a touring car when the curtains are used. The odor is caused by the escape of vapor from the overflow pipe of the radiator. To eliminate this odor from the car, get a length of rubber tubing large enough to fit the lower end of the radiator overflow pipe and fasten it to the latter. Let the tubing extend under the front side member of the frame and for about 6 in. above the bottom edge of the frame side member, where it should be fastened to the front-fender support bracket with tape or a small clamp, as shown in the drawing. In this way the vapors will all be carried away into the outer air and



Length of Rubber Tubing, Attached to Overflow Pipe, Disposes of Alcohol Odors

will not reach the inside of the car.—G. C. Douglas, Raleigh, N. C.

☐ A sash lock can be used as a bolt on a door, if the casing is flush with the surface of the door.

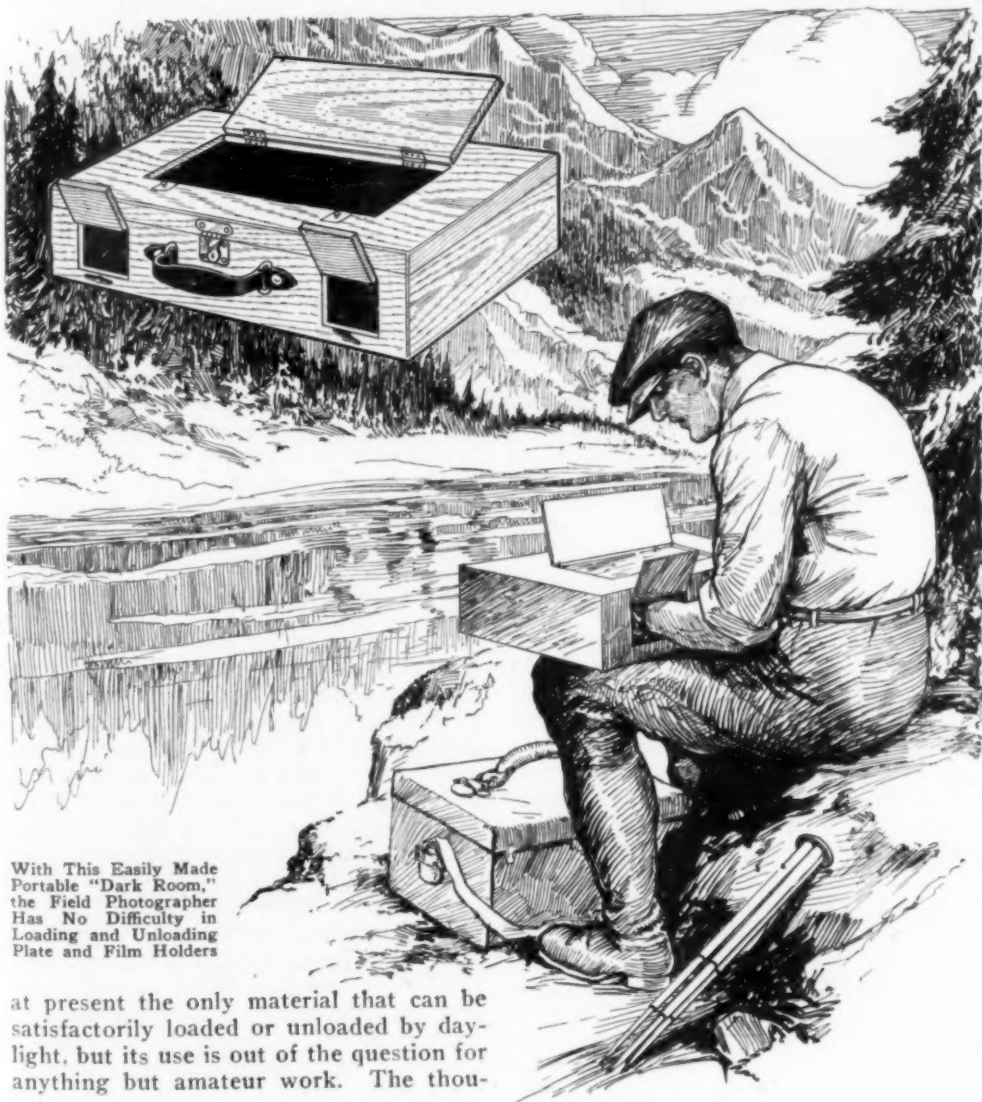
Loading Box Aids Field Work with Camera

By JOHN EDWIN HOAG

SINCE cut film has supplemented glass plates for photographic work, photography has taken one of the greatest forward strides after dry plates displaced wet ones. Every photographer, however, if he does much field work, is confronted with the problem of carrying a sufficient number of holders, or reloading them on locations where he does not have access to a photographic dark room. Roll film is

sands of commercial photographers, and others who do photographic work upon a serious basis, must use either plates or cut film, and with them, loading or unloading holders in the field is always a problem.

The writer was recently called upon to do certain photographic work in a region where he was to make some 300 negatives, and where not once during a period of six



With This Easily Made Portable "Dark Room," the Field Photographer Has No Difficulty in Loading and Unloading Plate and Film Holders

at present the only material that can be satisfactorily loaded or unloaded by daylight, but its use is out of the question for anything but amateur work. The thou-



Above, Details of the Loading Box; Below, the Box Serves as a "Carryall," When Not in Use as a Dark Room

weeks did he have access to a photographic dark room. Obviously, carrying 150 loaded holders would have been out of the question (two negatives in each holder). Moreover, the use of roll film would have been impractical. Glass plates would have been impossible because of the weight and bulk, and vulnerability; therefore, the use of cut film was the only practical solution. There, again, the problem of loading and unloading the holders in the field, had to be solved.

I therefore went to work in my home workshop to develop some sort of a device that would permit the loading and unloading of cut film in the field, independent of dark rooms, or without being compelled to wait for night to do the job. After much experimenting and various trials and errors, the loading box shown in the accompanying illustrations was made up. It weighs but 8 lb., is easily portable, and turns the trick to perfection. Its use enabled me to produce 300 perfect negatives, with only six holders. I was able to load and unload these holders by daylight anywhere in the field, and to mail

the exposed negatives home for development as fast as they were put through the camera. This obviated the necessity for developing negatives under the unsatisfactory conditions one faces in the field, or taking a chance with some doubtful local laboratory technicians.

The box is made of basswood, carefully mortised, finished in cherry on the outside, and painted black inside. It is 22 in. long, 7 in. deep, and 18 in. wide. This gives ample space for handling the 5 by 7-in. cut films with which I was working. For handling larger negatives it would be easy to increase the size of the box. The box has a carrying handle like a suitcase, so it can be transported with no more

difficulty. It is also provided with means for handling panchromatic negatives, which must be loaded or unloaded in total darkness. I used more than 100 panchromatic negatives, loading and unloading them within the box, and did not have a failure with one.

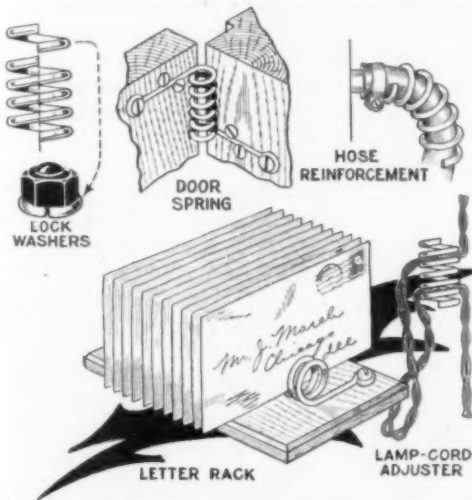
Two square holes are cut in one side of the box, and fitted with hinged covers. To the inside of the holes are tacked and glued cloth armlets, made of heavy, light-tight black sateen and fitted with elastic wrist bands. A rectangular opening is cut in the top of the box and rabbeted to hold a red glass, and a lid is hinged to fit over the glass. When in use, a package of unexposed cut film is placed inside the box, on one side, and an empty cardboard box on the other. The film holder is placed in the center between the armlets, the lid closed, and the hands thrust through the armlets. The exposed film is taken from the holder and transferred to the empty box, then the holder is reloaded from the fresh package. The operator can easily see what he is doing through the ruby glass in the top.

Top for Aquarium

In order to prevent my goldfish from leaping out of the aquarium, which they tried occasionally, I made a cover for the top of the glass bowl. The cover is nothing more than a piece of ordinary mosquito wire screening stretched over a pair of wooden embroidery hoops in the same way that the ladies adjust a piece of cloth when they do embroidery work. After the screening was placed upon the smaller hoop I forced the larger hoop over it until it was only halfway in place. Then the wire screening is trimmed off neatly about $\frac{1}{8}$ in. from the edge of the hoop. When the larger hoop is forced all the way down into proper position, the entire cover is as tight as a drum without a single sharp end of screening protruding beyond the edge of the hoop.—W. C. Michel, Jersey City, N. J.

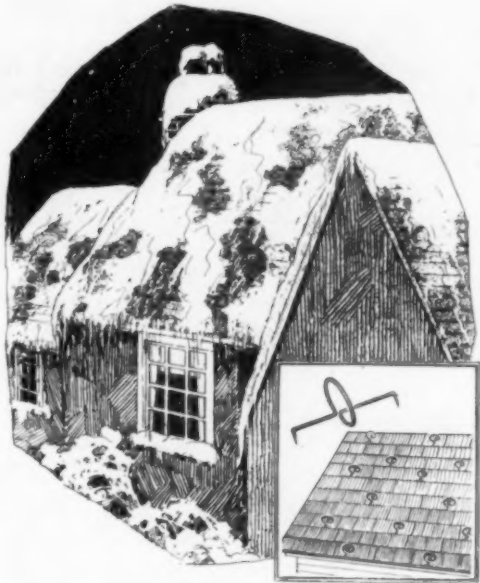
Use for Old Valve Springs

The illustration shows a number of different ways in which old valve springs can be made to give additional service after they have been discarded from the car. The ends of the spring can easily be bent into the required shape by heating them with a blowtorch or bunsen burner and



Old Auto Valve Springs Can Be Put to Various Uses around the Home

bending them while hot. After being bent, the ends should be heated to a dull red heat and plunged into cold water or oil to restore the temper.



