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POPULAR MECHANICS MAGAZINE

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SEE PAGE 329

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Popular Mechanics Magazine

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AMATEUR MECHANICS

SHOP NOTES

Popular Mechanics Magazine
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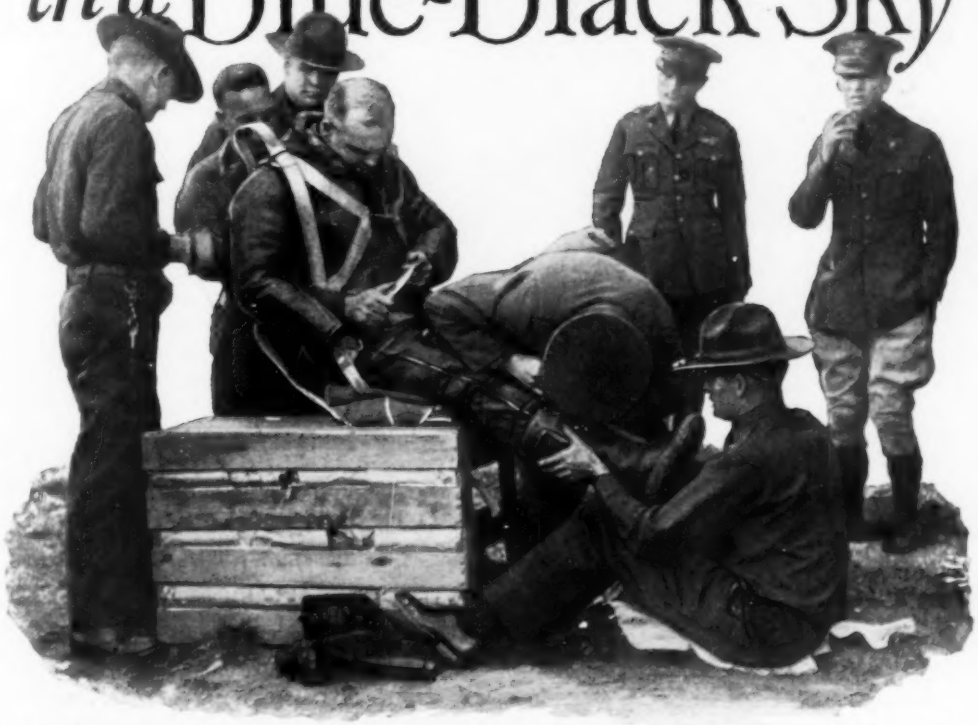
Vol. 49 FEBRUARY, 1928 No. 2

Battling for Life in a Blue-Black Sky



Capt. Hawthorne C. Gray, Who Passed the Eight-Mile Height, Higher Than Any Man Had Ever Been, and Then Died When Exhaustion Prevented His Opening a New Oxygen Valve

SOMEWHERE over the lower Ohio river valley, Capt. Hawthorne C. Gray, holder of the world's altitude record, died recently in one of the strangest accidents in flying history. He died, his recording instruments indicated, at the moment he had reached the earth's ceiling in a successful attempt to re-establish his previous record of 42,470 feet—more than eight miles—which was disallowed because he was forced to leave his balloon by parachute before it returned to earth.

A severed oxygen tube, cut by his own sheath knife as, with mind dazed and body weakened by the rarefied air, he struggled to cut loose a final piece of equipment to free the bag of a weight that would permit his balloon to rise a few more feet,

The Big Balloon Being Walked from the Hangar; the Nose of a Small Army Dirigible Is Seen in the Background

and a closed oxygen valve told the story of his death. The last entry in his log showed he had pulled the final release cord and dropped the last of his 4,700 pounds of sand ballast at 40,000 feet. That was at 3:15 p. m. The next morning a curious boy, climbing a tree to inspect the tangled balloon lodged in its top, found the flyer's body, still in the basket.

From the mute evidence of log and instruments and the cleanly severed ends of the life-sustaining oxygen tube, fellow officers from Scott field, the army balloon school at Belleville, Ill., pieced together the story of what had happened more than eight miles in the air.

Capt. Gray had taken off from Belleville at 2:22 p. m., followed by four airplanes carrying brother officers as observers. The planes circled around as the 80,000-cubic-foot gas bag shot upward. Around the wicker basket were grouped, on a wooden frame, a multitude of long cylindrical sand bags, their bottoms held closed by rip cords that centered on a small wooden panel in the basket.

Up through the clouds the balloon and planes climbed, and, at 12,000 feet, the aviators in the escort ships waved good-by and leveled out to hover along the cloud tops. The balloon continued to rise, drifting to the south before a fifty-mile-an-hour wind. At 15,000 feet, if he followed his usual practice, Capt. Gray tested his oxygen equipment and took several deep breaths of the gas, until he reached 20,000 feet and turned it on steadily.

The oxygen equipment consisted of three steel flasks, a gauge, connecting tubing, a helmet and chest canister, which made the outfit resemble a war-time gas mask. The canister, however, instead of containing purifying materials, was a double metal tube into which an electric heater had been built. The heater warmed the oxygen and helped make breathing easier.

At 30,000 feet, the silvery bag passed from sight of the hovering airplanes. From there on, his last link with the world was lost, save for his radio set, which he was in the habit of tuning in on some broadcast station in order that the cheerful jazz might relieve the monotony and act as a stimulant to the mind, which, in such rarefied air, is apt to wander and grow hazy. As the balloon pierced the last cloud bank, it entered a world that only two or three men have ever seen. The earth had disappeared from sight and with it, the dust particles of the air that make sunlight white. Above him the sky was a deep blue-black save for a brilliant ball of fire where the sun rode. The temperature was about seventy degrees below zero.

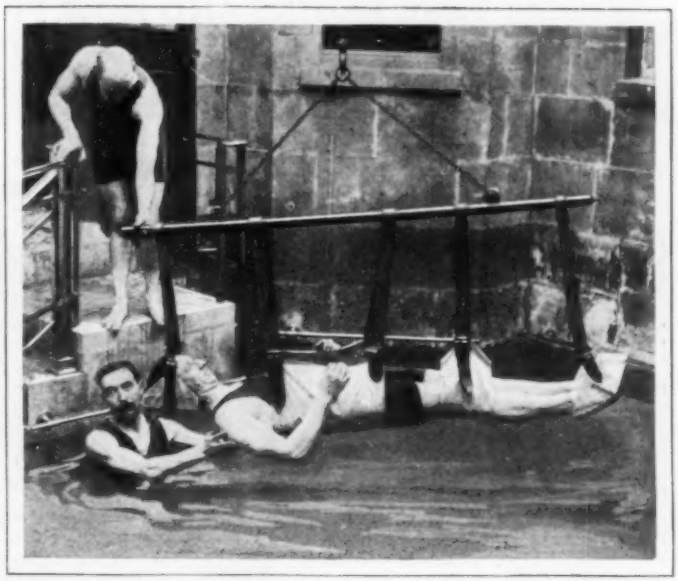
At 40,000 feet; his last entry in the log

shows, the final bag of sand was dropped. Unless something else went, the balloon could go no higher. The release of the frame supporting the empty sand bags would have been sufficient to send the balloon up another couple of thousand feet. Then, apparently, he decided to cut loose an oxygen tube and turn on another.

In rarefied air and breathing oxygen, men become so dazed that the hand will not obey the brain. Something of that sort apparently happened when Capt. Gray drew his knife and cut the rubber tube, for, after severing his link with life, he failed, either through exhaustion or because of his dazed condition, to open the valve of the second cylinder and death followed.

It is doubtful whether anyone will ever ascend higher than Capt. Gray, unless he goes up in an air-tight shell, for the test-chamber experiments of the army air corps show that somewhere between 40,000 and 45,000 feet is a point where even oxygen would fail to support life.

The army experimental laboratory designed an air-tight metal balloon car some time ago for Capt. Gray, but he never used it feeling it was more dangerous than exposure in an open basket. He pointed out that, while the air-tight car would keep him in air at ground-level pressure during a flight, it would make it impossible to leave the balloon by parachute, because the sudden transition to rarefied air would be almost instantly fatal, the body literally blowing up from the pressure within it.



Lowering Patient into the Bathing Tank in Special Sling; the Apparatus Saves Painful Lifting and Possible Injury of Subject

BATHING SLING FOR INVALIDS AIDS IN TREATMENTS

Sick persons, or cripples who are unable to walk, are given baths in an English health resort by means of a special sling apparatus which lifts them from their beds and permits them to be lowered into the water. It simplifies the work of attendants and assures greater comfort for patients.

WEIGHT DROPS FOR FIRE CALL TO PROTECT BUILDINGS

An automatic fire alarm, tested in London, sounds a number of bells and telephones for the fire company. It functions by the dropping of a twelve-pound weight. This is held by wires that melt when the temperature reaches 160 degrees. As the weight drops, it works a control box from which the signals are operated.

© Keystone View Co.

Part of the Control Assembly of Fire-Alarm System Which Functions by a Falling Weight

WHERE TIME BEGINS AND HOW IT IS SENT TO YOU

For all the tens of millions of clocks and watches in the United States there is one single regulating authority. It is the naval observatory in Washington. But where does the observatory itself discover a time which it can say with confidence is exactly right? The answer is: It goes to the one process in nature which repeats itself daily with unfailing precision—the silent, stately, never-varying march of the stars across the sky. Every night of the year when the sky is clear, an astronomer takes his station at the eyepiece of a transit instrument, which is a small telescope set in such a position that the light from a given star is caught at the precise split-second when it crosses the meridian, or the great circle that bisects the sky north and south directly overhead. From intricate calculations the observatory staff knows when the given "clock" star is due to make the transit of the meridian. When its light flashes down into the transit instrument they know that the exact calculated time has arrived. If their clocks show a different time, then the clocks are wrong. The stars themselves are never too early or too late. As a matter of fact, the clocks, being made of materials subject to wear and affected by temperature changes, etc., do tend to wander away from the correct time, though they are never "out" more than a small fraction of a second. The standard clocks by which the time of the United States is regulated are three in number. Each is set on a pier of solid concrete running deep into the ground, so that it will be unshaken by any tremors short of those of an earthquake, but is surrounded by a glass case. The three stand in an underground vault, in which the temperature and pressure are kept automatically at a constant mark. Only when absolutely necessary does an attendant enter this part of the vault, as the heat from his body might affect the clocks. As their pendulums swing back and forth, their motion is registered electrically upstairs, in the "time room" of the observatory. From there the impulse is sent to the government radio station at Arlington. So, when you set your watch by radio, you are getting your time almost directly from the stars with only two or three relays, which are supervised with extreme care by expert hands and eyes.

Clocking the Stars to Gauge Time; Left, a "Riefler" Clock; Center, View of Naval Observatory; Right, Clock That Sends Time Signals

QUICK-CHANGING AUTO WHEEL REDUCES TIRE WEAR

Made of aluminum and steel, a recently introduced auto wheel permits changing a tire in a few seconds. The rim is locked by four steel cams that extend through the spokes. These are controlled by a

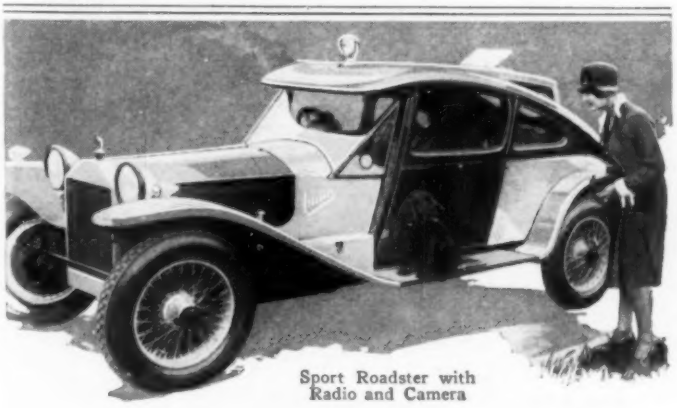
wrench at the hub. A quarter turn releases them so that the rim can be slipped off and a new one put on. This can be done in only one way, so that accurate alinement is assured with consequent easier driving and longer life for the tire.

GOLF REAL WORK SCIENCE FINDS

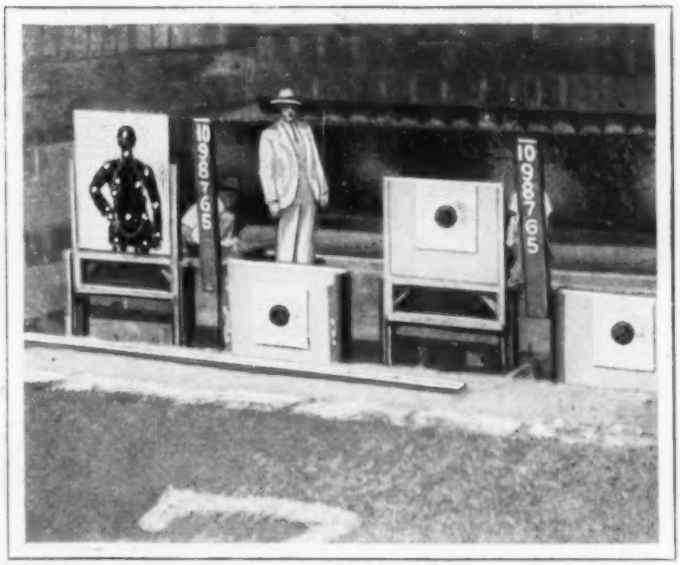
Measured on the basis of the energy expended, a man works about as hard playing three rounds of golf as he does in plowing an acre, scientists declare. He walks about four miles and makes, on an average, ninety-five strokes to one round of eighteen holes. Some time ago, a man played six rounds in one day or the estimated equivalent of two days of hard manual labor.

THIS AUTO HAS EVERYTHING FROM RADIO TO CAMERA

A sport roadster equipped with every possible accessory for a country tour—from a five-tube radio set to a camera—was one of the attractions at the recent British motor show. The car, which seats three passengers comfortably, has a modified "tear-drop" body and is finished in white and bright red.



Sport Roadster with Radio and Camera



Where Spent Bullets Are Salvaged for Reuse: Los Angeles Police Target Range with Lead Shield to Catch Projectiles

STEEL-BACKED PISTOL RANGE RECOVERS SPENT BULLETS

One of the outstanding features of a pistol target range the Los Angeles police have erected, is a steel bulkhead just back of the markers. It is so shaped that all of the bullets that strike it can be salvaged and used for reloading the cartridges, thus reducing waste and expense. The range is reported to have interested army authorities who are considering making similar installations for military use.