Small Wire Loops Attached to Roof Prevent Dangerous Snowslides

Wire Loops Prevent Snowslides

Where a steep roof overhangs a sidewalk or other passageway, there is danger in winter from snowslides. To obviate this trouble one home owner utilized some wire devices, as shown in the drawing. A number of 18-in. lengths of No. 10 wire are pointed at each end by cold hammering on an anvil and afterward bent in the manner described. The nail points of each device are driven into the roof with a blow or two of the hammer, and, with the loops thus attached to the surface, about 10 ft. apart, the snow or ice will remain stationary until it melts.

Spraying Lath Speeds Work

A Wisconsin contracting carpenter claims to have greatly increased the efficiency of his men while engaged in lathing, by merely spraying the bundles of lath with water as they are opened for use. Bundles of pine or hemlock, as they come from the mills or yards, are full of fine, loose splinters that often penetrate the workmen's hands, causing considerable annoyance. Spraying them with water not only softens the splinters but prevents loose particles of wood and dust from flying about when the laths are nailed on.

Auto Steering Wheel on Bicycle

The usual type of bicycle handlebars were not satisfactory to Paul Webber of



Old Automobile Steering Wheel Substituted for the Customary Handlebars on Bicycle

Bedford, Mass., so he removed them and substituted a steering wheel taken from an old Ford. This, he says, is much better than the customary handlebars.—Arthur F. Egan, Boston.

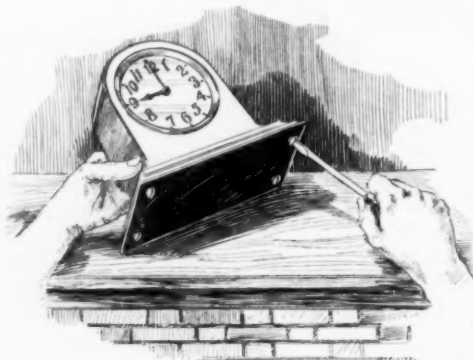
Steam Removes Wall Paper

I have just accomplished a difficult feat in the removal of paper from the wall of a room in which the first paper had been varnished after it was put on, about 40 years ago, and then papered over that thickness one to three times. The last thicknesses resisted strongly because the paperhanger apparently had used a little glue in his paste when he hung the paper. Warm water was used, but that was a slow process except where there was but one thickness over the varnished paper. I tried a commercial preparation to soften the

outer layers, as well as the varnished layer, but it was even then a very slow process. I finally conceived a plan to soften the paper with steam and this worked to perfection. I took a small teakettle and boiled the water on the stove. I filled the kettle about one-quarter full so that the steam would come out of the spout freely. Then I wired the kettle to a one-burner electric stove and switched the current on full. The kettle continued to boil and emit a full stream of steam. I then placed the nose of the spout within $\frac{1}{2}$ in. of the paper and the steam penetrated very readily, permitting the removal of the paper with a putty knife or scraper. The outer layers came off readily, and the varnished paper was softened so that I could work continuously. The electric cord was plugged in the baseboard socket and the wall sockets so that I could reach every part of the wall. As the kettle handle prevented steaming the paper near the ceiling, I added a short piece of rubber tubing at this point, and finished the work in a short time.—Harry E. Gifford, Medford, Mass.

How to Level a Clock

Most clocks do not run well unless they are set exactly level and this is sometimes a difficult thing to do, especially if one has no level. Most people raise one side of the clock up by means of a piece of cardboard or bits of paper stuck under the feet, but these often shift. A better method is shown in the drawing. Drive four small round-head screws in the bottom of the block and adjust them so that



Round-Head Screws in Base of Clock, When Properly Adjusted, Make It Stand Level

the clock stands perfectly level. Set the clock on a piece of cloth or felt to prevent the screw-heads from marring the mantle top.

Split an inner tube and cut cross-ways in two pieces. Tack or glue the pieces together, one on top of the other. This mat saves foot ache when ironing.



All Shop Notes published in 1927, in book form—Fifty Cents—from our Book Department

Insulating the Hot-Water Tank

By E. E. SCOTT

WHY place a radiator in the cellar?

That is just what you do when you permit the plumbing contractor to install the hot-water tank in your new house, without covering it to prevent loss of heat. The usual 40-gal. dwelling-house tank will radiate sufficient heat to keep a 10 by 12-ft. room comfortably warm. In so doing, it causes the temperature of the water in the tank to drop about 20° below that at which it enters the tank. Furthermore this heat is not needed in the basement as the heater itself will radiate, unavoidably, sufficient warmth to keep that part of the house comfortable.

If you would have more and hotter water and save some fuel besides, cover the tank with as-

bestos cement. But, you ask, how can it be made to stick to such a smooth surface as that of a galvanized-iron water tank? First, buy sufficient wire window screening to cover the tank completely except for the top and bottom. Bind this screening around the tank with bare-copper or soft-iron wire of about No. 18 gauge and



Upper Right, Applying the Asbestos; Center, How the Covering Is Anchored; Left, Completed Job; Note the Covered Heating Coil between the Tank and Boiler

draw the wire up as tightly as possible. Next purchase about 30 lb. asbestos "furnace-covering cement" from a hardware-supply house or plumbing shop; this should cost about five cents per pound when bought in bulk. Make a paste by mixing this material with

water. The consistency should be such that, when a little of the paste is thrown at the screen-covered tank, it will stick. Apply the paste with a masons' trowel; the quality obtainable at a five and ten-cent store will be satisfactory.

The first coat is known as the skin coat and should be smoothed on to a depth of about $\frac{1}{4}$ in. and allowed to set about 24 hours, until it dries white and hard. Add layers of the cement until a covering about $\frac{3}{4}$ in. in thickness is obtained. The upper half of the tank should, however, be covered a little more heavily than the lower as the hottest water is always at the top. This is also desirable because, frequently, only the upper portion of the tank contains hot water, due to a low fire or to the water having been drawn off. The thickness of the coating can be determined by sticking a pin through the asbestos to the tank. The rounded top of the tank should also be covered to a depth of 1 in. or more.

Considerable care must be expended on the finish coat. A molder's slick makes the best smoothing tool, although a large spoon, flattened somewhat on the bottom, will do. Cover only about 1 ft. at a time, and smooth it carefully before putting on more. The work can be stopped at any time, as the new wet cement will make a perfect joint with a completely dried section. In order to make the finished surface as smooth as possible, a second smoothing with the slick should be given after the cement has dried for about one-half hour. If sufficient care is taken, a smooth eggshell gloss will result, which will not only shed dust but will also permit only the very minimum amount of radiation.

Many hot-water tanks used in connection with home steam-heating

plants are heated by an external copper coil which is so connected that it is completely surrounded by hot water from the boiler. This heater is always at nearly the temperature of boiling water and should consequently be covered with an extra-heavy coating of cement, about $1\frac{1}{2}$ in.

The first layer should be quite thin, $\frac{1}{8}$ in. or so, as a heavier application will drop off in patches due to the smaller radius and sharper angles of the heater. As the piping between the heater, boiler and tank presents only a small amount of radiating surface, it may simply be painted black with stovepipe enamel. The gas or separate heater used during the summer may also be improved in appearance, while it is standing idle, with a coat of the black enamel.

Double Wheels Conquer Soft Dirt

By bolting a complete extra wheel and tire to the regular rear wheels of his Ford cars, a large landowner in the peat-sediment delta of the San Joaquin river in California has solved a difficult traction problem. The soil is of the peculiar ashy, springy type characteristic of reclaimed peat areas, and affords little traction to the

ordinary small single tire. The ranch foremen and mechanics must travel from field to field, often when cultivation is going on, and there is no time to make roads. With these double wheels a Ford can go anywhere on the ranch, even across a freshly plowed field. The photo shows how the extra wheel is attached by means of blocks of wood, through which are driven bolts, held in place by iron strips on both sides. The work was done in the ranch shop. —Logan Studio, Stockton, Calif.



Extra Rear Wheel on Ford Permits It to Cross Freshly Plowed Soft Land



Pivoted Containers for Vegetables in Grocery Store Make It an Easy Task to Transfer Them into Peck and Other Measures or to Bags

Handy Vegetable Containers for Stores

In grocery stores, clerks usually have to lift a whole basket of potatoes, apples or vegetables when transferring them into a peck measure or bag. This practice is more or less difficult and inconvenient, and can be entirely eliminated by pivoting the containers as shown in the illustration. It is advisable to use half sections of small barrels or large kegs for this purpose. Each one is securely strengthened and two 1-in. holes are drilled directly opposite each other through the side, so that the container can be slipped over a suitable length of pipe. The ends of this pipe are slipped through tees, provided on the ends of vertical standards, as indicated, the latter being securely bolted to the floor. The containers are filled, and it is an easy matter to fill either measures or bags by tilting the proper container to one side.

Steel Wool as Aluminum-Ware Cleaner

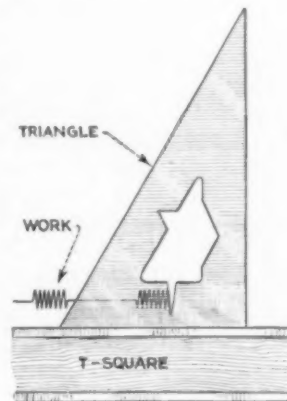
It takes little trouble to keep aluminum pots and pans shining if they are cleaned frequently with steel wool,

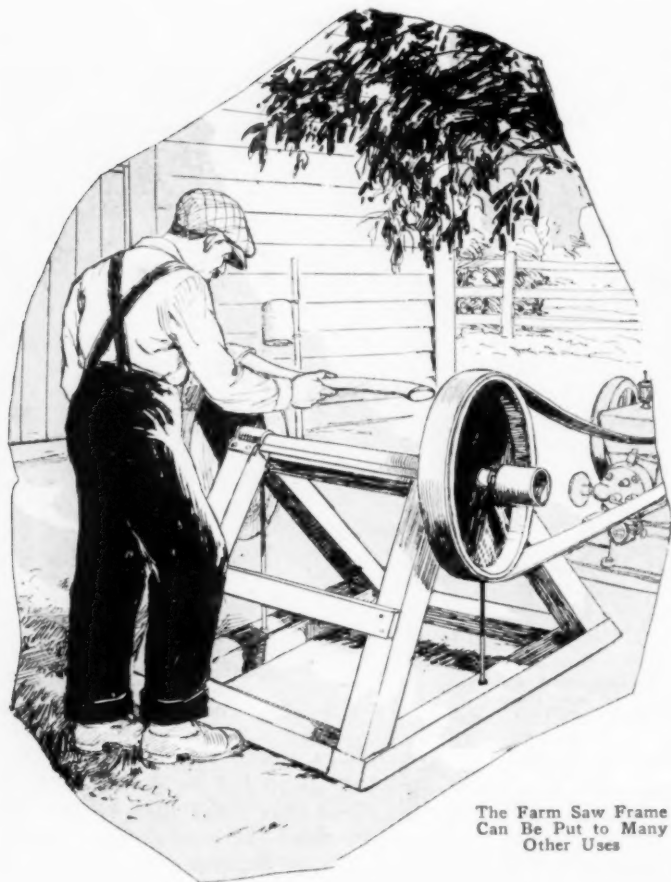
and a nonalkaline soap. Use a very fine grade of the wool, and give the utensils a few rubs frequently, rather than attempt to clean them only occasionally, when they have become more soiled.—L. P. Langan, Denver, Colo.

A Timesaver for the Draftsman

Draftsmen who make electrical diagrams find that the drawing of a large number of resistance symbols is a rather irksome task.

If slots are cut in a 30°-60° triangle, as shown in the drawing, the task becomes simply one of working between two previously established guide lines.—Reuben Jensen, Silverton, Oregon.





The Farm Saw Frame
Can Be Put to Many
Other Uses

Uses for the Farm Saw Frame

A Nebraska power farmer, who employs a large circular saw each winter for getting stove wood in shape, finds other uses for the machine. During the haying season he removes the saw and puts the grindstone in its place. Of course, the drive shaft is turned at low speed, about 150 r.p.m., by putting the belt onto a 4-in. pulley on the 4-hp. engine which is used to drive it. Another use to which the saw frame is put is for twisting cable for fence-corner braces. The frame is braced against end strain and the several strands are attached to the shaft. The other ends of the wires are fastened to the rear end of a heavy farm wagon. As the wires are twisted together, the over-all length is reduced. A man stands in the wagon with his hand on the brake and as the tension grows stiff, the brake is loos-

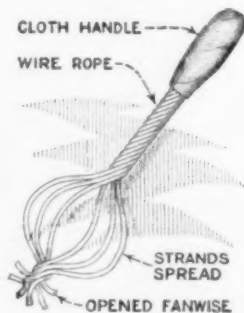
ened just enough to permit the wagon to be drawn slowly toward the saw frame. When the wires have been twisted enough, the belt is thrown and a block of wood is held against the fly wheel to prevent too much back spin. Sometimes long pieces of cable, 100 to 200 ft., are twisted at one time and are later cut up into smaller lengths of proper size.—Dale R. Van Horn, Walton, Nebr.

Effective Tool for Stirring Paint

The secret of stirring up paint to its best consistency is to churn the contents of the can thoroughly so that all the ingredients are completely mixed. This cannot be done with a stick except by long patient effort. A device that will do the trick in a much shorter time can quickly be made from a short

length of stiff wire cable. Wrap some cloth around one end for a handle. Then open the strands near the bottom and bow them out in the form of a hollow ball, as shown in the drawing. Such a stirring rod will pick up all the solid matter at the

bottom of the can, and the separated strands will churn it into a good mixture.—L. B. Robbins, Harwich, Massachusetts.



☐ A cork can be made to do the work of a glass stopper by placing it in a metal vessel

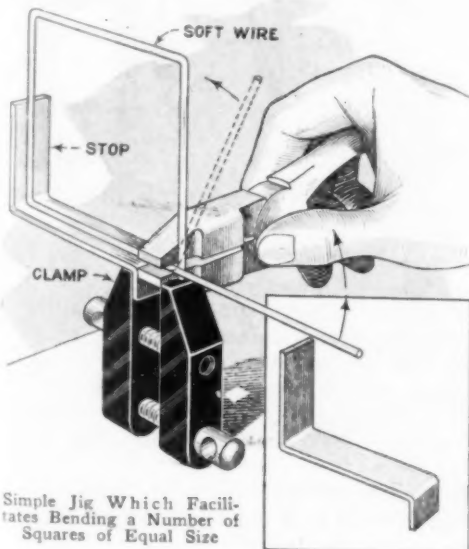
and boiling it in vaseline; when dry, it is acid-resistant, unaffected by jamming it into a bottle, and will last indefinitely.

Continuous Fertilizer for the Garden

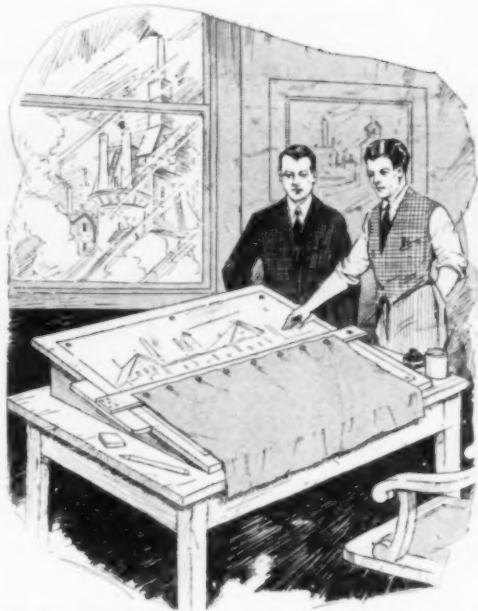
In many locations, especially in the cities, small garden spots need a great deal of fertilizing to make plants and flowers grow successfully. Take an old lime barrel or a metal can and clean it out well with water. It should be perforated with $\frac{1}{2}$ -in. holes along the sides and bottom, and is then half filled with some good fertilizer. Pour in water enough to fill the barrel. The fertilizer should be churned up every day. It has been found that the most stubborn soil conditions have been corrected in this way so that almost anything could be made to grow.—L. H. Georger, Buffalo, N. Y.

Pliers Have Stop for Bending Wire

Soft wire up to $\frac{1}{8}$ in. in diameter can be most conveniently bent with the aid of a pair of pliers and a simple stop piece, clamped in place as shown in the drawing. As an example of what can be done with this device, a number of wire squares can be made exactly the same size. The stop is made and attached in a few moments and the whole batch of pieces finished quickly. A length of strip metal is bent at right angles at both ends and clamped to the side of one of the plier jaws. To make a right-angle bend, push the wire tip to the stop and bend it close over the other jaw.



Simple Jig Which Facilitates Bending a Number of Squares of Equal Size



Cloth Attached to Draftsman's T-Square Prevents Drawings from Being Soiled

Protecting Drawings from Being Soiled

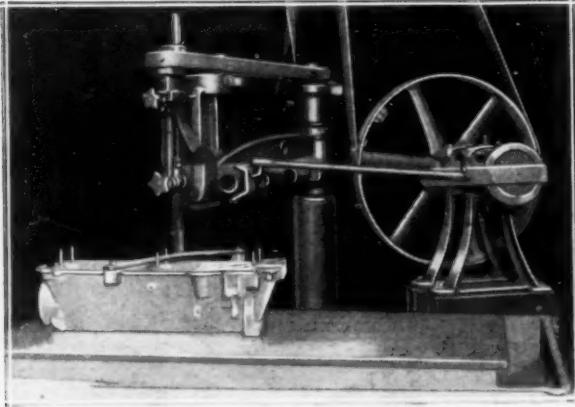
Draftsmen making sketches and pencil plans will find that a cloth fastened to the T-square with thumbtacks, as shown in the illustration, is of considerable service in protecting drawings from being soiled. The cloth does not interfere with the work and covers the section of the drawing not being worked on, permitting the draftsman to rest his arms on it without any risk of smudging the work.

Using Sandpaper in Plane

For sandpapering a smooth surface where it is necessary to keep the paper absolutely flat so that no hollow places will be rubbed into the surface, a common plane can be used to advantage. Remove the blade and cut a strip of sandpaper sufficiently narrow to fit through the slot in the plane, then double it over so that it will remain fixed under the clamp that is used to hold the blade in position. The free end of the paper can be brought around under the plane and up over the front to be held down by the hand grasping the knob in front. By pushing and pulling the plane over the surface it can be sanded flat and with the least exertion.