PARQUET FLOORING ROLLS UP LIKE CARPET

Plywood in thin sheets for the floors of show cases, shop windows and similar purposes, has been devised so that it can be rolled up like a carpet and removed. It is furnished in pieces a foot wide and three feet long and consists of two plies, one of oak or other hardwood on a backing of pine. The manufacturers assert that it will not become warped.

Open-Air Lion Cage in German City Where Circus Beasts Were Turned Loose for the Entertainment of the Townspeople

LIONS LOOSE IN PUBLIC SQUARE GIVE CITY A THRILL

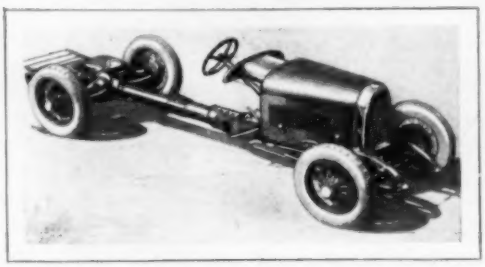
School children and others were given a thrill in Braunschweig, Germany, when twenty circus lions were turned loose around a lion monument in the public square. Steel caging was placed about the inclosure and, as a special precaution to prevent the animals from jumping over the barriers, a heavy netting was spread on top. The trainer performed his stunts to the delight of hundreds of pupils, who were dismissed from school for the occasion.

HIGHER-SPEED TRAINS

Development of a powerful type of "King" class locomotives on British railways has led to greater speeds and longer nonstop runs on some of the lines. A heavy train, hauled by the "King Edward VII," recently ran from Swindon to Paddington, a distance of seventy-seven and one-fourth miles in sixty-eight minutes. A still larger type of engine handles a 600-ton express train from London to Scotland, a distance of 400 miles, at an average of fifty-two miles an hour, with no stop in the first 268 miles.

"BACKBONED" AUTO CHASSIS REDUCES BODY STRAINS

Instead of the usual built-up frame, the chassis of a foreign car, recently introduced, has a central steel tube, about ten inches in diameter. Inside it lie the transmission shaft and control cables for the brakes, while fittings are provided at either end for the necessary engine-mounting and back-axle units. Engineers declare that since this tube forms a "backbone" for the car, the body is not subjected to bending and other strains. This permits lighter construction, with greater ease and safety, even at high speeds.



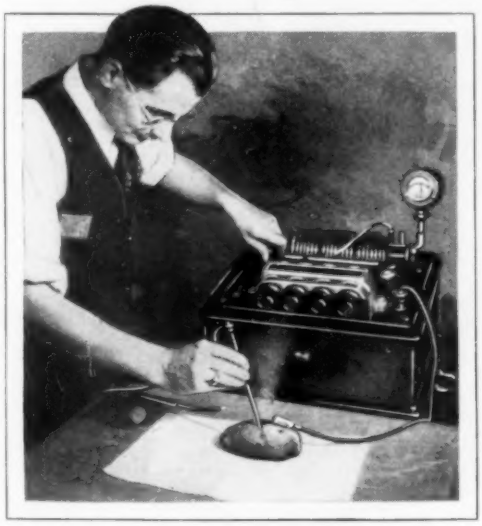
Steel-Tube Auto Chassis Which Is Said to Reduce Strain on the Body and Permit Lighter Construction

Cooking a Steak in Thirty Seconds

Broiling Steak with the Doctor's Diathermy Apparatus in a High-Speed Cooking Experiment

USING the doctor's diathermy apparatus to cook the family dinner and completing the job in seconds instead of minutes or hours, is being successfully tried in England. Steaks are broiled in thirty seconds, eggs fried in two seconds and large potatoes baked to a delicious tender mealiness in fifty seconds.

The cooking apparatus is simply a high-frequency electrical machine, which passes several hundred thousand volts, at a frequency of a million or more cycles, through the food. Essentially it is no different from the electric knife used in the latest bloodless surgery, or the machine which generates heat within the body tissues to clear up lung congestion in pneumonia patients and relieve neuritis and rheumatic pains.



A Quick Way to Bake a Potato, One of the Oldest of High-Frequency Electric Experiments

That high-frequency currents will cook is not a new discovery, for Tesla-coil experimenters were baking potatoes twenty years or more ago. But the English experimenters are working to develop the proper type of machine and fittings to make high-speed cooking practical in the home. If they succeed, electric cooking may become cheaper than coal or gas, for, while the average high-frequency apparatus has an efficiency of but fifty per cent, as compared with ninety per cent for good resistance-type heaters, the time element is so much in its favor that it more than offsets the losses. It takes about an hour to heat up an oven and bake a large potato, but if the same work can be done in fifty seconds, the cost will be no greater than burning an electric light for one minute.

The problem to be solved is the type and size of high-frequency generator to be used and the best type of electrodes for different forms of food. Using an electrode that is too small to broil a steak may cause the meat to burn, and one too

big will slow up the cooking, as it does not permit the necessary concentration of current in a small area.

One striking advantage of high-frequency cooking, particularly of meats, is the equal distribution of cooking throughout the food. It eliminates steaks burned on the outside and too raw within, for the color, clear through the meat, will be exactly the same as the color on the outside. Neither the metal plate beneath the steak nor the electrode above it becomes hot, since all the heat generated is produced by the resistance of the meat tissues.

Potatoes can be baked by simply sticking a small electrode, or a piece of wire in either end. Eggs broken in a metal tray, which is connected to one side of the electrical line, can be fried by touching the other electrode to their surface. To hard-boil an egg in its shell, it is only necessary to stick a needle in either end, insert the wires and turn the switch. Actually the egg is not boiled, in the usual sense, for the current apparently coagulates the albumen by vaporizing its water current. The water, reduced to steam, will burst the shell within a few seconds.

American manufacturers of physicians' electrical equipment are rather doubtful that high-frequency cooking will ever become practical for the average home, though its novelty, or the nutritional value of the food or its taste, may overshadow all objections. Meat broiled in this way tastes entirely different from the usual steak, the taste being a cross between broiled steak and boiled meat, owing to the fact that it loses none of its juices and only a very small part of its fats.

Some of the English experiments, reproduced in the experimental laboratory of the Victor X-Ray company, showed that almost any form of high-frequency machine will do the cooking. A new type of electric knife, still in the experimental stage, but ten times as powerful as any knife now in hospital use; a machine for treating pneumonia patients, and even an ordinary Tesla coil cooked successfully. The same current that does the cooking can be used to cut up the meat. The electric knife is not really a knife, though it may be fitted with a knife-shaped electrode. An ordinary darning needle or any small piece of steel will do as well.

The cutting is done by a small arc which precedes the tool. Apparently it parts the flesh through dehydration of a layer of cells. In hospital use, the heat is sufficient to cauterize the adjoining tissue and prevent bleeding.

Using a New Experimental Type of Surgeons' Electric Knife to Cut Up a Steak; the Knife, Developed in the Victor X-Ray Laboratory, Employs Radio Power Tubes

RADIO POLICE PATROL CITY OF EIGHTY THOUSAND

Berkeley Policeman in His Radio Car, the Headquarters Operator, and, Left, the Chief at the Transmitter

Equipping every policeman in a city of 80,000 population with a radio set, so he is in constant touch with headquarters, has given Berkeley, Calif., the world's most mobile police force, according to August Vollmer, its chief. Every Berkeley patrolman covers his beat by automobile, instead of on foot, which makes the radio system possible. Each car has a radio receiver, with a loud speaker mounted just beneath the steering wheel, and also headphones, if the patrolman prefers to use them. In addition there is a small red neon light in the wireless circuit, which can be flashed on and off by a telegraph key at headquarters. When the policeman leaves his car for any reason, he tries to keep one eye on the neon globe. If he is wanted, the operator at central station transmits the order in Morse code. Tests, according to Chief Vollmer, show the radio system works perfectly at speeds of fifty miles an hour, and that within three to five minutes the entire force can be assembled at the scene of an alarm. The wireless system works on 160-meter wavelength, and the receivers on the cars are built for that wave only.

REMOVABLE-HEAD AUTO PISTON SIMPLIFIES CHANGING RINGS

To introduce a new set of rings in an auto piston now on the market, it is only necessary to remove the cylinder head, unscrew two stud bolts and lift the piston head out. The unit, which is made of an aluminum alloy, does not score and is structually stronger than the ordinary kind, the manufacturers assert.

BEAUTY IN IRON IS WROUGHT FROM WAX MODELS

Below, Welding Delicate Pieces of Iron for Chandeliers; Center, Making Designs and a Fire Screen; Top, Left, Giving Iron Appearance of Old Bronze

Of all metals, forged iron lends itself best to decoration, for it unites strength with lightness. The artisan may form it to his fancy, for monumental doors, graceful stairway railings, elevator cages, fire screens, lanterns, lamps, chandeliers, wall sconces, as well as pretty baubles. Its tendency to rust makes it less desirable than bronze or copper for interior decoration, but paint and lacquer remedy this defect. Despite the progress made in the perfection of metal-working implements, the hammer still remains the indispensable tool of the iron craftsman. Even in important factories, which tend to replace more and more the blacksmith shops of

former days, the forge continues the professional laboratory. In the modern establishments, where the art is being revived, there exists a modeling studio where the designers and sculptors create models for ironworkers. The models are made with potters' clay or wax, after which the workers execute them in metal. The masterly achievement of the patient locksmith, Biscornet, of the thirteenth century, who forged the grill gates of the Cathedral of Notre Dame, Paris, represents perhaps the highest art of the metal workers of all time. After having finished the design, the artisan had to prepare and stamp the fifty-five motifs which decorate the scrolls, and by 807 weldings join these ornaments with the body of the grillwork.

CAMERA TAKES FOUR HUNDRED PICTURES AT ONE FILLING

Standard motion-picture film is used in a camera that takes 400 exposures on one filling. It is not for movies but for "stills," eight to the foot of film, and portions of the reel that have been exposed can be removed at any time for development. The camera has an effective lens, weighs but forty ounces, is securely housed in a bakelite case and will slip into the pocket. Each picture is an inch wide and an inch and a half long. They are sufficiently clear to stand considerable enlargement.

Compact Camera Which Uses Standard-Size Motion-Picture Film to Take 400 Exposures

One of the Contestants in Race in Which Auto Equipment Is Worn

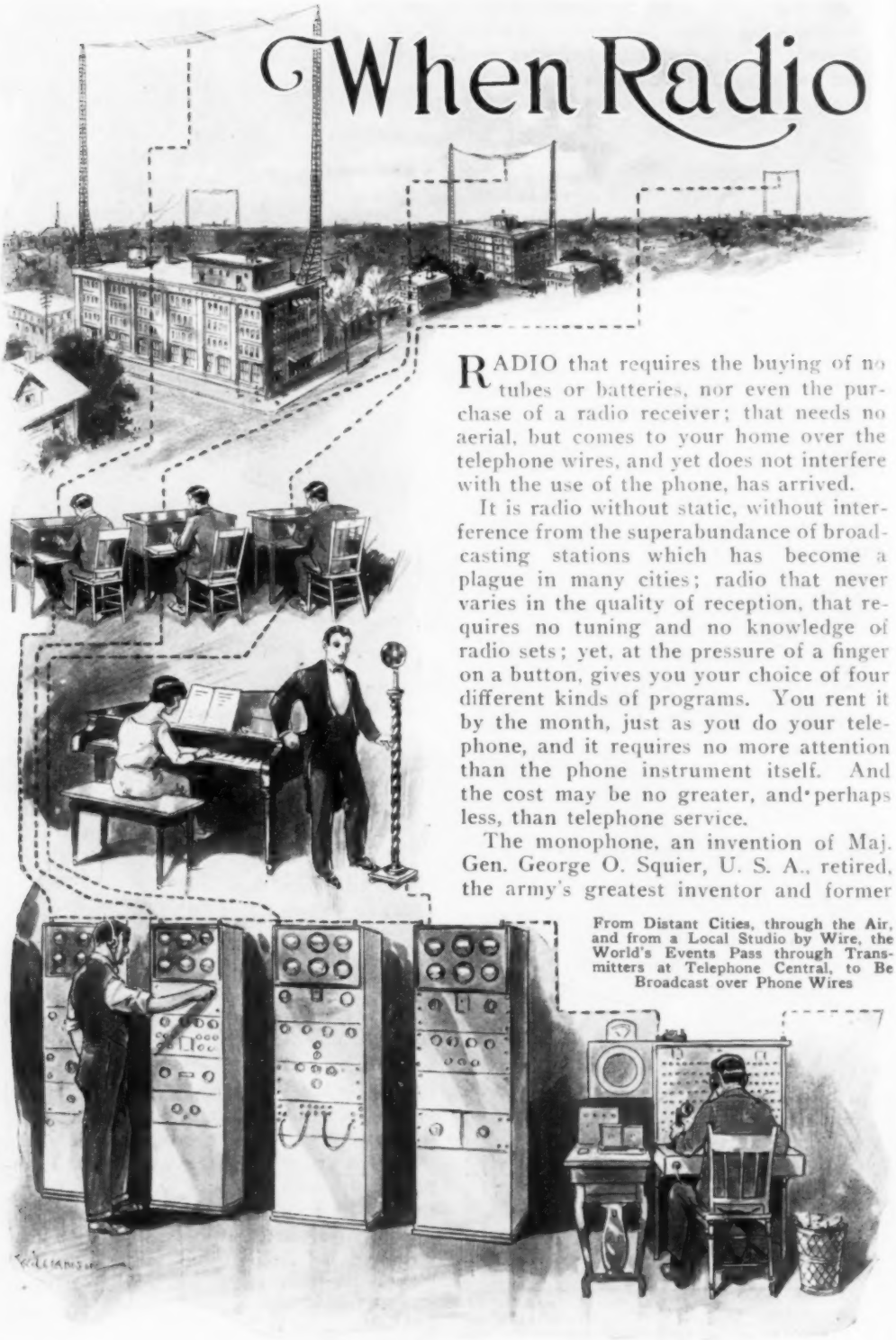
TIRE-ROLLING RACERS WEAR AUTO EQUIPMENT

One of the features of an outdoor fete in England was an automobile-equipment race. Women were the participants and were required to wear various accessories, such as license plates, a horn and a pennant over the dresses, and, while running, roll a tire. Another requirement was to tie the pennant to the head and keep tooting the horn while the race was in progress.

PURIFY WATER BY ELECTRICITY INSTEAD OF DISTILLING

Purification of water by subjecting it to electric current is accomplished successfully and economically, according to reports, in a unit devised by German engineers. It somewhat resembles a collapsed steam radiator and is composed of a group of connected cells through which the water passes while the electricity decomposes various impurities that it may contain. The foreign matter is washed away, leaving the water almost as pure as that obtained by distillation, it is said. The purifier requires little current and needs no attention save an occasional cleaning of the walls of the cells.

When Radio



RADIO that requires the buying of no tubes or batteries, nor even the purchase of a radio receiver; that needs no aerial, but comes to your home over the telephone wires, and yet does not interfere with the use of the phone, has arrived.

It is radio without static, without interference from the superabundance of broadcasting stations which has become a plague in many cities; radio that never varies in the quality of reception, that requires no tuning and no knowledge of radio sets; yet, at the pressure of a finger on a button, gives you your choice of four different kinds of programs. You rent it by the month, just as you do your telephone, and it requires no more attention than the phone instrument itself. And the cost may be no greater, and perhaps less, than telephone service.

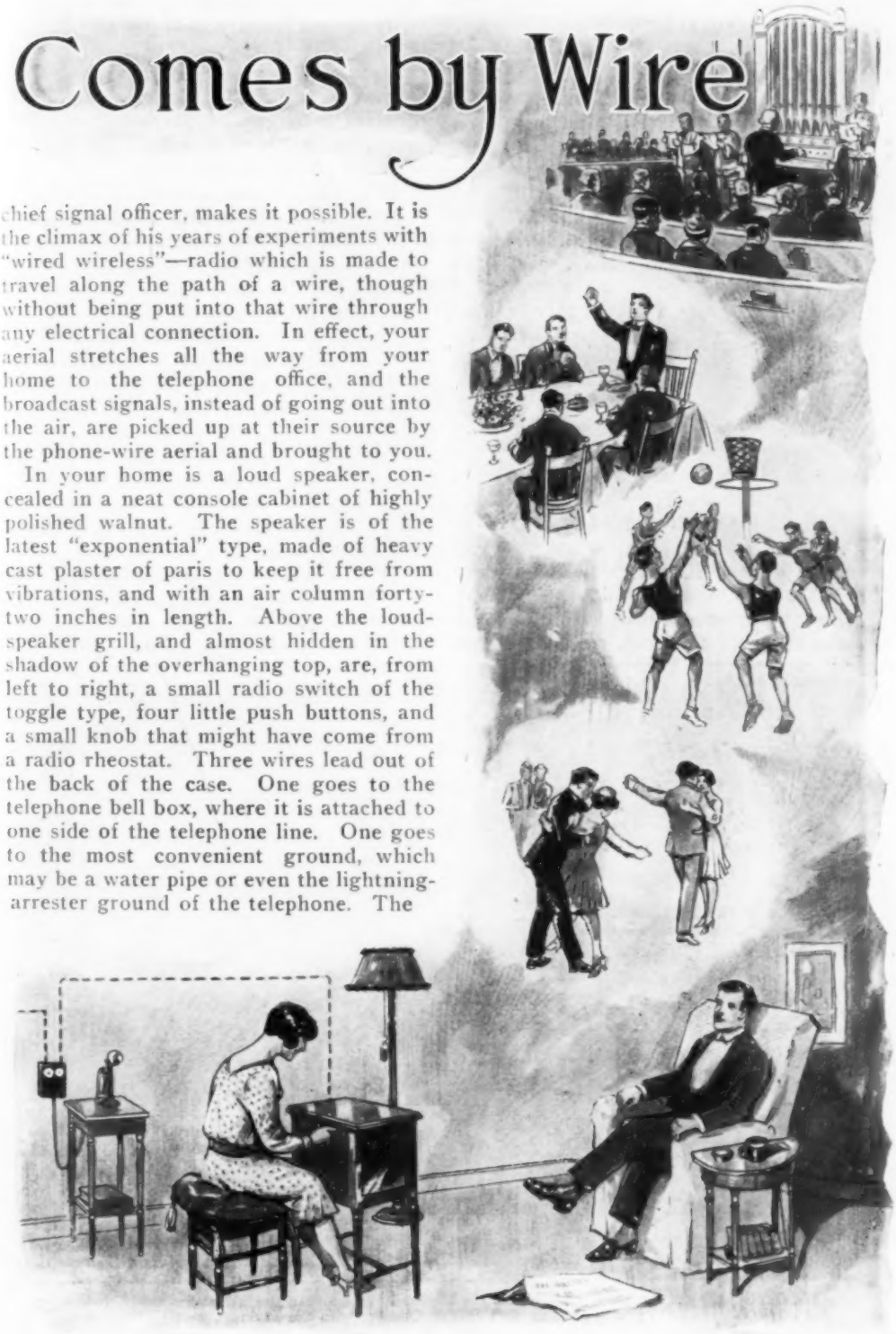
The monophone, an invention of Maj. Gen. George O. Squier, U. S. A., retired, the army's greatest inventor and former

From Distant Cities, through the Air, and from a Local Studio by Wire, the World's Events Pass through Transmitters at Telephone Central, to Be Broadcast over Phone Wires

Comes by Wire

chief signal officer, makes it possible. It is the climax of his years of experiments with "wired wireless"—radio which is made to travel along the path of a wire, though without being put into that wire through any electrical connection. In effect, your aerial stretches all the way from your home to the telephone office, and the broadcast signals, instead of going out into the air, are picked up at their source by the phone-wire aerial and brought to you.

In your home is a loud speaker, concealed in a neat console cabinet of highly polished walnut. The speaker is of the latest "exponential" type, made of heavy cast plaster of paris to keep it free from vibrations, and with an air column forty-two inches in length. Above the loud-speaker grill, and almost hidden in the shadow of the overhanging top, are, from left to right, a small radio switch of the toggle type, four little push buttons, and a small knob that might have come from a radio rheostat. Three wires lead out of the back of the case. One goes to the telephone bell box, where it is attached to one side of the telephone line. One goes to the most convenient ground, which may be a water pipe or even the lightning-arrester ground of the telephone. The



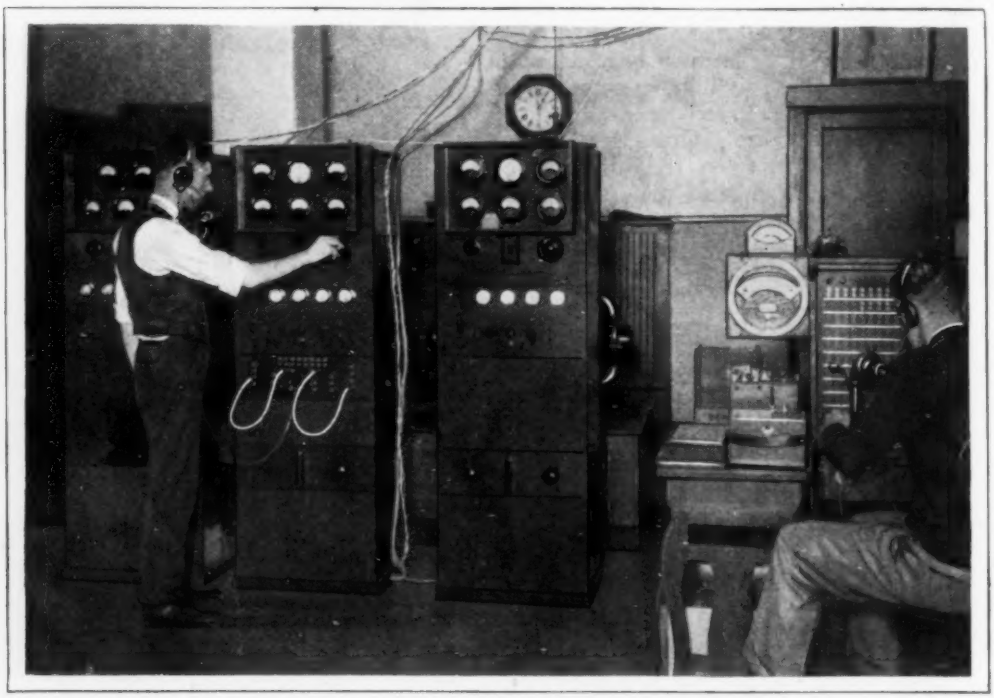
third is an extension cord that plugs into the nearest electric-light socket.

In operation you turn on the switch, push one of the buttons, and turn the knob to the desired volume—to the right to increase it and to the left to cut it down. If you want another program you push another button; each of the four brings in a different selection. One may furnish nothing but dance music; another provide classical music only; a third, educational talks, bedtime stories, children's hours, the day's news, time signals, and special features. The fourth may be used for popular programs of songs, semi-classical and popular music, playlets and other diversions.

Use of the monophone is not limited, says Gen. Squier, to the telephone. The electric-light company may enter the broadcasting field and furnish radio over the electric-light wires. One city, however, is already getting radio by telephone. The Kellogg Switchboard and Supply company, which furnishes the equipment for most of the 8,000 independent telephone companies in the United States, has developed it for use with the phone, and has installed the first equipment in Freeport, Ill., a county seat of 25,000 population, 110 miles west of Chicago. At the start the service is costing subscribers about $4 a month. George X. Cannon, general manager of the telephone company, estimates that, with 2,000 users, it may go as low at $2.

"For the present," says Mr. Cannon, "we will operate one studio to furnish local programs, and use powerful receiving sets to pick out of the air the best programs of distant stations, passing them on over our telephone wires to our subscribers. We have made a survey of the entire city with a receiver mounted on a portable truck, and found the point in the suburbs where radio reception is at its best. There we will locate our studio. People who live in parts of town where radio reception is bad, because of steel buildings, power lines or other causes, will be able to get just as good radio as those at the most perfect receiving point in Freeport.

"The local studio will present 'home talent,' something Freeport has never heard on the air, as we have no local broadcasting station. The studio per-



Three Radio Transmitters, for Three Different Wave Channels, Installed in the Telephone Office at Freeport, Ill.; the Wires Leading Out at Top Connect with the Phone Cables

formers will be supplemented by a number of portable microphones for use at other places about town. On Sunday mornings we will present one of the local church services. When the luncheon clubs have interesting programs, we will put them on the wired wireless. If there is a basketball game at the high-school gymnasium, graduation exercises or something else of interest, it will be picked up. Occasionally one of the local dance halls brings in a good orchestra from Chicago. When that happens, our microphone will be among those present. At regular intervals during the day and evening the local newspaper will go on the air with local and telegraph news bulletins. Even the city-council proceedings may be carried into the homes when matters of wide interest are up for discussion.

The Radio Receiver and Loud Speaker, and, Inset in Oval, a Close-Up of the Four Push Buttons, Switch and Volume Control

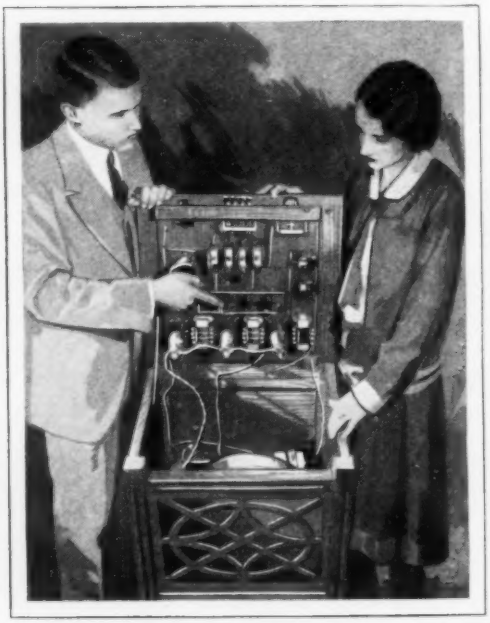
"Educational talks, of course, will be included, and, if the necessary royalty arrangements can be made, we will buy all the latest talking-machine records and use them to fill in at odd moments and during the earlier morning hours.

"That will take care of the local studio channel. Later, as the number of subscribers increases to produce more revenue, we expect to join one of the radio chains and bring the best of the national broadcast programs direct to Freeport by wire, instead of picking them up out of the air and rebroadcasting.

"The monophone is the first real by-product of the telephone business. Utilizing our existing wires and equipment, and without any great additional investment, we will be able to work up a good revenue-producing side line, and will be able to put quite a bit of the revenue back into the business of providing better programs."

The question of utilizing the telephone to bring radio into the home on a monthly rental basis has interested telephone men for several years. Three years ago, a phone company in Kansas installed a receiver in its exchange and began placing loud speakers in subscribers' homes. Several cities followed suit, notably St. Paul, Minn., where more than 1,400 loud speakers were installed. The system had two drawbacks. First, it was only possible to transmit one program, so the subscriber had no choice but to take what was offered by the operator at central. Secondly, special pairs of wires were needed, as the radio could not be carried over the same lines used for the subscriber's telephone, and the interest on the investment in special wires made the cost relatively high.

From the technical standpoint there was an even more serious objection. The receiver at central picked the broadcast out of the air, passed it through powerful amplifiers, and then put this audio-stage current onto the wires. The result was "cross talk" in the cables, and leakage of the radio onto the ordinary phone wires, so that interference with telephone conversations was caused.



What the Subscriber Doesn't See in the Sealed Cabinet: a Complete Three-Tube Radio Set

The Squier system, as developed in the Kellogg laboratories, gets away from all these objections. The transmitters, instead of operating on the usual broadcast wave bands, are extremely long-wave sets, utilizing waves far above even the code bands used for commercial wireless transmission. Because of their wavelength, and correspondingly low frequency, they interfere neither with the telephone nor with other wireless broadcasting. And instead of bothering about leakage in the cables, the system courts it. At Freeport, the telephone wires enter the exchange in big lead cables, each containing 400 wires—200 pairs, as the telephone man calls them. Only one pair from each cable is connected to the battery of transmitters, a separate transmitter for each of the wavelengths being used. The current from this one pair saturates the other 199 in each cable as thoroughly as though there was a direct electrical connection between them. There is no investment in wires tied up, for all the 200 can be used for ordinary telephone conversations.