Machine to Lap Crankcases

Crankcases have not been lapped by hand in the plant of the Marmon Motor

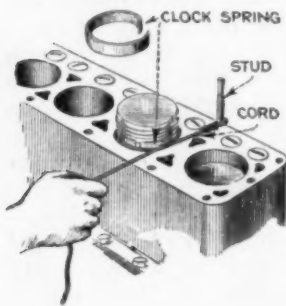


Old Radial Drill Press Converted into a Good Machine for Lapping Auto Crankcases

Car company at Indianapolis since J. W. Anderson, mechanical engineer of the company, built, at a very low cost, a machine that does the work better, and saves 47 cents on the cost of each crankcase. A discarded radial drill press, reclaimed from the junk heap, is the principal part of the apparatus. The crankcase is fastened to a rotating vertical arm of the press and is given a supplemental to-and-fro movement by an eccentrically driven shaft. Ground glass was formerly used as the lapping compound. Worn-out sand from sand-blasting machines has replaced the ground glass. Mixed with coal oil, this sand has been found more satisfactory than the ground glass.

Piston-Ring Compressor

In the absence of a regular piston-ring compressor, an excellent substitute can be



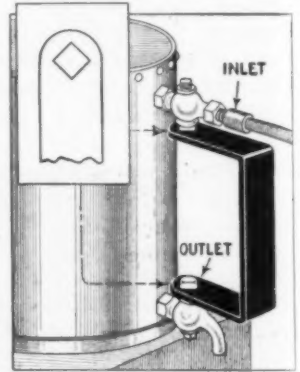
made from a piece of $\frac{1}{2}$ -in. clock spring, about an inch longer than the circumference of the ring, and a piece of stout cord. Insert the piston in the cylinder

as far as the expanded ring will permit, fit the clock spring around the first ring to be inserted, anchor the cord to a stud or other fitting, which will enable it to lie flat on top of the cylinder block, wrap it once around the clock spring and pull it tight. As a result the ring will be evenly and positively compressed and the first ring will slide into the cylinder. Loosen the cord, remove the spring and repeat the operation for the other rings.

Double Cock Handle

A method of connecting two cocks so that one handle can be used to control both is shown in the accompanying drawing. This idea is being successfully used in connection with filling an in-

closed tank with the correct amount of liquid required to make a mixture used in the printing business. The inlet cock is attached to the tank upside down, at the top, and the outlet in an upright position at the bottom. The handle is a piece of flat steel bent at right angles at both ends with square holes to fit over the squares on the plugs. Sockets are brazed to the tank to receive the cocks, one of these being brazed in place with the wrench assembled. When this is



done, one faucet must be open and the other shut. Thus, if the inlet is open the tank will be filled, and when the outlet is open the inlet is automatically closed. As soon as the tank is emptied the outlet is closed, which automatically opens the inlet again, filling the tank ready for the next measure.—Harry Moore, Montreal, Can.

⚠ Graphite should never be used on an engine timer as it may cause short-circuiting of the current.

Packing for Ford Window Glass

Older models of Ford closed cars had a metal frame on the glass windows. It was padded with cloth on the sides, but was merely a metal channel along the lower side of the glass. The frame was filled on both sides of the glass with some sort of wax. This is hard to find when the glass must be replaced, and if not used, the glass vibrates along the lower edge. Also, during a rain, water is likely to run into the channel and under the glass, where it will be thrown into the car by the movement of the glass. Cork strips, which may be cut from gasket material and forced down edgewise beside the glass into the frame, make good packing. The strips should be coated with shellac on both sides to keep them in place. The upper edge of the strips should be painted with black enamel, using a small brush. This is done to keep the gaskets dry, as the glue that binds the cork will be dissolved if it becomes wet.—E. T. Gunderson, Jr., Humboldt, Iowa.

Help for Drilling Vertical Holes

A mechanic who does not have access to a drill press, but is required to drill a perfectly vertical hole with an ordinary hand or breast drill, will appreciate the kink shown in the drawing. A circular level, such as used on cameras, is attached to the drill frame by means of a sheet-metal clamp. One ring of the clamp fits around the frame of the drill, preferably below the driving wheel, while the ring to which the level is attached is made the same diameter as the level, and has a wooden disk inserted in it so that the level may be screwed on it as indicated. The clamp is about $\frac{3}{4}$ in. in width.—W. J. Edmonds, Jr., Whitehall, N. Y.



Reading Glass, Inserted in the End of a Flexible Tube of Desk Lamp, Helps Letterer

Reading Glass for Draftsmen

I had to do quite a bit of fine lettering in my high-school work and, as I worked at night, this caused a strain on my eyes. I took a lamp shade, which was an adjustable one of the hollow-tube kind, unscrewed the lamp socket, and withdrew the electric cord. Then I bought a 5-in. reading glass and whittled the wooden handle down until it fitted snugly into the end of the hose. In use, the glass is arranged directly over the work, as shown in the drawing. I showed this scheme to our drawing instructor and he has had one fixed up for himself.—Harry Lampert, Los Angeles, Calif.

Easy Way to Fill Furnace Water Pan

On pipeless furnaces the water pan is often difficult to get at. The trouble was overcome in one case by filling the pan from the register in the floor rather than from the cramped and inconvenient position in the basement. An old gasoline-stove tank was used as a funnel and the pipe attached to it was extended into the water pan. A large-sized funnel can be substituted if desired, and a length of copper tubing used instead of the pipe, the tubing being soldered to the funnel.



Improved Hangers Hold Eave Troughs in Position While Attaching Regular Hangers

Combination Eave-Trough Hanger

Tinsmiths, when handling eave troughs, often find it inconvenient to fasten the first hanger onto the edge of the roof, as one must hold the long section of the trough, place the nail and manipulate the hammer, all while maintaining a safe position on the ladder or scaffold. A Wisconsin tinsmith simplified the labor and eliminated much of the attendant danger by altering a number of common wire hangers in the manner shown. As not more than three or four of these are necessary on the average job, they are well worth the little trouble required to make them. Extra-long hangers are used for this purpose, the wire being cut diagonally at the loop end to provide a sharp point on the hook. One of the severed ends is bent in the form of a loop while the other is hooked so that the point centers within the loop. When the trough has been soldered, on the ground, the altered hanger is placed as near the middle of the angle of the trough as possible and bent to the angle of the eaves. The trough may then

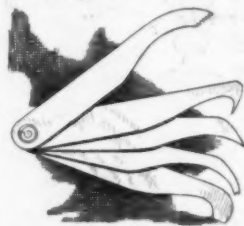
be carried up the ladder and balanced in place with one hand while the other wields the hammer to drive the hook point through the loop and into the shingles. The trough being thus quickly and easily supported, the workman is free to move his ladder back and forth to fasten the remaining hangers, and the work is completed.—G. E. Hendrickson, Argyle, Wis.

Rubber Tips to Keep Finger Nails Clean

Having trouble to prevent ink from getting under the cuticle of his nails, and not caring to wear rubber gloves all the time, a printer thought of a plan for keeping his nails clean without using gloves. He took a pair of rubber gloves, cut the finger ends off about 1 in. and put the tips over his fingers, which effectively avoided the trouble.—G. R. Dement, Buffalo, N. Y.

Commutator Tool

One of the most frequent causes of trouble on direct-current motors, particularly those having undercut commutators, is short circuits between commutator bars. Serious breakdowns in the commutators or windings of the armature can be prevented if the trouble is discovered in time, by digging out the carbonized mass between bars down to the clean mica. Tools useful for this purpose can be cheaply made from pieces of old hacksaw blades. The blades should vary in thickness to take care of mica segments of different widths, and a point of the desired shape is ground on the broken end. A number of tools with differently shaped points should be made, to suit the work of various types of motors. After the desired



shape and edge have been formed on the blades, they should be hinged together by passing a rivet through the hole in the end of each and turning the head over

with a hammer. This arrangement makes a very serviceable tool for the electrician and mechanics who find need of differently shaped tools of this type. It also provides a better grip than separate blades.

Making the Old Pump New

By L. B. ROBBINS

WHEN a pump commences to gurgle, suck and whistle at each stroke of the handle you may feel assured that something is wrong. Either the leathers are worn out or some air leak has developed, in the pump castings or in the pipe line above or below ground. In the majority of cases this will be found to be due to worn leathers.

For maximum efficiency, a pump depends upon a vacuum being created in the cylinder at each upstroke of the plunger. If air leaks past, this vacuum is destroyed and water will refuse to rise in the pipe. It is then that pumping water becomes a soul-searing and back-breaking job.

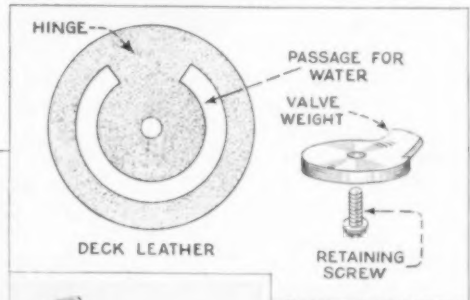
Now, it doesn't take a great deal of work to transform a leaky pump that requires 75 strokes to the bucket to one that will lift the same amount of water in 25 strokes

because so many pumps can be fitted with standard-size factory-cut leathers. It is simply a matter of taking the pump apart, inserting the new leathers and then reassembling as before.

There are essentially two types of dwelling-house pumps; the pitcher pump and the force pump. The former is found everywhere, and consists simply of an open-ended metal cylinder in which works a plunger with a lifting valve in the center. Between the bottom end of the cylinder and the pipe there is another valve, or deck leather. As the plunger is pushed down, the deck-leather valve closes and the plunger valve opens, thus allowing any water above the deck leather to pass through the plunger instead of being forced down into the well. When the plunger rises, the water thus brought over

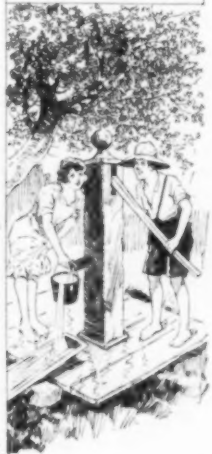
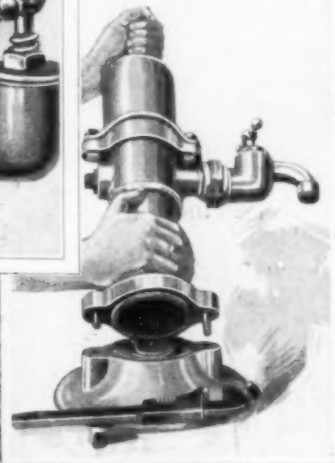


Above, the Plunger Spider; Upper Right, Form of Deck Leather and Weight; Center, Removing the Cylinder



DECK LEATHER

RETAINING SCREW



or less. In the majority of cases the trouble will be located in defective leathers. Nowadays it is a comparatively simple matter to change leathers,

it is raised higher and the suction below it lifts the deck-leather valve, and water in the pipe rises for the next stroke. In this way a more or less continuous stream of water is lifted from the depths and flows from the top of the cylinder through the open spout or "pitcher" lip. Varied forms of the pitcher pump exist, but the essentials of operation are identical.

The force pump makes use of the same principle, but the cylinder is entirely closed and the lifted water is directed into a closed chamber called the air dome. In there it comes into contact with a body of air which after compression by the inflowing water, forces the water in a continuous and steady stream to a considerable distance or height. The compressed air forms a wonderfully powerful cushion and in this manner creates an internal pressure very useful in filling overhead tanks or projecting the pumped water along a rising pipe line.

Deep-well pumps are essentially the same as the simple shallow-well pumps except the pumping cylinder may be separated many feet from the pump body. This is because the plunger can only operate at a maximum of about 28 ft. above water level. Therefore, for a 50-ft. well, the cylinder must be placed in a pit or driven to within at least 28 ft. of the water level, and the plunger operated from above ground by a long rod running down through the pipe to the plunger rod in the cylinder.

The leathering of any of these types of pumps is essentially the same. Where the entire pump is above ground, the job is simple. If one or more cylinders are below ground the job becomes more difficult. But the leathering job remains the same; the plunger and the deck leather must be renewed.

The first thing to do with a shallow-well pump is to trip the water out by forcing the plunger down until you hear a sucking noise and the water drops back into the well. Then loosen the bolts holding the cylinder and the base casting together and lift the cylinder off. This exposes the deck leather, shown clearly in the photograph illustrating this operation. The drawing on page 165 also shows the shape of a typical deck leather and its component parts. It consists of a circular ring of stiff leather inside of which is a round

leather disk attached to the ring at one side. The open space between is horse-shoe-shaped and permits the passage of water. A weight fastened to the disk helps to force it in place over the deck opening and thus make it a quicker-operating and tighter-fitting valve.

Remove this leather carefully so as not to score the metal deck or seat. If it is hard or cracked it should be discarded and a new leather provided. Remove the clapper weight by taking out the retaining screw in the center. Fit this on the new leather in its proper position, which is with the raised lug over the hinge. If no ready-cut leather can be obtained, a suitable one can be cut from a piece of $\frac{1}{8}$ -in. oak-tanned stock by placing the old one over it as a pattern and marking around it with a pencil. Then cut the new one out with a sharp knife and fit the clapper weight to it. If the old leather is beyond use as a pattern, place the new piece of leather over the deck and tap it gently but firmly with the ball end of a ball-peen hammer around the outside edge and the edge of the pipe opening. When removed, the markings of the metal edges will be plainly visible and can be followed with the cutting knife.

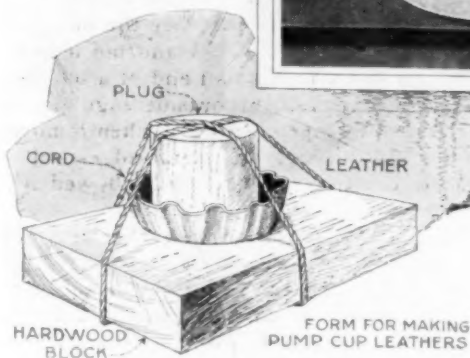
Before the new deck leather is placed in position, wipe the deck clean of any dirt or grit. If any slight bits of nicked metal exist along the surface, smooth them off with a fine emery stone. Soak the new leather in water an hour or two to thoroughly soften it and then lay it carefully on the deck, still wet, placing the weight uppermost. When in the proper position, place the cylinder carefully upon it so as not to disturb its position, reinsert the bolts and take up on them slowly and evenly until the leather is firmly clamped in position. Use care in taking up on these bolts, taking a part of a turn on each one at a time. This will compress the leather evenly and also prevent clamping down one side before the other, and thus insure even pressure and eliminate chances of cracking the casting from uneven pressure on either side.

On deep-well pumps the cylinder must, of course, be removed from the pipe line before the packing can be accomplished. If it is in a pit, it is only a matter of removing the pipe from above and the

sections of wooden plunger rod, and then releasing the cylinder from its base. Otherwise it must be pulled up with a pump puller and raised above ground until it can be dismantled. In any case the method of replacing is essentially as previously described for a simple above-ground pump.

Most plungers are constructed similar

Center, Soaking Deck and Cup Leathers; Below, Forming New Cup Leather



to the one shown in the photographs. To releather, clamp the spider carefully but firmly in a vise and then turn off the plunger end which threads onto the spider. The old leather can then be removed. If the retaining nut turns off hard, be especially careful in removing so as not to strain the spider to the cracking point. Turn it up a bit and then in the opposite direction until it will start. Sometimes a tap with a cold chisel in one of the notches will serve to start it. For general use a large pipe wrench is best suited for this job although there are special spanners that come with some makes of pumps for this purpose.

When disassembled, clean the threads on the spider and retaining nut and graphite them. Then slip the new cup leather in position, replace the nut and take up on it until the leather is held firmly in posi-

tion, using care, of course, with this procedure. If a ready-cut

cup leather cannot be procured, here is an excellent method of making one at home, using $\frac{3}{8}$ -in. oak-tanned leather as material. Put the leather to soak in water for at least 24 hours while making the former, herein described.

Using an expansion bit, bore a hole in the center of a hardwood block $\frac{1}{4}$ in. larger than the diameter of the plunger, and $1\frac{1}{2}$ in. deep. Then fashion a round plug of hardwood just the diameter of the plunger and about 3 or 4 in. long. Thoroughly oil both pieces, provide some strong cord and have a large bench vise handy. When the leather is sufficiently pliable, place it over the hole in the block and then place the plug end upon it directly over the hole. Carefully turn the entire assembly on its side and place between the vise jaws. Then slowly turn up on the vise and push the plug into the hole, carrying the leather with it. Work very slowly so the leather will stretch over the plug during the process. When the bottom of the hole has been reached, leave the job alone until the leather has thoroughly dried out or, if the vise must



be used for other purposes, tie block and plug together with the cord, as shown in drawing and set aside to dry.



marked out, as previously mentioned, with a ball-peen hammer. Leather gaskets are best, but for this purpose a thinner stock can be used than for the section leathers.

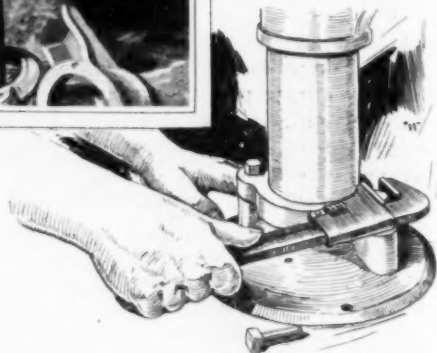
After the pump has been releathered and assembled a few days, it will be wise to go over all bolts and take up adjustments. New leather is flexible

Left, Replacing Air-Dome Gasket; Center, Wiping Off Deck-Leather Seat; Right, Tightening Down Cylinder

When the leather is bone-dry, take off the cord, pull out the plug, and a nicely formed cup leather will be the result. Trim off the edges with a sharp knife, bevel the top edge on the inside, and then cut a round hole in the bottom to fit snugly around the retaining nut of the plunger.

With the new leather on the plunger, soak it in water again until softened and then insert in the pump cylinder and push down until the top of the rod can be again connected to the pump handle. It is also a good plan, with unlined cylinders, to wipe out the inside with very fine emery paper to remove any rust coating that may have formed through the years. This rough surface is particularly hard on leathers and wears them out before their time. Keep the cylinder walls clean and bright and the leathers will last much longer than would otherwise be the case.

The air domes on force pumps are usually provided with leather gaskets between them and the cylinder connection. When these grow hard they should be renewed. They can be cut from leather or sheet rubber, using the old one as a pattern, or



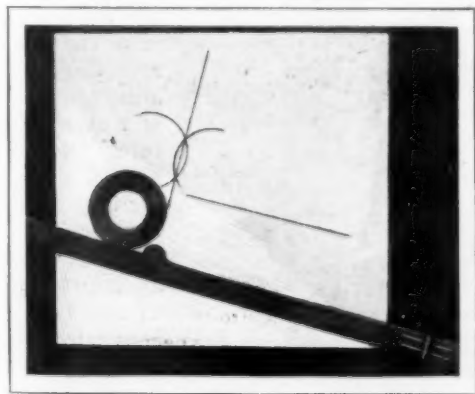
and it will probably be found that a turn or two can be taken up on all adjustments as the leather compresses. This will insure an air-tight job and give a positive vacuum in the cylinder. The plunger will, of course, have to be removed and the retaining nut turned up in the vise as before. If the cup leather has swollen too much and it works unduly hard, shave off a little from the edges with a safety-razor blade.