The signals sent out over the system are not the audio-frequency, but the radio wave, which gets away from "cross talk" troubles, and the radio wave is amplified and converted by a receiver built into the loud-speaker cabinet in the home. The receiver used is a three-tube outfit, utilizing alternating-current tubes, heated by attachment to the electric-light wires. A B-eliminator completes the electrical equipment of the set. There is one detector tube and two stages of audio, the second using a power tube. A special long-wave coil is used to pick up the low frequencies, and fixed condensers, switched in or out by the tuning buttons, take care of the changes in wavelength.

SUNSPOTS AFFECT WEATHER AS MOON DOES TIDES

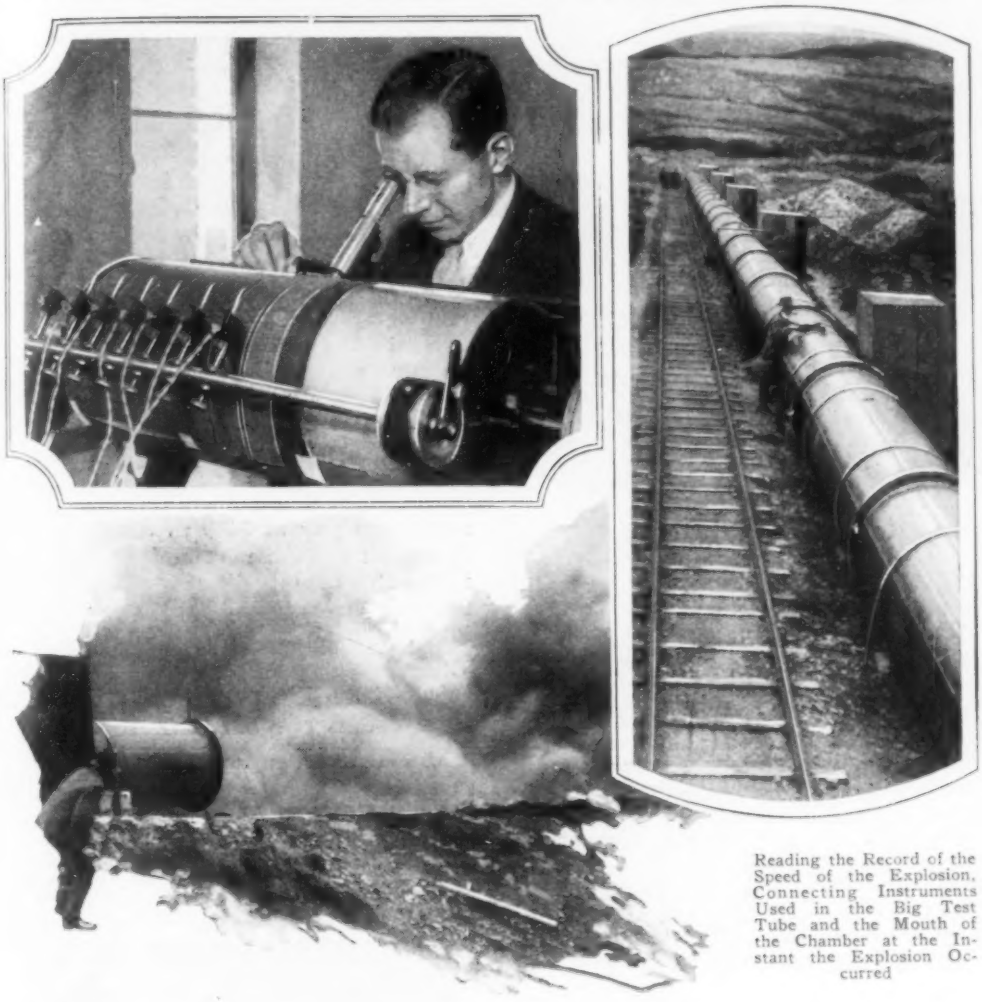
The relationship between the weather and spots in the sun is as close as that of the moon and the tides, according to Father Jerome S. Ricard, of the University of Santa Clara. He points out that the northern sunspots give observers knowledge of the prospect of storms over the Pacific and Atlantic coasts while southern sunspots give the dates of the advent of counterstorms over the same coasts. The spots are carried around in the sun in about twenty-seven days and the storms circle the earth in the same time.

CHURCH SHAPED LIKE STADIUM HAS GOOD ACOUSTICS

One of the most interesting structures in Amsterdam is a church of odd architecture. It somewhat resembles a stadium, having a deeply curved side, and is arranged to afford a lecture hall with satisfactory acoustical conditions.

Church in Which Exterior Beauty Was Sacrificed for Service; It Houses a Roomy Lecture Hall

MAN-MADE DUST EXPLOSIONS AID MINE SAFETY



Reading the Record of the Speed of the Explosion, Connecting Instruments Used in the Big Test Tube and the Mouth of the Chamber at the Instant the Explosion Occurred

Interesting experiments to determine the cause and effect of dust explosions in mines are being made in England. The apparatus used is a long steel shaft, essentially a gigantic test tube, which is exploded electrically and the effects measured with special instruments. The time required to fire the fumes can be determined, the force of the explosions and other factors. Some of the tests have shown that the speed of the explosions ranges from 3,000 to 4,000 feet per second.

PAPER FIBER FOR FURNITURE ALSO WOVEN IN RUGS

By twisting a form of paper into round shape, smoothing and polishing it by various processes, then weaving it, a serviceable substitute for reed has been devised in the manufacture of furniture and rugs. Approximately 50,000 tons of this material are now used yearly in the United States alone. A wide variety of articles can be made with the fiber reed and at lower costs, largely due to machine methods. According to reports, the introduction of this paper product has not hurt the sale of rattan or similar kinds of furniture.

FLY WINGS GAUGE STAR HEAT ON DELICATE INSTRUMENT

Curious Thermometer for Measuring the Heat of the Stars; It Contains Blackened Fly Wings to Help Gauge the Temperature

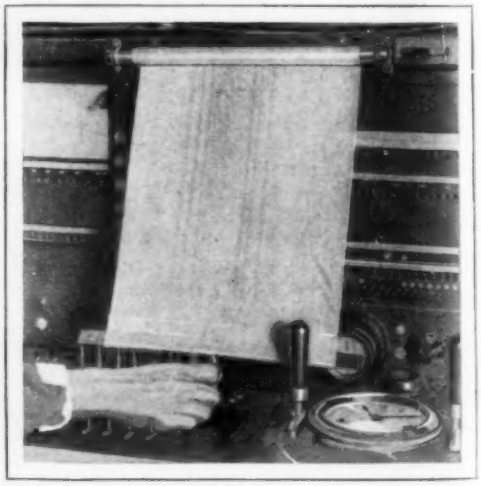
Heat from the stars can be measured and one of the instruments used to do it contains fly wings in the shape of a tiny "vane" suspended from quartz fibers in a small mirror. When a ray of starlight, passing through a prism, is trained on the blackened wings, the vane turns the fiber and the amount of the turn is registered by the mirror that reflects another beam of light along a calibrated arc.

BOYS TRAINED FOR LIFE AT SEA BY SHIPPING-BOARD SCHOOL

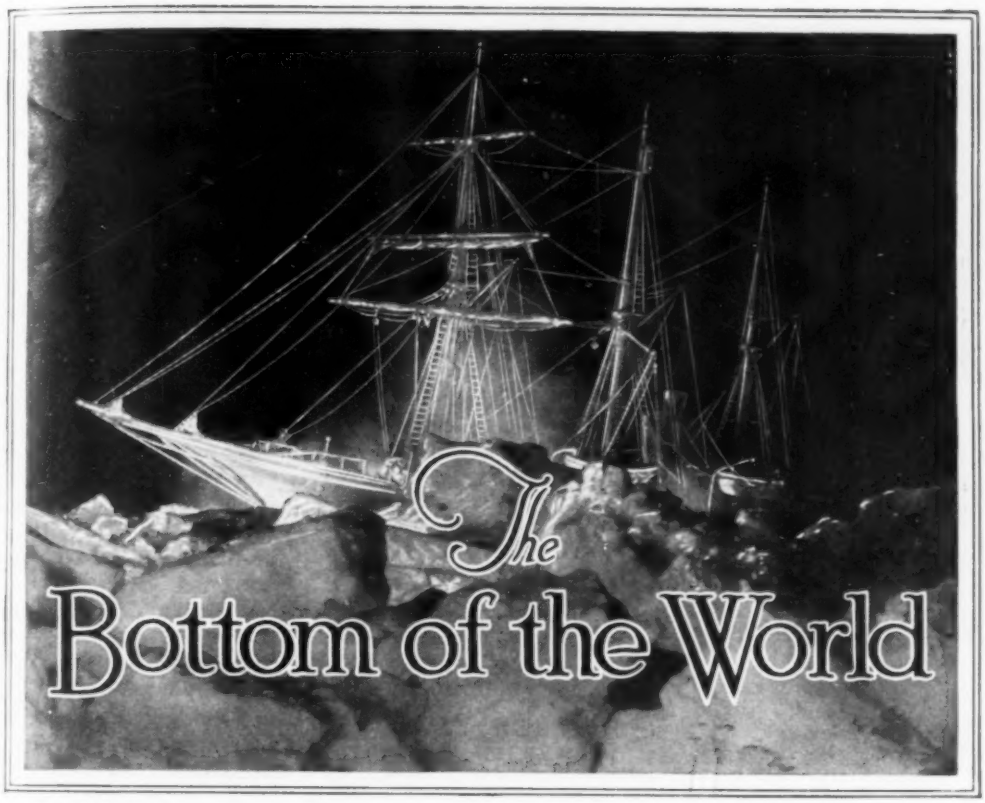
American boys with a taste for the sea have been afforded a thorough training system by the United States shipping board. Last year, more than 1,000 young men between the ages of 18 and 23 were introduced to the merchant marine for this special schooling. They are classed, at first, as student sailors. There are no classrooms and no theoretical instruction through correspondence or other means. Each boy learns his job by working with the men of the regular crews. They are scattered over the entire fleet of government-owned ships. In this "university," covering the seven seas and touching all ports of the globe, the boys are under the watchful eyes of the officers of the vessels. Masters and mates have been given orders to see that the training is thorough and that the teaching is not passed along to subordinates. Instructions state that every shipping-board vessel shall carry two students, known as deck boys, taking the place of one ordinary seaman on the crew payroll. The deck boys must be Americans of good physical and moral character, and the training such as to fit them for the higher ratings of ordinary and able seamen and ultimate advancement to the rank of officers. The real meaning of the system is that the boys shall be eligible for promotion as mates or captains. Six months of service as deck boy, at $25 a month, brings promotion to the grade of ordinary seaman at $47.50. This is followed by further advancement to the grade of able seaman at $62.50. The next upward step is an appointment as third mate with pay at $140 to $150 monthly. From this point, the promotions may come as rapidly as ability dictates. The boys are fed with the crew and have shore leave in foreign ports.

PHONE RATES ON ROLL CURTAIN SAVE HANDLING BOOK

Mounted on a curtain roller, a rate guide saves the telephone operators time and trouble when looking up long-distance tolls. It is always in position for reference, is out of the way when not needed and is protected from damage.



When the Operator Wishes to Refer to the Rate Card, She Simply Pulls Down This Roller Chart



Photos © U. & U.

Sir Ernest Shackleton's Ship "Endurance" Caught in the Ice, Shortly Before She Was Crushed; His Trip Back to Civilization by Open Boat Is an Epic Story

By J. OLIN HOWE

THE earth's most remote realm of mystery and silence, the great land mass about the south pole, is to have its age-long secrets laid bare. What is at the south pole? And what startling discoveries may come to light in that vast unknown continent in the midst of which the pole is located, a supposedly dead and barren area twice the size of the United States, where frost is king? Next summer Comm. Richard E. Byrd and a group of American scientists, aviators and others will sail south hoping to find out.

This isolated section of the world has been viewed by three small parties of humans on hasty dashes for the south pole. Our knowledge of it is very limited. Those who go now face well-nigh insurmountable difficulties in their attempt to penetrate nature's hidden places behind icy mountain ranges and across blizzard-swept plains at the bottom of the world.

Byrd himself plans to fly over the pole and to make other flights across and about this mysterious continent, and, with others of his expedition, will explore it as thoroughly as may be from the air, from aboard caterpillar tractors or by the use of sledges drawn by dog teams.

In the immediate region of the pole, the airmen will look down on only snow and ice—a scene of sheer lifeless desolation such as one might imagine upon the face of the moon—and their planes will be tossed by the most violent and tumultuous winds that blow upon our planet. Amundsen and Scott, who reached the south pole, and Shackleton, who almost made it, agree on this.

Amundsen was first to reach the pole—and not till as recently as 1910—traveling by dog sledge from a base on the antarctic coast on its New Zealand side. Gales and blizzards of titanic force hampered him,

Sledge and Dogs in Difficulties, Just One of the Adventures of the Lauge Koch Expedition to Northern Greenland

but his journey to the pole and back was far less arduous than that of Scott, who a month later planted the British flag at the pole, only to perish on his return trip with three companions within a hundred miles of his main base.

What little we know now supports the idea that no life exists on the antarctic continent after one has left the coast a few miles behind. Yet, but for these three explorers, the only visitors there have been whaling captains and other sailors, who have merely landed during the short summer, which corresponds to our winter. These have found the hardy penguin, an odd mammal-like bird which stays on through the winter and lays its eggs in the snow, exceedingly numerous. For a few short weeks certain species of gulls are there too, and the waters abound in seals and whales. But soon all but the penguin are gone. Upon the land only fungi and lichens grow in scattered places. A lone queer insect has been found in the interior, but there is nothing to show that there is a single worm, mollusk, reptile, bird or mammal there. This because there is no known vegetable life without which animal life cannot exist.

The antarctic never has the extremes of temperature of the arctic, where winter's 70 or 80 degrees below zero, centigrade, are followed by summer days sometimes uncomfortably hot, and great herds of musk oxen may graze on green pastures for weeks. The soil on Antarctica seems never to thaw sufficiently for seeds to germinate, for here no summer day finds the mercury much above freezing.

Yet, is this mystic land at the southernmost tip of the world, the seventh continent upon its face, so nearly lifeless? Does death rule in Antarctica? We do not know. Byrd thinks not, nor hesitates to say this.