Now with the pump newly releathered, it should hold water indefinitely. If the water still persists in dropping back and the pump needs priming each time it is used, you may feel absolutely sure the leak is in the mechanical end of the affair. Go over all connections to see that they are drawn up tight. Inspect the castings and pipe sections above ground for cracks or leaky couplings. If possible, grab the pump base with a large pipe wrench and

turn clockwise, rotating the entire pipe line and strainer point in the ground. This will take up any loose threads that may have developed, due to threads corroding over a long period of time. Do not, however, turn the pipe backward, as threads will undoubtedly be loosened and you will be worse off than before. In making up new connections, always use plenty of lead in the joints and turn them well home, and leaky joints will be practically impossible. By attending to this while sinking a well and assembling a pump, about the only trouble that can develop will be cracked parts due to freezing or overstrain in assembling, or faulty leathers. Other things being equal, water should flow freely always.

Accurate Perpendiculars with a 2-Ft. Rule

The 2-ft. rule is the faithful standby of the rough-and-ready draftsman who makes sketches on the job. To draw a fairly accurate perpendicular to a line not parallel with an edge of the sheet or pad is not so easy to do but often necessary to the correctness of a sketch. The photo shows how a perpendicular can be drawn which will be about as correct as any circumstance will require. Lay the rule down along the line, then lay a dollar or washer on one side of the circular middle-joint hinge of the rule, and touching it, and scribe an arc. Place the dollar on the other side and scribe another. Draw a line through the two points where the arcs intersect. This line will be perpendicular and as correct as necessary.



How to Draw a Perpendicular to a Horizontal Line with an Ordinary 2-Ft. Rule



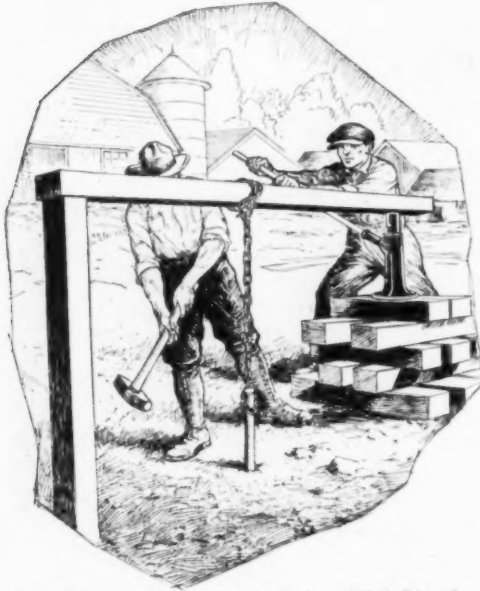
Handy Dolly, Which Can Be Swung in Any Direction, Made from Old Roller Skates

Dolly for Handling Baled Hay

When any great number of bales of hay have to be moved across the floor it becomes a heavy and tiresome task. To alleviate some of this work a dolly, as shown in the illustration, can easily be made from odds and ends. Build a small plank platform of short boards and cleat them solidly from underneath with similar stout boards. Make it about the size of a bale of hay. Fasten four roller-bearings casters, one to each corner, or four wheels removed from a pair of old roller skates. In the latter case, see that the wheels are pivoted so that they will turn in any direction.—L. B. Robbins, Harwich, Mass.

Drilling Chilled Cast Iron

Iron castings, made in chilled molds, are frequently too hard to drill. Even high-speed drills and turpentine will fail to break through the surface of the casting. The trouble can, however, be remedied in the following way: Place a lump of sulphur on the spot to be drilled and slowly bring the casting to a red heat, then allow it to cool off. This will soften the spot so that the drill will cut it readily.—G. A. Luers, Washington, D. C.



Easy Method of Removing a Driven Well Pipe from the Ground

Pulling a Driven Well Pipe

It was desired to salvage the driven pipe of an old well. Usually a driven pipe is abandoned because of the difficulty connected with its removal, but in this case the task was simplified considerably and the pipe was removed without much difficulty. A post was set about 2 ft. on one side of the pipe, the top being about 4 ft. from the ground. The crosspiece, a length of 4 by 6-in. wood, was fastened to the post at one end and at the other end it was set on a screw jack, properly supported. A chain was fastened to the crosspiece in the center, and to the pipe, on which a cap was screwed. First the jack was turned up until the chain was tight. The pipe was then struck a few light blows with a sledge while the jack pressure was being increased. In this way, combining pipe vibration with a constant pull, the pipe was readily pulled out.

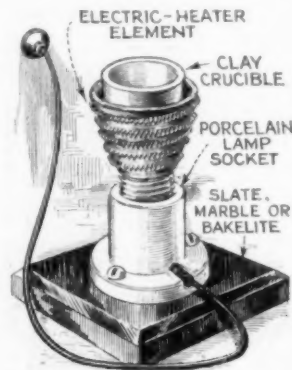
Softening Hard Leather Belting

I had some old leather belting that had not been used for several years. To my knowledge it had been around the shop for over 30 years. Needing some belting I was forced to make use of this old piece, which was made soft and pliable in the fol-

lowing way: I filled a tub with boiling water and poured in about a gallon of old engine oil, which floated on top of the water. I dipped the belting to the bottom of the tub and allowed it to soak a few moments. Then I lifted it slowly through the layer of oil and repeated the operation several times. Within 15 min. the leather was as soft and pliable as though it had just been removed from a machine. The boiling water had opened up the pores of the leather and on removing it from the water, the hot oil had penetrated the pores and completely filled them. The belt is still in use after some years and is apparently good for many more.—L. B. Robbins, Harwich, Mass.

Improvised Electric Crucible

A small crucible that can be used for melting chemicals and soft metals can readily be constructed, using only a porcelain lamp socket and the element of an electric heater. The socket is mounted on a small base of marble, slate or bakelite, about 6 in. square. The heating element is screwed into this socket. The heater should be of the kind that is shaped like a cup, which is mostly used in reflecting heaters. A small clay crucible is easily slipped into this cup-shaped opening. If no crucible is available, a clay pipe with the stem broken off and the hole plugged will do. A length of lampcord and plug is connected to the socket and plugged with this outfit in a few minutes. It can be placed in a metal box or case



so that the heat will not be dissipated into the surrounding air, although this is not absolutely necessary. For melting lead and soft metals, such an improvised crucible is convenient, as

a cupful of scrap lead will melt in less than half a minute.—Herman R. Wallin, Brooklyn, N. Y.