"Does it seem reasonable," asks the man who first flew to the north pole and last summer winged his way to France with the first multi-engined plane to cross the Atlantic, "that lands which for months of the year are swept by sunshine twenty-four hours a day should not somewhere support life? Not on the great plateaus which stretch out inland to the pole; here there is only snow and ice. But somewhere in those tremendous areas there must be lowlands where temperatures rise sufficiently to permit vegetable and animal life—the latter very possibly as different from any we know as the penguin is different from birds of climes with which we are familiar.

"In some antarctic valley, perhaps, shut in by towering mountains, a thrilling discovery may await us. We may find forms

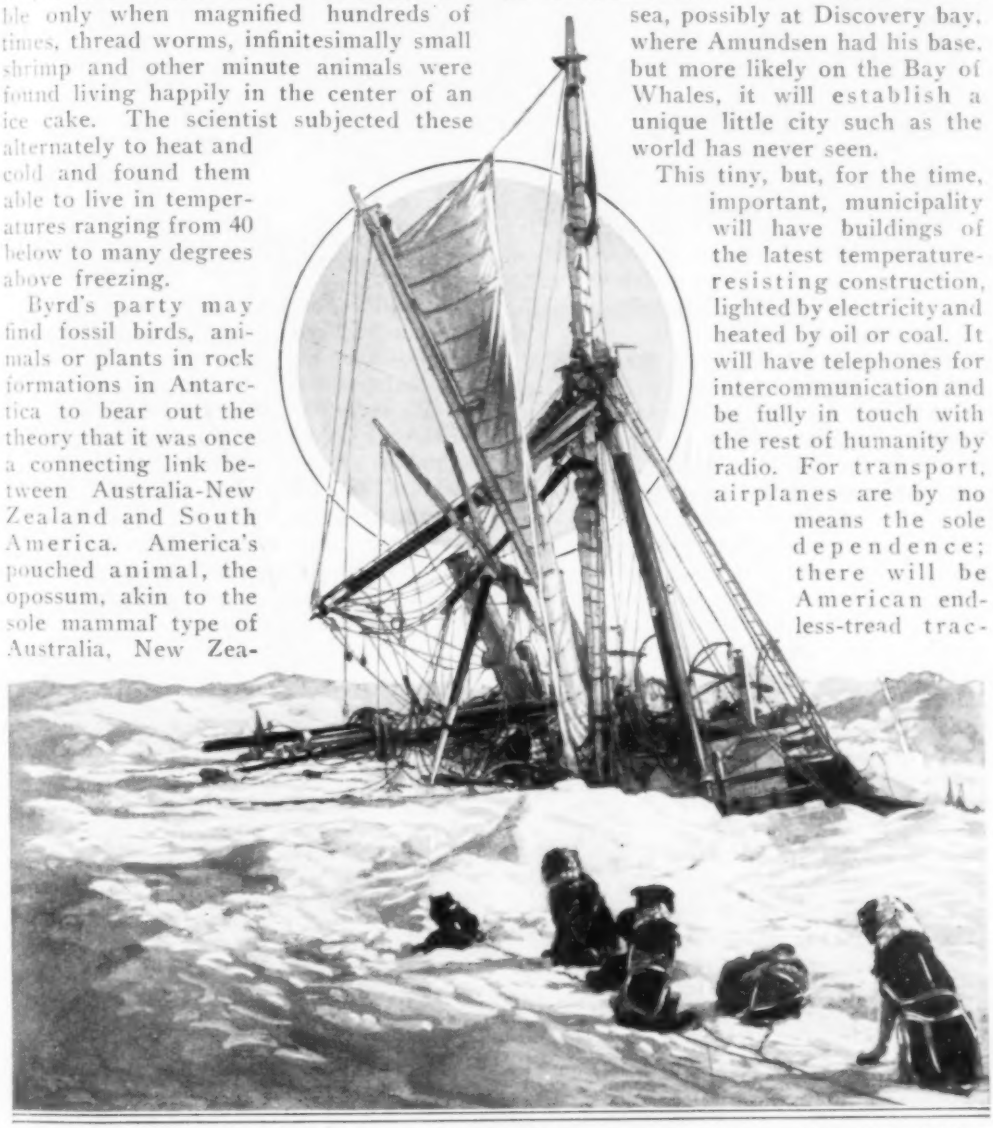
of life completely new to us. Who knows what link with prehistoric times might be there? If the elemental and sturdy penguin can live through the extremes of winter, in warmer lowlands there should be animals able to do the same."

Curious discoveries of James Murray, biologist with the Shackleton expedition, bear on Byrd's theory of life in Antarctica. In weeds in the bottoms of lakes, in the ice itself, Murray found abundant microscopic life. Small bearlike animals, visible only when magnified hundreds of times, thread worms, infinitesimally small shrimp and other minute animals were found living happily in the center of an ice cake. The scientist subjected these alternately to heat and cold and found them able to live in temperatures ranging from 40 below to many degrees above freezing.

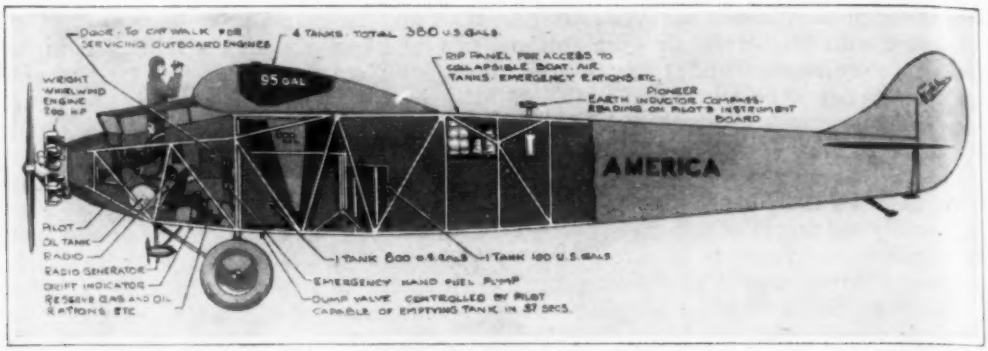
Byrd's party may find fossil birds, animals or plants in rock formations in Antarctica to bear out the theory that it was once a connecting link between Australia-New Zealand and South America. America's pouched animal, the opossum, akin to the sole mammal type of Australia, New Zealand and Tasmania, may have crossed on this land bridge, which would account for the complete absence of this type of animal in Europe, Asia and Africa. Again, South America has a parrot which is a close relative of the New Zealand kea.

The expedition plans to sail for the antarctic about next August—in a 17,000-ton ship not built for ice conditions and which will winter in New Zealand or Tasmania—prepared to remain a year and half. On its coast, somewhere on the shore of Ross sea, possibly at Discovery bay, where Amundsen had his base, but more likely on the Bay of Whales, it will establish a unique little city such as the world has never seen.

This tiny, but, for the time, important, municipality will have buildings of the latest temperature-resisting construction, lighted by electricity and heated by oil or coal. It will have telephones for intercommunication and be fully in touch with the rest of humanity by radio. For transport, airplanes are by no means the sole dependence; there will be American endless-tread trac-



Trapped and Crushed by South Polar Ice, Shackleton's "Endurance" as She Disappeared beneath the Grinding Floes, Leaving Twenty-Six Men Homeless on the Ice



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Sectional View of Commander Byrd's Plane "America," in Which He Flew from New York to the Coast of France Last Summer; Somewhat Similar Ships Will Be Used in the Pole Flight

tors with special snow treads to haul planes about and draw trains of sledges. The latest metal and woodworking machinery will be in its machine shops and its storehouses will be replete with extra parts. Gasoline engines are to furnish its power, similar to those which will drive the portable dynamos that generate the community's electric current.

Roughing it is, of course, the lot of adventurers at either pole, but these will have their lot made more tolerable by all science or human genius can do. A large assembly room in one of the main buildings will have a fine library of late and standard fiction and reference works, many games, a phonograph or two with hundreds of records, a portable organ and other musical instruments, a stereopticon with a wealth of slides, motion-picture projectors, and much besides.

The radio station will be a feature of the little city. Experts have built for it the latest model in sending sets using a short wavelength of forty meters, and are confident this will maintain communication with the United States. Another sending set on a much longer wavelength will easily reach out 1,500 to 2,000 miles. There will be several receiving sets.

Nothing that the expedition's leader or his aides can think of which would make for human safety or simple welfare will be overlooked, and by a year from now very interesting news should come out of the antarctic.

"LIQUID PEARLS" OF FISH SCALES BASIS FOR NEW INDUSTRY

Manufacture from fish scales of "pearl essence," a liquid used in coating artificial pearls, backs of combs, brushes and dressing-table sets, is a new industry on the Pacific coast. A plant for the preparation of the "liquid pearls" has just been established near San Diego, Calif., and the product sells for from $60 to $200 per pound, depending upon the quality. The scales are taken from sardines as the fish are delivered to the canneries. After being washed, they are put through special treatment with ether.

UMBRELLA FITS IN HANDBAG FOR SHOPPER'S COMFORT

Carrying an umbrella is usually a bother, but one that has a short stick and can be stowed away in a pocket in a special handbag eliminates most of the difficulty and leaves one hand free. The sheath about the umbrella protects the contents of the bag from dampness and the outfit also offers the advantage of helping safeguard against loss by accident or theft.

Slipping Umbrella into Convenient Handbag Pocket, Where It Is Easily Carried and Safer against Loss or Theft

HARD ROADS SAVE TIRES

Engineers of a southern bus company have found that gravel roads cost them two cents a mile more on tires than do hard-surfaced roads. They estimate that the saving of hard roads in the wear to the tires of an average car is at least six-tenths of a cent a mile. At a recent meeting of officials interested in municipal improvements, W. H. Rhodes, a New Orleans engineer, declared that a highway carrying 6,000 vehicles in twenty-four hours will, in five years, wear down gravel laid eight inches thick to a veneer of less than three inches. Sprinkling hastens this wear. The original cost of gravel roads is high and their upkeep expense is also great. In towns having at least 1,000 cars in motion daily, Mr. Rhodes estimates that there would be a saving of $2,190 a mile per year in tire wear alone, if the roads were hard.

By Passing His Hand over the Opening in the Window, the Man Outside Is Able to Start Demonstration Auto through Action of Relays

WAVE OF HAND STARTS AUTO FOR WINDOW DISPLAY

Crowds of delighted spectators thronged in front of an automobile show window in New York recently and amused themselves by starting a car displayed inside, simply by passing their hands over a hole in a disk on the glass. The action caused sensitive electric controls to function, throw a switch and start the car, which rolled slowly forward on a track until it threw another switch and was reversed.

SAW FILE WITH WEIGHT HELPS GIVE TEETH SAME PITCH

Saw teeth can be filed more easily to the same pitch by using a weighted file recently introduced. It is provided with a scale and marker to permit setting the file in its holder at the proper position to cut the teeth to the desired pitch, and the weight causes the file to move in relation to the handle until the weight reaches the lowest possible position, which will be the point at which the desired pitch is attained. In this way, every tooth on the saw can be easily filed to the same pitch. If desired, the weight may be removed and used as a plumb bob.

LIFE PRESERVER FITS IN POCKET AND INFLATES ITSELF

For sea or air travelers, a life preserver just introduced is especially serviceable, as it is carried in a small leather case that fits the pocket, and inflates itself as it strikes the water. This is accomplished by the automatic release of gas in a small rubber balloon. The preserver is said to remain inflated quite long.

MUSIC FROM THE AIR PRODUCED BY WAVE OF HAND

Instruments That Produce Music by Taming the Radio Squeals Due to Varying Body Capacity; the Right Hand, in the Picture at the Left, Produces the Tone and the Left Regulates Volume

Producing music out of the air by merely waving the hands in space has been demonstrated with more or less success by two radio engineers in Germany. The secret lies in "body capacity," the familiar phenomenon which many radio fans have encountered when their radio sets changed pitch or squealed when a hand approached the condenser to change the tuning. The two aerial musicians have simply tamed the squeals by developing a system in which the body capacity is controlled by moving the hands until each motion produces a corresponding musical note. The tones of a violin and a cello, and a close resemblance to the human voice were produced. All of the selections, as music critics pointed out, were chosen because they were slow and rather simple pieces, of a kind adapted to the difficulties of production. A metal rod forms the antenna near which the fingers "play" and a single-wire loop at the side permits changing volume by advancing or withdrawing the hand. A two-tube set and loud speaker complete the outfit.

SAWING GUIDE SIMPLIFIES TASK OF CUTTING AT ANGLES

Sawing at angles is usually a somewhat difficult task, especially for the amateur, but the work is greatly simplified with a guide that also serves as a miter, T-square, precision tool and protractor. It is simply a plate arrangement with a loop through which the saw is inserted after the

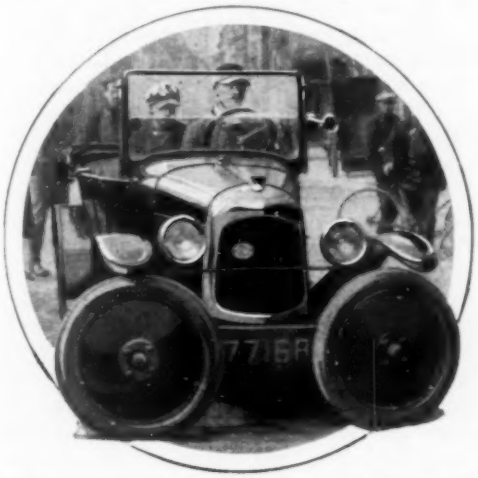
guiding member has been set to the proper angle. Accuracy is insured, there is practically no danger of the saw slipping and no need for pencil markings. The tool can be used for measuring the angle between walls that are not ninety degrees, for instance, and for other purposes. Little skill is required to operate it and it will serve on both indoor and outdoor jobs.

WINDOW DISPLAYS BY RADIO TO AID ADVERTISERS

Transmission of billboard pictures and advertising window displays by radio from a central broadcasting station is foreseen as a result of a recent invention by C. Francis Jenkins. It is similar to the apparatus used for receiving weather maps sent by wireless, but instead of being registered on a disk, the pictures are recorded on a broad, flat surface, by a carrying arm that sweeps over it like a fountain pen. This arm is actuated by impulses broadcast from the central radio station.

AUTO TURNS IN OWN LENGTH TO ESCAPE TRAFFIC JAM

Especially suited to service in congested streets, an automobile introduced in Paris can be turned in the space of its own length. This is made possible by wheels that swing around at sharp angles so that the car can be whirled about without repeated backing up and turning.



Auto with Wheels That Turn at Sharp Angle Can Be Managed Easily Where Traffic Is Congested

Sparing the Attendant a Climb up a Ladder; Watering Street Pole Garden with Extension Sprinkler

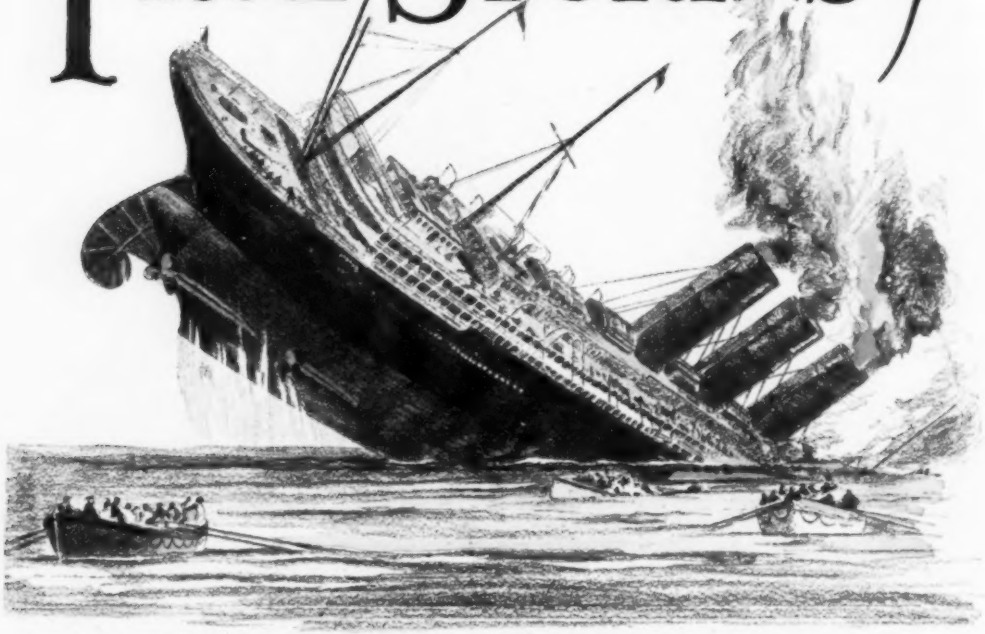
EXTENSION POLE FOR WATERING AIDS STREET GARDENS

In Vienna, plant and flower boxes have been attached to the electric-light standards on some of the streets. As they are too high to be watered from the ground, an extension pole, carrying a length of hose, has been devised for sprinkling the little gardens in order to eliminate the necessity of a ladder and save the trouble of climbing.

WOOL IS MADE MOTH-PROOF BY CHEMICAL TREATMENT

German chemists are reported to have discovered a way for making wool distasteful to moths. The process is said not to injure in any degree the material, which retains the same appearance and has the same feeling after the treatment but repels the moths.

TRUE STORIES of



One of the Greatest Sea Tragedies of All Time, the Sinking of the "Lusitania" by a Submarine off the Irish Coast, in 1915, as Drawn from the Survivors' Stories

By HAROLD T. WILKINS

SOME time ago, a fast steamship, fitted with radio apparatus and embodying the latest devices known in the science of marine engineering, set sail from Montevideo to Rio de Janeiro. She was loaded with Argentine wheat for Antwerp.

From Montevideo to Rio is a distance of 1,100 miles over a sea lane right in the track of ocean-going liners and freight vessels. She was to touch at Rio, take in cargo, and then sail direct to Antwerp. Days passed and she did not arrive at Rio. No radio SOS had been sent out and no passing vessel had observed her. She vanished as completely as mists before the rising sun, and, from that day to this, no clue has ever thrown the least light on the mystery.

Modern radio and the latest airplanes in the service of ocean sleuths are powerless when faced by these baffling mysteries, which occur more often than landsmen imagine. The wires hummed with this mystery of the "Tenzam Maru," overdue in the South Atlantic, and 6,300 miles away the news of the missing, radio-equipped steamer came to the royal exchange, the home in London of the famous sea corporation of Lloyd's.

The ship's owners, in despair at the absence of any news, applied to Lloyd's to have her posted as missing. A printed notice was affixed to the baize board of the "Chamber of Horrors"—Lloyd's agony room or ships' graveyard—asking news of the lost ship. A week later, no word having arrived, a "caller," wearing a picturesque scarlet robe with a fur collar, rang one short stroke on the "Lutine" bell. If the missing ship had reached port safely after the report of missing—a very rare occurrence—he would have rung two short strokes. He next mounted a rostrum and announced that the ship, which sailed from Montevideo, on such a date, for Antwerp had not been heard of since. The ship was then posted as missing, and a notice stuck on a special board. Next

SEA TRAGEDIES

day the loss is payable by the underwriters, while relatives of the missing seamen (presumed dead in law) may obtain probate of their wills, if they have any. This is the proceeding in the case of important missing ships.

Lloyd's keep a big book of missing ships, bound in green leather, in which there are recorded details of the events. The "Lutine" bell, hanging in chains over the caller's rostrum, has a romantic association with a mystery of a treasure wreck of the days of Napoleon Bonaparte.

The ship "Lutine" was a captured French frigate which left Yarmouth, Eng., on Oct. 16, 1799, bound for Cuxhaven, Germany, with about $10,000,000 of specie to pay the debts of London merchants. Two days later a fishing smack, passing close to the "Lutine," was amazed to see this ship ablaze with lights, and a scene of riot and revelry in her main cabin.

When the Red-Robed "Caller" at Lloyd's Mounts His Rostrum to Toll the "Lutine" Bell Another Ship Has Disappeared from the Seas

At midnight, running under a press of canvas, the "Lutine" struck a shoal off the mouth of the Zuyder Zee, Holland, and sank at once, only two sailors, clinging to spars, being picked up by a Dutch boat. The castaways died a few hours later, and were never able to tell what brought the "Lutine" so far out of her proper course. The Dutch government claimed the wreck, refused to allow British salvors to fish for her treasure, and for fifty years Lloyd's battled in the law courts with the Dutch authorities over this claim. Only $500,000 worth of gold has been raised from the wreck, and today, on the shoals of Vlieland, there are about $8,000,000 of specie waiting for some lucky salvor of the future.

The "Lutine's" ship bell was fished up from the shoals and hung in chains at Lloyd's, London, whose president today sits in a handsomely carved chair made out of the ship's rudder. So many years passed before even the relatively small amount of bullion was raised from the wreck that the original underwriters, who settled the claim for $5,000,000 the day after the news of the loss reached London, were long dead, and could not be traced, owing to the destruction by fire of Lloyd's records in the royal exchange. So the money was used to set up Lloyd's signal

stations on coasts and cliffs all round the world.

Close to the caller's rostrum is the famous graveyard or "Chamber of Horrors" —Lloyd's agony room. No skeletons or grinning skulls decorate this chamber, and there isn't even a replica of Davy Jones' locker. In the graveyard is a casualty board to which are pinned each day radio messages and telegrams telling of ships' accidents, arrivals and sailings. Daily, a clerk writes in large script the more serious casualties, which he enters in a big book, close to the notice board, and they are next day recorded in Lloyd's Shipping Gazette.

Queer yarns and strange mysteries of derelicts, wrecks and missing ships are buried in the immense store of volumes accumulated in the library of Lloyd's since 1838. There is an old-fashioned captains' room at Lloyd's—today a tea room for members—where the old windjammer skipper and the dapper captain of the old-time Indian tea clipper told startling yarns of adventures with pirates, or boarding ghost-ridden derelicts on dark nights. In this room, the last captured slave ship and the first large ocean steamship were sold by auctioneers who stuck a pin in a candle and stopped bids when the flame burned down to the pin.

Derelicts met at sea, and reported to Lloyd's agent at the nearest port, provide weird thrills and baffling mysteries. A Nova Scotian captain of a barque, bound from New York to Gibraltar, sighted a brig and signaled. He received no reply, and something queer about the sailing of the ship struck him. He looked through his glasses, but could see nobody on her deck.

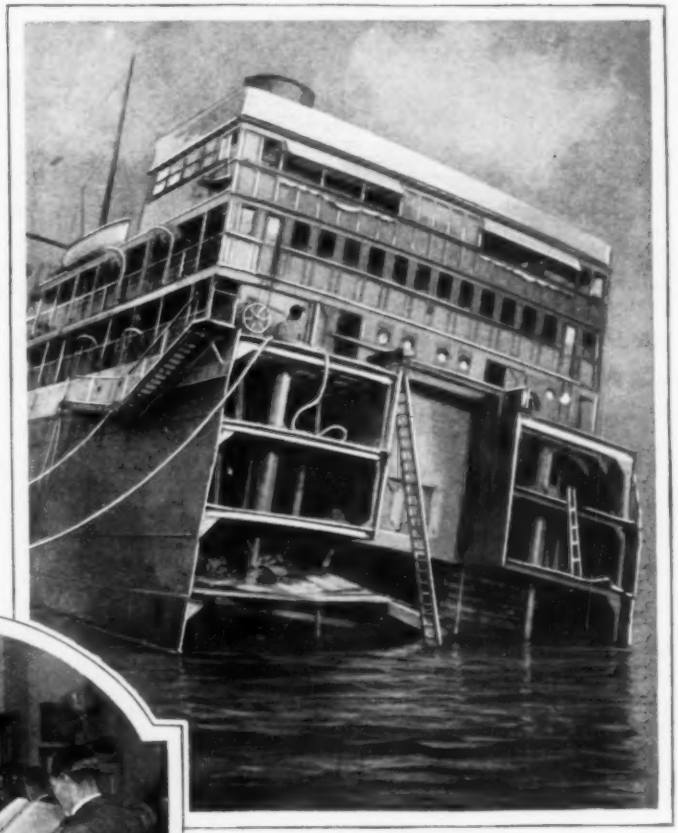
"She's a derelict," he said to the mate. "Lower a boat." As the crew pulled up to her, they saw painted on her stern in white the name "Mary Celeste." A strange sight met their eyes in the cabin. A table was laid for breakfast which had been half eaten, and it seemed as though the occupants had left in haste. "Mary Celeste's" boat hung untouched on the davits. The captain looked in the log and saw that the last day recorded on the "Mary Celeste" was eleven days before. Bewildered, the Nova Scotian captain towed the mystery ship to Gibraltar to claim salvage. There, the officials of the British vice-admiralty court searched her, but found no signs of fire, bad weather, or explosions. A sword was picked up showing traces of blood having been wiped off before the blade was returned to the scabbard. A puzzling feature was that both bows of the "Mary Celeste" had been recently cut by a sharp instrument. The court made a second examination and discovered marks of an ax on the top-gallant rail and signs of blood. The manifest, the bill of lading, and the sextant were all missing.

Now, the "Mary Celeste" was a 500-ton brig, commanded by Capt. Griggs, who had his wife and child aboard on her last fateful voyage. She was bound from New York to Genoa. The archives of the state department at Washington say that both sword and rail found on the "Mary Celeste" were free from blood. But leaving aside this apparent conflict of official evidence, what are we to make of the curious slashing of her bows with a knife? Was it faked evidence of a collision? The mystery remains unsolved to this day.

A grim event occurred at sea in the fall of 1926, which parallels some of the details of the mystery of the "Mary Celeste" and may throw some light on the fate of her crew. The Norwegian walrus-fishing steamship "Istiennan" was found abandoned off the lonely coast of Finnmark, in the region of Norway's "land of the midnight sun." There was no one on board, the table was laid and the lamps were still burning. No theory of the mystery was formed and the enigma remained unsolved until November, 1926, when a German sailor made a confession on his deathbed in the hospital at Hammerfest, Norway. He said that, in company with liquor smugglers, he had boarded the Norwegian steamship. They overwhelmed her crew by a sudden attack, murdered them, and threw the nine bodies overboard. Then the pirates looted the ship, prepared a table for dinner, lit the lamps as a "blind" and escaped in her lifeboat ashore, and last, on reaching the wild and lonely coast, burnt the boat to cover up all traces of their crime.

Pirates are not unknown in European waters even today. In April, 1925, three men rowed out to a British trawler repairing her nets and gear at Trondhjem, Nor-

way and, overpowering the engineer who was the only person aboard, stole all the valuables they could find. The British steamer "Branksome Hall" reported to Lloyd's the finding of a derelict four-masted barque, the "Buteshire," in mid-Atlantic. The ship, which was on a voyage from Pisagua, Chile, to the English channel, was flying signals of distress, but when the "Branksome Hall" bore down on her, she found her in good order, though abandoned. The lifeboats were gone and the lights were still burning.



Cut in Two above the Water and Dynamited Apart below, the Halves of This Stranded Liner Were Saved

© Topical Press Agency
Underwriters Consulting the Lost-Ship Book at Lloyd's

The Atlantic, of all the seven seas, presents the most baffling of marine mysteries. The British trading ship "Marathon" met a 1,000-ton vessel with disordered rigging. No reply came to the "Marathon's" hails. The captain saw she was undamaged and deserted and sent a crew to board her She was the "James B. Chester," an American ship. Her paintwork was fresh and brasswork polished, but the boarders were so scared by her appearance and strangeness that they kept close together and tiptoed over the decks.

No sound was heard but the creaking of wooden blocks, the groaning of the rudder, and the lapping of the water against her sides. Amidships the cabins were in disorder, furniture was overturned, a chest burst open, and clothes strewn about. Her cargo of wool and provisions was intact, and there were no signs of violence, but the ship's compasses and papers were missing. The "Marathon" towed the mystery ship to Liverpool. Why did the crew quit her in a sudden panic, taking a few valuables in their flight? The answer will never be known.