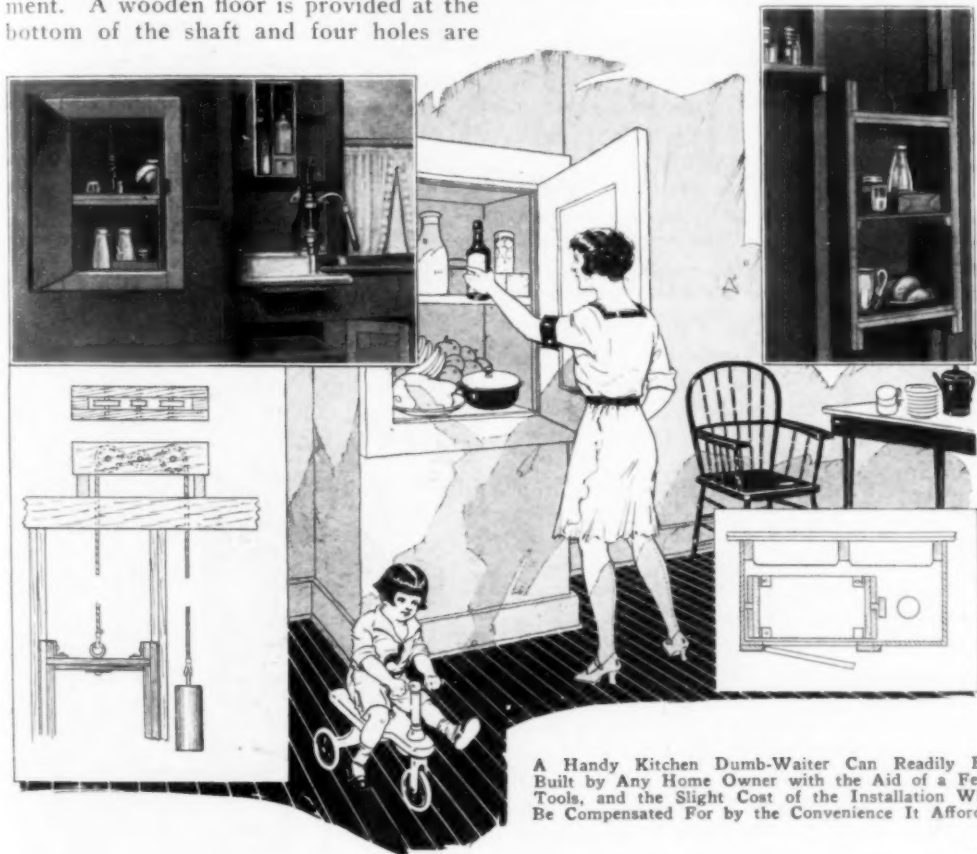
How to Build a Dumb-Waiter

By ERIC B. ROBERTS

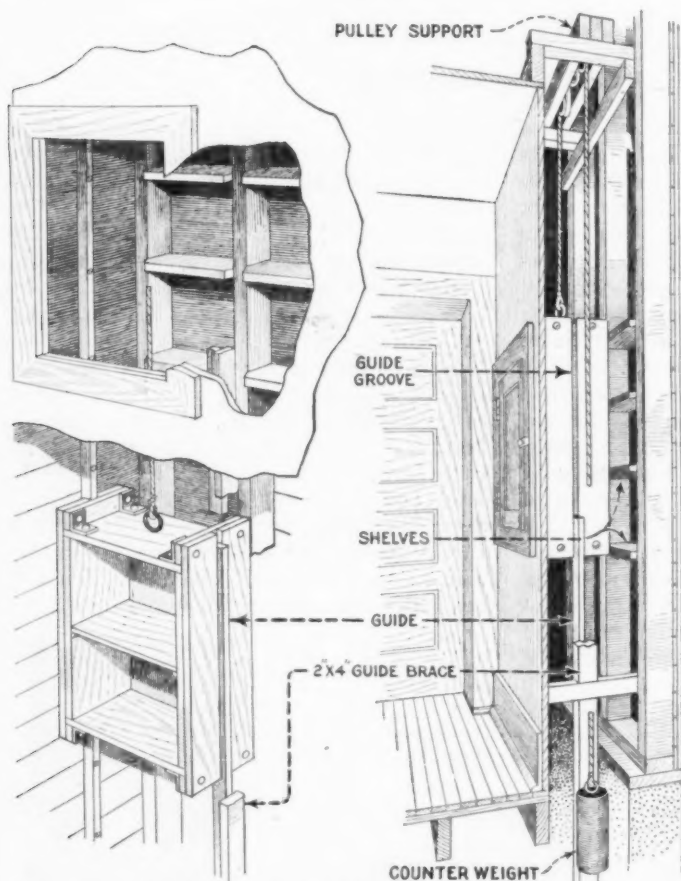
AMATEUR knowledge of carpentry is all that is necessary to build the dumb-waiter described in this article and shown in the illustrations. The first step is to choose a location where a vertical drop to the basement will meet with no obstructions. After the location has been determined, the shaft is built from the ceiling of the first story to the basement floor. The frame of the shaft consists of 2 by 4-in. material; in the kitchen this is boxed in with 1-in. stock on the inside and lathed on the outside preparatory to plastering. If desired, wallboard can be used on the outside. The basement section of the shaft is also boarded up tightly. A neat paneled door should be provided for the kitchen outlet of the waiter, but a simple board door will suffice in the basement. A wooden floor is provided at the bottom of the shaft and four holes are

drilled in the floor to hold old auto-valve springs in a vertical position to absorb the shock of the lift when it is lowered rapidly.

After the shaft has been finished, the rails or guides for the lift are fastened on the inside, leaving out a short section to permit the insertion of the lift, after which the omitted guide section also may be fastened in place. Lengths of $\frac{3}{4}$ -in. wood may be used for making the guides. Next, the lift should be made. For the average household it should weigh about 65 lb., so that it will carry a load of from 5 to 20 lb. The counterweight, which consists of scrap lead, iron, etc., must be between 5 and 10 lb. heavier than the empty waiter, to allow for the additional load. To obtain the above-mentioned weights, 1



A Handy Kitchen Dumb-Waiter Can Readily Be Built by Any Home Owner with the Aid of a Few Tools, and the Slight Cost of the Installation Will Be Compensated For by the Convenience It Affords



Constructional Details of the Dumb-Waiter, Showing the Shaft, Lift and the Counterweight, and the Method of Assembly

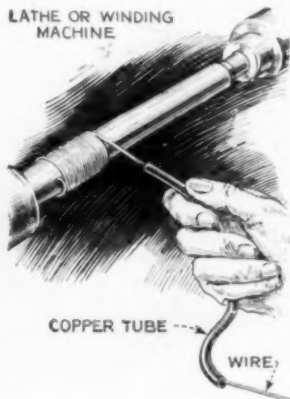
placed the materials used for making the lift on one end of a plank, pivoted in the center, to balance the counterweight on the other end. When both weights were equal, I added about 8 lb. to the counterweight. Then I proceeded to build the lift, which was made with double sides, top and bottom in order to make it solid and heavy. Ordinary 1 by 6-in. lumber was used. Angle iron may be used to add weight and rigidity but it must be remembered that no additional material must be used besides that which was balanced with the counterweight. Between the two boards forming the side, a groove is left for the guide, on each side. The pulley assembly is then made. It must be carefully calculated where the ropes and weights are to hang in order to be sure that they clear the lift while in motion or at rest, and the weight must be hung in

a position where it can do no damage if it falls. The pulleys need be of no special size; anything from 2 to 7 or 8 in. will do. They must, however, be of the grooved type and able to retain a $\frac{3}{8}$ -in. rope. Lengths of pipe or rod make good axles. I used one 2-in. and two 4-in. pulleys, the rope passing over the large ones and under the small one to provide the necessary friction to hold the waiter steady at the top or bottom, yet allow it to move freely when pulled up or let down. Ordinary sash cord is well suited for use in a dumb-waiter.

Copper Pipe Aids in Coiling Wire

Coiling wire for springs, electrical coils or for binding purposes, is accomplished usually with some means to restrain the wire and keep it under tension. Leather and wood will serve for hold-

ing the wire under tension while it is fed on a lathe mandrel at a slow speed. A new means, differing from any of the customary practices, is shown in the attached drawing, and consists of a short



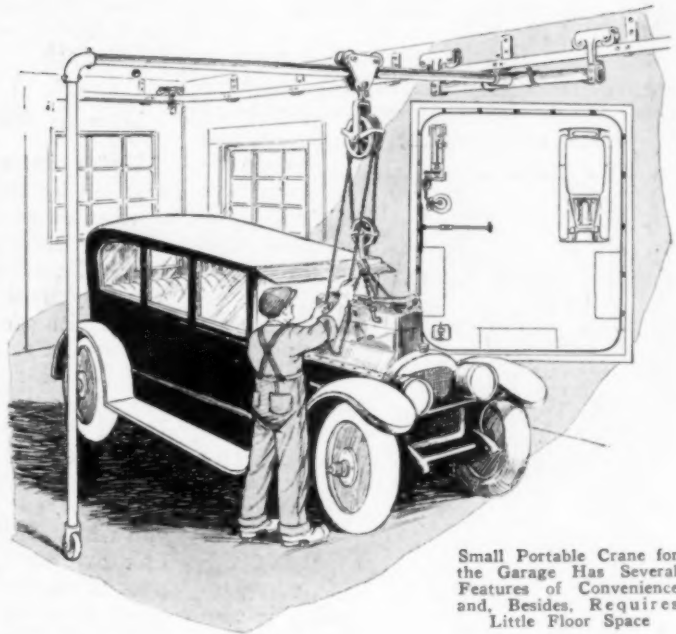
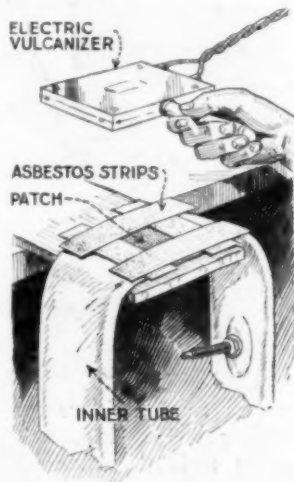
length of small copper pipe, with abrupt bends, which restrains the wire and maintains sufficient friction to insure tightly wound coils, in spite of the fact that the operation is rapid and the wire tension uniform.

Renovating Copper-Asbestos Gaskets

When the cylinder head of a car is removed for valve grinding and carbon removal, the gasket is frequently bent, dented or otherwise mutilated. Efforts to straighten it are not often successful, because the copper is usually brittle and hardened from use. This is also the case with the copper-asbestos gaskets used for the water connections, manifolds and valve seats. If installed with sharp bends and kinks in them, they are almost certain to leak. To renew the old gaskets, they are placed in the flame of a gas heater until they are quite red and then plunged in cold water. The copper is made plastic by this treatment, and, when the gasket is bolted down, it spreads and makes a tight seal.

Vulcanizing Inner Tubes

In vulcanizing small patches on inner tubes with an electric or gasoline vulcanizer, a Wisconsin repairman claims that the portion of the tube covered by the patch is apt to become overcooked or burned, and thereby weakened. To overcome this trouble, he uses four strips of asbestos paper over the tube, as shown in the illustration, leaving only the patch exposed to the full heat of the vulcanizing plate.



Small Portable Crane for the Garage Has Several Features of Convenience and, Besides, Requires Little Floor Space

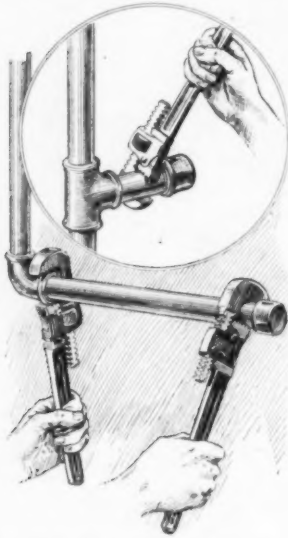
Small Crane for the Garage

The crane shown in the accompanying drawing has a wide range of travel and is capable of transferring heavy units from the bench to the machines and to the several cars being repaired. It uses the same track as employed to support the hanging doors at the front of the garage. The provision of such a track around the four walls, is the main support for the crane. A double hanger with swivel rollers allows the crane to travel along the continuous runway. The corners are traversed on a curved track, similar to the track on which the door is supported when swung from the front to the side. A cross rail extends from these hangers and rests on a vertical support of pipe, provided with a fixed roller at the bottom. The hoist is carried by a trolley on the cross rail, which permits placing the hoist directly above the load. While every advantage of a crane is provided, the single leg, reaching to the floor, does not encroach on the available floor space, as is usually the case with four-legged portable cranes.