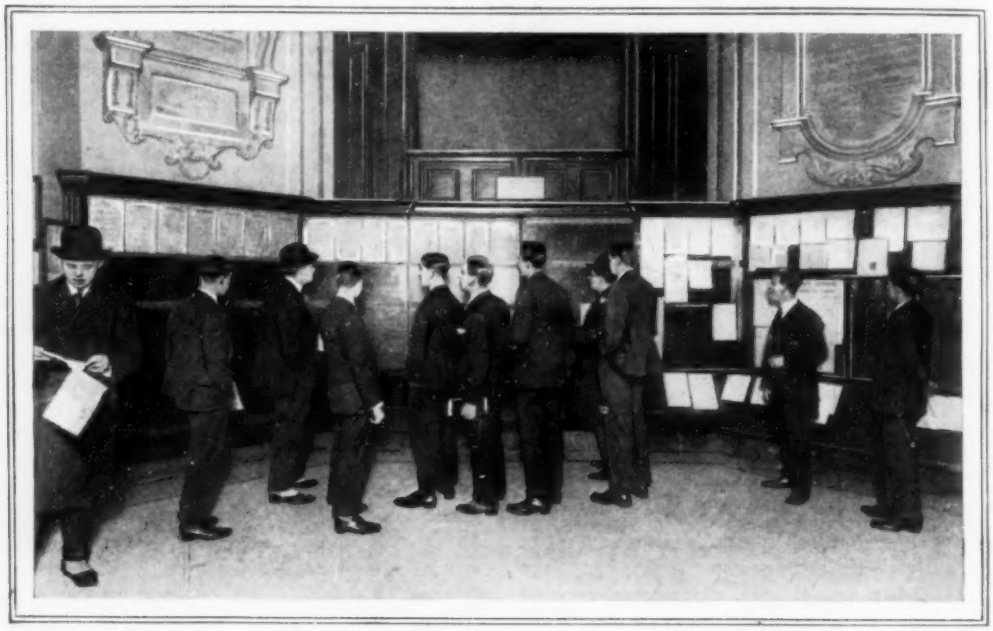
Another English ship sighted an American-built sailing vessel in the south At-

lantic. The American ship had badly battered bulwarks, and no one aboard. The name "Orion" was read on her bows. A boarding party landed on her decks, but the sailors presently returned, violently sick, to the English ship. They said they saw a man lying on his back at the foot of the steps down a companion way. On going to see what was the matter, an abominable smell belched up to them, and they had to retreat. The English captain went on his way, and the "Orion" was never seen again.

There also are tales of haunted ships. One such was the "Squando," a trading vessel anchored off the wharves of Bathurst docks, N. B., Can. No crew would man her, and the tale was that when the "Squando" was lying off San Francisco at anchor, the captain and his wife suddenly attacked the mate. The ship became haunted after that, in the opinion of mariners. The Norwegian consul at Bathurst engaged two watchmen to look after her, but after the first night, they came off and declined to go back. Cold hands, said they, had touched them in the night, caught their clothes, thrown articles about the deck, while ghostly voices of unseen beings kept telling them to quit at once. In the cabin they had seen the shadowy outline of a man in seafaring costume minus his head. But, whatever the reason, the boat had to be abandoned, for nobody would ship in her.

The tale of the mirage ship—the British gun brig "Baracoutta"—should be told by a tattooed seafarer, round a roaring fire of a winter's night. The "Baracoutta" was a ship in a squadron sent to explore the coasts of Madagascar and East Africa. She got separated from the rest. Capt. Owen, of the British warship "Severn," tells the story: "Off Point Danger, South Africa, one evening in April, the 'Baracoutta' was seen two miles to leeward. We at first concluded that it could not be she, but the peculiarity of her rigging convinced us we were not mistaken. Many well-known faces could be seen looking toward our ship. To our surprise, she made no effort to join us, but stood away. We were near the port to which we were both bound, and I attached no importance to the event. We continued our course.

"At sunset, she hove to and sent a boat, apparently to pick up a man overboard. During the night, we saw no light showing her location. Next morning we anchored and wasted a whole month waiting



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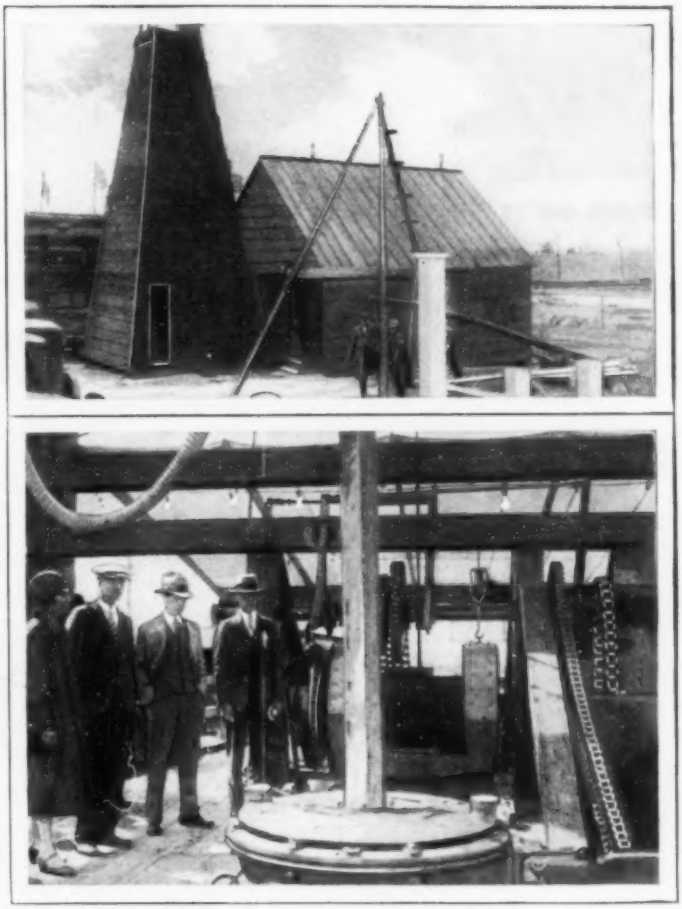
Lloyd's "Chamber of Horrors," Where the Radio and Cable Reports of Accidents and Losses at Sea Are Posted Each Day for the Underwriters to Inspect

er coming. Afterward appeared that, at this eriod, she was about 300 miles from us, and no other vessel of the same lass was ever seen about he Cape of Good Hope." Was this a case of a ma- ine mirage or refraction phenomenon?

Lighthouses have given rise to many of the unsolved mysteries of the sea. Out in the Atlantic, nineteen miles from the island of Lewis, in the outer Hebrides of western Scotland, stands a lonely lighthouse, called the "Seven Hunters." The light stands on cliffs of gneiss, 150 feet above the sea. Of its staff of keepers, one man is always on leave. Not long ago, the relief ship was twenty days overdue, owing to fierce December storms, and as it approached the island, it signaled the lighthouse, but got no answer. So the relief man landed with letters and provisions. He stepped onto a landing stage cut out of live rock. A crane and rope derrick hung over the top. No preparations had been made to meet the relief ship, and the wondering lightkeeper ran up the stairway to the entrance of the lighthouse. Nobody answered his hails, and when he went inside, he found the place empty, the clock stopped, and no fire lit, although the day was cold. There was no trace of the missing men. Then, some time later, a queer thing happened. It was noticed that, in calm weather, the sea would suddenly upheave and rise to a great height above the rock base of the lighthouse to the landing stage. If men were standing on the platform, they would be sucked back by the retreating waters down into the sea beyond the possibility of rescue. This was probably the fate of the missing lightkeepers.



Oil-Well Drilling Development at a Glance; Upper Photo Shows Old-Fashioned Hand-and-Foot Rig; Lower, a Modern Outfit

GROWTH IN OIL-WELL DRILLING SHOWN IN CHANGING RIGS

Combined hand and foot power was used in drilling some of the first oil wells in America, as an exhibition of old equipment at a recent gathering in Tulsa, Okla., showed. In contrast to this old-fashioned outfit was shown one of the latest rotary drilling rigs, operated by powerful machinery and capable of penetrating, with comparative ease, hard strata of rock and other materials.

¶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, to anyone addressing our Bureau of Information.

Surfboard Polo Is Introduced as a New Form of Water-Sport Thriller; Two Players Find Enough to Do in Keeping the Ball within Striking Distance, and the Pilot of the Towing Craft Must Watch the Movements of the Sphere; a Stroke Missed Usually Means a Long Detour to Pick Up the Ball Again

POLO PLAYED ON SURFBOARDS TESTS RIDERS' SKILL

Additional thrills are furnished from surfboard riding in a form of polo game played with a large inflated ball and long clubs. As the boards are towed along, the riders endeavor to keep the ball in motion with the clubs and strike it back and forth. The task calls for unusual skill in balancing as the strikes are made.

STEAM BOILER TO CLEAN PIPE LATEST SMOKERS' AID

For a quick and thorough cleansing of the tobacco pipe, a metal boiler with a nozzle that fits into the stem, has been devised. The bowl of the boiler is partly filled with water, a cap screwed on and the nozzle introduced into the pipe stem. The boiler is held over a gas jet or other flame until the water boils, forcing steam through the pipe. Considerable pressure is developed, sufficient to blow out all accumulations of sediment. There is practically no risk in handling the cleaner as the bowl is made of metal, consequently eliminating the danger of breakage.

AUTOMATIC GUN REPLACES BELL AS BURGLAR ALARM

Bank bandits ordering the cashier to "stick 'em up," are bound to meet a surprise in a machine-gun alarm recently devised as a substitute for the ordinary bell or buzzer signals. It is fired from the cashier's cage by electrical contact through pressing a button down and sideways. This is done by the person behind the bars and can be accomplished without attracting the attention of the bandits, while the side motion necessary makes it unlikely that the signal will be fired by mistake. The gun is intended to be placed over the entrance, or in a similar location, so that the marauders will have to turn around.

It shoots only blanks and is aimed through a metal tube outdoors, the object being mainly to frighten the intruders and distract them momentarily. Two shots are first fired in rapid succession, then, after a pause, four more come at short intervals. The reports are heard loudly in the bank as well as on the outside and serve as a compelling alarm both to drive the bandits out and to summon assistance for the persons in the bank. Tests have been made to insure that the installation cannot easily be thrown out of order or the gun fired accidentally by vibrations or rough handling.

TALKING-MACHINE RECORDS WILL NOT BREAK

Phonograph records that are said to be practically indestructible have been introduced recently. Dropping or striking them does little damage, and the playing surface is not easily scratched, according to reports. They are sewed into special containers for mailing and can be shipped with little likelihood of breakage.

Sewing the Unbreakable Records into Their Containers for Mailing; Little Extra Wrapping Is Needed

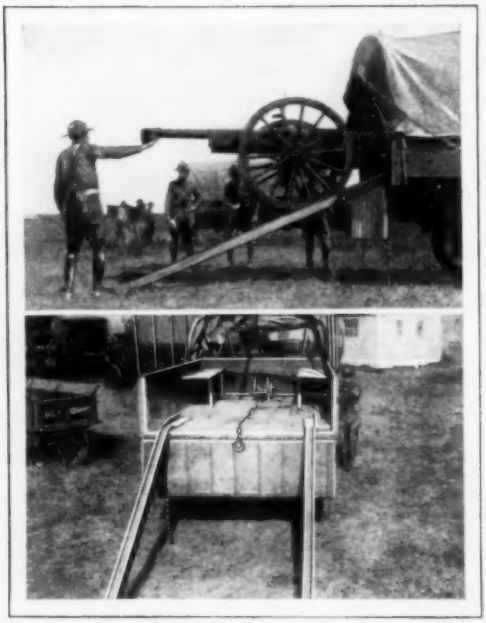
One End of the Lofty Steel Bridge Recently Built in Japan; It Is 450 Feet Long and Spans a Gorge 500 Feet Deep

WINGS OF GIANT BRIDGE MEET FIVE HUNDRED FEET IN AIR

Spanning a gorge 500 feet deep, a steel railroad bridge recently built in Japan called for the greatest accuracy in figuring and construction. It was started from each side of the canyon and met in the center. So exactly had the bridge been planned, that the last units fitted perfectly. Engineers reported that a piece of paper could not have been inserted between the final steel members. The bridge span has a length of 450 feet.

¶The potato is said to have originally come from South America.

WINCH TO LOAD GUNS SAVES SOLDIERS' TIME AND WORK



Gun on the Ramp and View inside Auto Truck, Showing the Arrangement of the Loading Winch

One man can load an artillery piece weighing 2,700 pounds on an army motor truck in about a minute and unload it in a few seconds with a special winch recently developed. The guns are rolled up on two beam ramps with a cable which winds about a drum as the crank of the winch is turned.

PICTURE RECORD OF U. S. WARS TO AID HISTORIANS

A collection of photographs, showing scenes from all the wars in which the United States has been engaged since 1860, has been placed on file in the war college. It comprises between 275,000 and 300,000 prints and includes important records of the Civil, Indian, Spanish-American and World wars. One of the most interesting of the entire collection is of the battlefield of Wounded Knee, scene of Custer's last stand, taken immediately after the battle. The Brady collection of the Civil-war period, numbering about 6,000 photographs, is also filed. The World-war section includes all pictures made by the signal corps, the army, the only British collection of World-war pictures in this country and an Austrian section. Negotiations have been completed with the German government for approximately 1,200 pictures.

RADIO RECORDS EARTHQUAKES WITH GREATER ACCURACY

Earth tremors can now be studied with a degree of refinement hitherto impossible with an electric apparatus developed in Japan. It makes use of the ordinary radio vacuum tube and consists chiefly of a pendulum, held about ten degrees out of vertical by a prop against a thin metal diaphragm which serves as one element of an electrical condenser. The second element is placed so that any variation of the pressure of the prop will vary the distance between the elements and so vary the capacity of the condenser. This variation is registered by means of a galvanometer, enabling a reading of the earth movement.

GOLF-BALL HOLDER FITS IN BAG TO SAVE ROOM AND TROUBLE

Bother of loose golf balls with the likelihood of loss and theft is avoided in a holder that slips into the bag, keeps a dozen balls in plain sight for quick selection and also has a nickelplated container at the top for tees or cigarets. The spheres are securely held in spring-steel wire clips and the "rack" is well suited for practice, when the player does not want to carry a bag.

Golf-Ball Rack Filled and Ready to Be Slipped into the Bag; It Helps Prevent Loss

GIANT LIGHT USES SKYSCRAPERS AS BILLBOARDS

Throwing an Electric Sign on the Side of Another Building with the New Searchlight Sign "Gun," and, Below, the Projector Itself, the Man beside It Showing Its Enormous Size in Proportion

A sky-writing sign of four billion candlepower, the invention of Grindell Matthews, the English scientist whose "death ray" claims startled the world several years ago, was tried out recently in New York and sprayed signs in letters 150 feet high over the walls of the uptown skyscrapers. Mounted atop a movie theater to advertise its eighth anniversary, the big sign found all the neighboring buildings for a mile around too small to hold many of its giant letters, so it had to be shifted back and forth to paint successive words on the building sides. The framework of the sky-writing gun, which was designed to project advertising onto clouds, resembled a big reflecting telescope.