Insert a scratch awl in common hard soap for hardening, and it will need no drawing after the plunge.

Unscrewing Thin Tubing

When unscrewing thin tubing, there is a decided tendency for it to close under the wrench grip, especially at the open ends. To prevent damaging the pipe, the method



of protecting it shown in the illustration, has been found effective. It consists in screwing a pipe cap on the end of the pipe and gripping it as close to the cap as possible. Also in the removal of close nipples, this procedure is useful. The cap stiffens the nipple so that it can be removed easily, regardless of the tendency of the pipe-joint compound to hold it tight.—G. A. Luers, Washington, District of Columbia.

Better Potato Plants

By placing a 4-in. layer of sawdust on top of his hotbed, a Mississippi farmer produced potato plants with much longer roots than usual, which made them more desirable than short-rooted plants. In making the hotbed, he first dug a hole to a depth of about 12 in. In the bottom of this he placed a 6-in. layer of barnyard manure, covering it with a layer of soil, about 5 or 6 in. thick. On top of this he placed the potatoes to be sprouted, pressing them into the earth and covering them with a thin layer of soil. A 4-in. layer of sawdust was then applied. Some 6-in. planks, held in position by stakes, prevented the sawdust from being washed away. This hotbed was not covered with glass. Besides producing long roots on potato plants, the sawdust helps to retain moisture. Potatoes should not come in contact with manure because the latter is likely to transmit certain diseases to the

former, causing the potatoes produced to be defective.—Bunyan Kennedy, McCool, Mississippi.

How to Mend Aluminum with Zinc

Holes in aluminum vessels can be mended by the following method: Paste a piece of strong paper over the hole on the inside, using shellac as an adhesive. Have the surface of the aluminum very clean by sandpapering it well. Pack the vessel with sand to hold the paper in position securely. Now take some clean zinc, melt it, clean off all the dross and pour the zinc over the hole from the outside. It will stick to aluminum, and can be finished with a file and sandpaper. We have mended canteens, hot-water bottles, kettles, pans, etc., by this simple method. If you wish to solder anything to aluminum, first coat the aluminum with melted zinc poured on, then solder to the zinc surface, using common solder and a good flux.—Robert C. Knox, Santa Barbara, Calif.

Saw Case for the Tool Chest

A number of saws are generally carried in a well-equipped tool chest, and protection for the teeth is not always easy to provide.

One carpenter uses a novel saw holder, which occupies little space and holds several blades for the detachable handle. Separate cases are used for miter and other attached-handle and backed and backed saws. Such holders are made of pieces of prepared roofing, such as comes in rolls, using a kind which does not contain crushed stone or anything injurious to the saw teeth. After cutting and forming it to the shape of the saw, a few turns of friction tape hold everything firmly, and the case may be tossed into the tool chest without risk of damaging the saws.

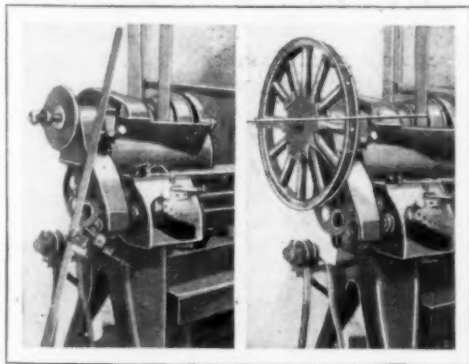


Restoring Contact of Third Generator Brush

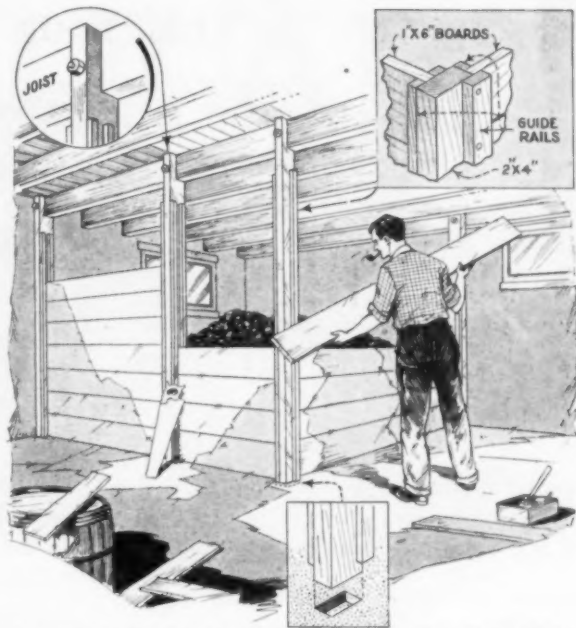
When the third brush on a Ford generator is shifted to change the output, it sometimes fails to make a good contact with the commutator and there is no output at all. This is often caused by a little dirt or an uneven surface on the brush. The proper method is to sand the brush to fit, but if the brush is pressed down gently with a small stick while the motor is running slowly, it can often be made to "run itself in" and the generator will charge.

Fitting Lathe to Do Job That Requires Larger Swing

The photos show how a job of boring automobile wheels to fit the hubs was done by fitting a faceplate to the back end of the lathe spindle. The faceplate was mounted on a shaft extending through the hollow spindle and was fastened in place by means of a nut and washer. The wheels were centered by means of a tapered cone, which was mounted on a stub mandrel screwed into the opening in the center of the faceplate after the wheel was lightly fastened with bolts and clamping pieces, as indicated. The cone was then removed and the boring done by means of a tool consisting of a suitable guide piece screwed into the faceplate opening, the guide carrying a sliding member with an adjustable cutter and an operating handle.



Boring Auto Wheels on Lathe Which Is Too Small to Handle Them in the Regular Way



Portable Bin Which Can Be Taken Down When Not Needed for Coal Storage

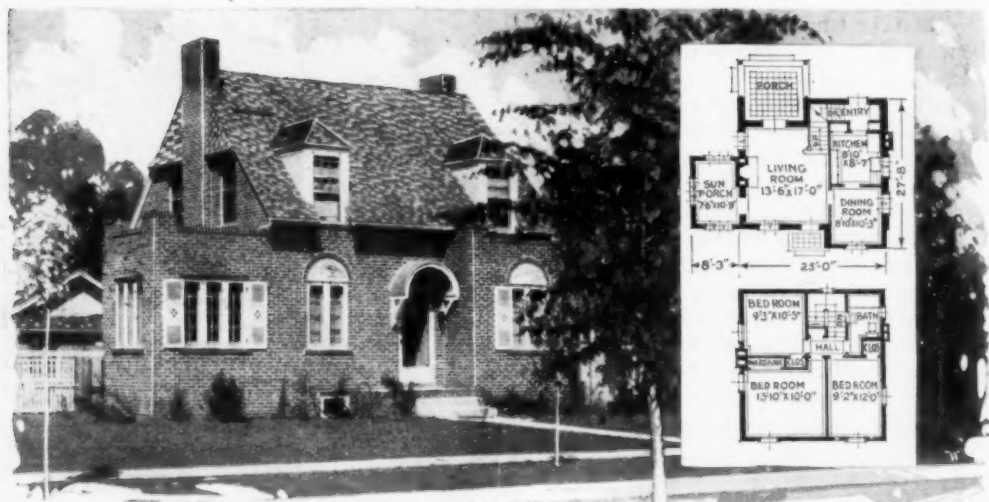
Easily Built Portable Coal Bin

Many home owners have only small basements and during the months when no coal is used, a bin is not needed, unless it is filled during the summer for the following winter. A portable coal bin of the kind shown in the drawing can readily be built by anyone. It can be taken down when not in use and put up again when coal is to be taken in. It is constructed of 1-in. boards which are slipped into grooves formed by nailing strips to 2 by 4-in. uprights. These extend from the floor to the joists above, to which they are bolted with $\frac{1}{2}$ -in. bolts. The boards are slipped into the grooves near the top and are forced down tightly. These boards should not be over 4 or 5 ft. long, unless an extra 2 by 4-in. upright is provided on the outside as a brace.

Etching on Aluminum

Etching on sheet aluminum is made better and more simple by using a solution of weak hydrochloric acid. It is important that this acid be diluted and not used in its full strength, for in a diluted state it will produce better work.

Is This Your Home?



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Plan No. 5B16

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THIS house is a model of compactness and economy of space. Omitting the sun room and rear porch, the over-all area of the plan is only about twenty-five by twenty-six feet. To many people whose means are limited and who must, therefore, reduce their requirements to the absolute minimum, this design will come as a welcome solution.

This really is a six-room house, containing the usual living room, kitchen and dining room and three bedrooms with bath. In addition there are two porches, one more properly a sun room, which, opening on the living room, not only adds considerably to the living space, but lends an extra item of interest to the exterior, for the front wall of this room, continuing in unbroken plane with the main wall of the house, gives a feeling of breadth.

The porch at the rear is open. Square wooden posts with lintels and brackets of the same material help to make the rear of the house interesting. Its floor is of

cement, marked in forms of tile, and is bordered with brick.

The living room is unusually well lighted, having windows on three sides; there is also the staircase in one corner, a fireplace, and the two porches opening upon it. The dining room and kitchen are small, but light and airy.

In the second story there are three bedrooms, well designed to accommodate the necessary furniture, each with a closet.

The kitchen equipment is complete, and with the working fixtures along the outside wall, there is an insurance of fine light and ventilation.

Suggested color scheme: Red and brown texture brick set in white mortar; wood-work painted white, the roof a combination of blue and gray.

Construction: Solid brick walls, shingle or slate roof. Size of lot: Approximately forty-five feet. Designed to face east or south, but may be built reversed for other facings.