STAINLESS SHOES IN COLORS

Shoes in a wide variety of colors that will not stain were introduced recently in London. According to reports, soot and other marks were easily wiped off with a damp cloth.

Thrilling Dog

"Mountie," One of the Famous Leaders in the Great Quebec International Dog Derby, an Annual Event

By EARLE W. GAGE

"MUSH—you! Mush on, Malamutes!" pleads the driver of the leading team as the racers approach the finish line. The snap of his long leather whip sounds like a rifle shot on the frosty air. Running beside his team of faithful dogs, he urges and commands them to give every ounce they possess to the race. In the next two minutes he will fight it out with a world-champion dog driver, and the next hundred feet decide the winner of the classic 200-mile race. As his lead dog breaks the tape the fractional part of a second ahead of the other team, a mighty roar is heard as 2,000 thrilled spectators give vent to pent-up emotions.

For the greatest races of the year are not run in million-dollar stadiums close to civilization, but in the heart of the northland, over wild and trackless snow trails.

The finish of this stirring spectacle is worth going many miles to see. Over the crest of a hill comes the first of the teams, the driver at the head of his dogs, no longer the gay and even-tempered fellow he was thirty hours ago when he crossed the starting line, but a tired and fretted man. Less than a minute behind runs the second driver, laboring with his last reserve beside his dogs, in an endeavor to cross the finish line first. Twenty-five seconds behind rides a fifty-year-old Alaskan musher, pushing with one foot behind the freshest-looking team on the course, little Siberian dogs traveling better than ten miles an hour.

These famous dog derbies of the northland are more than a race. They are a real test for real dogs. The light, fleet-footed team cannot win it in a canter. The men who draw up the articles of the race design them to encourage the development of the type of dog that has meant so

Races of the North

Courtesy Lomen Bros.

Scotty Allen, One of the Greatest Dog Racers of All Time, with His Team Coupled in Tandem on the Alaskan Sweepstakes Race Course, Dogdom's Kentucky Derby

much to the pioneers of the north and, so, stamina, courage, speed, strength and ability are qualities that must be possessed by the team which hopes to go the distance in the shortest time.

The first dog derby of international importance occurred at Nome, Alaska, twenty years ago, when "Lawyer" Albert Fink, a shrewd dog lover, raised $10,000 to be awarded winners. The distance was 408 miles, from Nome to Candle Creek and back, and every citizen for miles around was at the finish line to cheer the winners. The derby was won by John Hegness, driving Fink's team, in 119 hours, fifteen minutes, and proved such a popular success that the All-Alaskan sweepstakes became a regular feature until 1916, when the Hudson Bay dog derby, over a 200-mile snowy trail, from Flin-Flon, mushroom mining town, to The Pas, Manitoba, came into the limelight.

Although Scotty Allen, known as the "Dean of Dogdom," is the only man who ran in more than four All-Alaskan sweepstakes, it was "Iron Man" John Johnson who made the fastest record in the history of these epic races, turning the 408 miles in seventy-four hours, fourteen minutes. Walter Goyne holds the palm for the 100-mile The Pas race, with thirteen hours, fourteen minutes, and "Shorty" Russek the best time in the 200-mile race, twenty-three hours, fifty-two minutes.

Half a dozen famous races are run during the winter in snowland. At Prince Albert, Sask., where civilization is still close to the skirts of the unknown and unexplored northland, the dog holds the place of honor that the thoroughbred horse holds in cities where the woodland is considered a playground. The huge track is so arranged that spectators can follow the progress of the dogs for almost every foot of the 160-mile race, which is run in four heats of forty miles each, there being two laps to each heat on the twenty-mile oval track, the largest in the world designed for dog derbies.

At Ashton, Idaho, and Wolfeboro, N. H., are held two of the principal races run each winter in the United States. The winner at the latter classic last February was Leonard Seppala, hero of the Nome serum epic, who made the run of 113½ miles in eleven hours, fifty-seven minutes, forty-five seconds.

The third week in February the Inter-

Scotty Allen, the Dean of Northern Dogmen and Hero of Many of the Famous Snow Derbies of Alaska

national dog derby is held at historic Quebec city, and this 120-mile race was won last year by Emile St. Goddard, youthful driver of The Pas, who came in first in every lap of the three days' race. His time for the race was eleven hours, thirty-seven minutes, thirty-five seconds. He flashed down the Grande Allee to the finish line through more than a mile of cheering dog fans, beating all previous records in the race by fifty-four minutes, thirty-five seconds. Not only this, but he had the satisfaction of defeating Seppala by twenty minutes, twenty seconds, and passing a dozen other opponents in the race.

These dog derbies are run for prizes of from $1,000 to $2,500, besides coveted silver cups. In reality the drivers compete for the reputation of owning a string of dogs superior to those of any other section. There are from a dozen to a score of entrants covering the entire snowy course, the drivers being famous mushers of the north, powerful men of rare endurance and with the blindest faith in their teams.

Though much depends upon the teamster in the race, who will mush the 200, 160 or 120 miles behind the sleigh, the determining factor in achievement is the quality and power of the dog team. The husky dog is a hardy, sagacious animal of wonderful endurance, inured through generations to the climate of the north and the ardors of the snowy trail. He is a tremendous worker, all-enduring, and some-

Emile St. Goddard, the Frenchman Who Set the Record Time of Eleven Hours, Twenty-Seven Minutes and Fifteen and a Half Seconds for the 120-Mile Classic at The Pas, Man.

times partly of timber-wolf blood. In the matter of pedigree he usually is "too many kinds of dog" to stand much investigation of his family tree. His veins may carry the blood of the mastiff, German police dog, Great Dane, wolfhound, setter, spaniel or collie, or even a little of them all, while wolf blood imparts hardiness and a dash of speed. Although there have been varied methods of harnessing the dogs to the sleigh, Walter Goyne and Scotty Allen revolutionized dog racing with the introduction of the "gang" hitch, now considered standard for racing, which is a kitelike affair: One long trace from the nose of the sled to the leader, who is hitched alone, the other dogs being hitched in pairs to right and left of the central trace. This hitch insures versatility and least cross motion, which hampers smoothness and speed. Anywhere from five to fifteen dogs are used in a team, according to the rules, but five to seven now is standard.

Musher Guiding His Sledge over a Snowy Trail in the "Christmas Tree Lands" of the North

A good lead dog is worth several hundred dollars. Patience and care are required in training the sled dogs. The driving is done by the voice, thanks to the animals' strange divination, that elusive quality defined as instinct.

STOP VIBRATION OF BUILDINGS WITH "MATS"

Slots running the length of some of the buildings in New York city, at a point where the sidewalks meet the structures, call attention to an interesting engineering feat to prevent vibrations, caused by the subway trains, from being communicated throughout the structure. The steel uprights, which carry the railroad tracks and the streets above them, have been isolated from the building, and a free space of four inches horizontally and two inches vertically provided. In places where the railroad foundations and those of the buildings rest on the same bedrock, vibrations were kept from passing from one unit to the other through the rock by means of specially designed mats, consisting of pan-shaped sheets of lead, imbedded in concrete on the rock foundation. Above this was a layer of asbestos, another of sheet iron, still another sheet of asbestos and, finally, one more covering of lead. This mat effectively kept sound vibrations from reaching steel in the buildings.

Material Enough for a Dozen Ordinary Chairs Was Required for This Huge Wicker One, Used as Advertising Display on Water Tank

WICKER CHAIR TEN FEET HIGH ADVERTISES FACTORY

One of the largest chairs ever manufactured, has been constructed by a California factory as an advertising display on its water tank. It is made of wicker with leather upholstery, is nearly ten feet high and could seat several adult persons at one time. Enough material for a dozen ordinary chairs was used for the huge unit, which would comfortably accommodate a person about twenty feet tall.

TRACES OF VANISHED FORESTS DUG UP IN OREGON

Traces of trees of a species unknown today, but which probably grew in Oregon many thousands of years ago, have been found between strata of lava along the Deschutes river. The discovery further strengthens the belief of geologists that great forests flourished in primeval Oregon only to be obliterated by floods of molten rock which poured from huge fissures in the ground and covered large areas before cooling. In one locality, the explorers found as many as thirty different strata, each representing a separate flow of lava.

LIQUID WAX FINISH REVIVAL OF OLD ART

Centuries ago, the Egyptians produced mural paintings and other decorations in wax which has kept its colors almost as fresh as the day it was applied. This process is now duplicated, in some respects, in a method for treating walls to give them durable, washable finishes in a wide variety of colors and designs. A liquid wax is put on after a coat of sizing. This gives the wall a glaze which may be polished, after thorough drying, and lends itself to the application of colors. A gallon of the wax will cover 700 square feet and there is no danger of brush or lap marks. It may be easily removed without injury to the rest of the walls.

LABEL MOISTENER OF RUBBER CANNOT BE BROKEN

To moisten labels or envelope tabs, a rubber holder for water has been introduced in England. It is simply a tube corked at one end and with a bit of felt at the other to absorb the water. Pressure wets the felt if it becomes too dry.

Moistener with Filler Cork Removed, and Showing the Felt Stopper That Absorbs Water

TESTER FINDS TRACK DEFECTS FOR RAILROAD SAFETY

Ten pens write an accurate record of the condition of the track and roadbed of the Santa Fe railroad as an inspection car whirls along. Since the report is registered under actual train stresses, it reveals situations that might escape detection when the rails are not in use, saves time and expense and enables the section foremen to locate the weak spots exactly for immediate and thorough repairs. If the track is too high or too low on one side, a pen makes note of the fact, due to the departure of the testing car from perfect balance achieved by a special gyroscope. If the rails are not exactly the right distance apart, other pens designate this on the moving strip of paper, and still others show if there are faulty conditions with respect to the rail joints. The outfit has been satisfactorily employed over more than 100,000 miles of track. One of the interesting discoveries it revealed was that, in some instances, tracks in front of the foremen's homes had been neglected because the workers did not wish to be accused of "loafing" close to the dwellings of their task masters.

WOODEN PRONGS INSIDE VIOLIN TO IMPROVE TONE

Greater resonance and better tone in a violin are said to be effected by installing a set of wooden prongs an eastern craftsman has introduced. They are fastened to the end pin block of the instrument and are of spruce, carefully tuned to vibrate properly with the strings. The invention is intended especially for strengthening the tone of weak violins and for obtaining greater resonance and carrying power. Each set of prongs is adjusted and installed to suit the particular instrument, which is subjected to thorough tests before the addition is made.

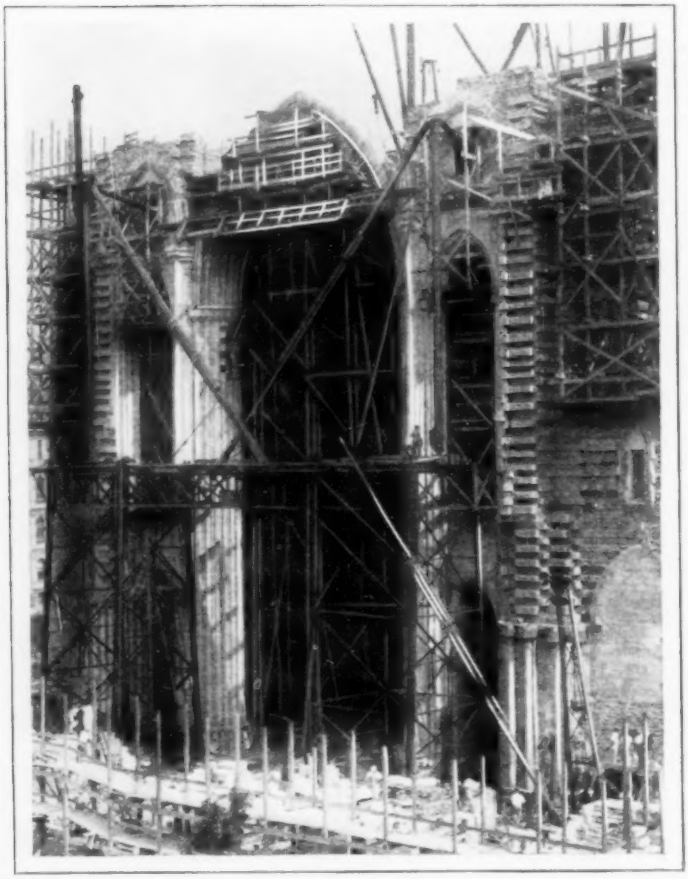
Part of the Outfit for Making Hollow Steel Axles and Other Units in Faster Time

HOLLOW AXLES QUICKLY MADE FROM STEEL BILLETS

Hollow or solid railway axles can be turned out in ten to fifteen seconds on a machine devised by a Californian, reports from Los Angeles state, whereas nearly half an hour is required to make an axle by the usual methods. Hollow steel shafting of irregular shapes and sizes, couplings for all sizes of pipe and many other products are obtainable from the outfit, which is said to have won the approval of steel men who have inspected it.

PEN AND PENCIL IN KNIFE GRIP SAVE POCKET SPACE

Contained in the handle of a small knife, lately introduced in Paris, is a fountain pen and variety of pencil that has a constantly sharp point. The blade is suited to wide usage and both writing units fit snugly within the handle when the knife is in the pocket, thus being always easily accessible, saving room and protecting the fabric.



Typical Arch Construction on Cathedral of St. John the Divine, in New York City, to Be One of the Largest Churches in the World

SETTING ARCHES OF CATHEDRAL TESTS ENGINEERS' SKILL

One of the exacting tasks in connection with the building of the Cathedral of St. John the Divine in New York city, was the erection of the seven huge transverse arches of the nave. With the aid of special derricks and tackle, the big units were swung into place and set with practically no deviation from the prescribed measurements.

CHEMICALS TO STAIN CONCRETE PRODUCE LASTING EFFECTS

By means of a chemical staining process, lately developed, concrete floors, walls and other surfaces of this material are given durable and pleasing color tones and finishes of a variety of shade and character. It penetrates deeply, helps give the cement a more durable and weatherproof surface and, by reacting on the lime in the concrete, gives the color a permanent foundation. Tests have shown that cement, treated in this way, only becomes slightly gray on the places exposed to extremely heavy duty, and such changes of color are always harmonious with the rest of the surface. Where other factors permit such a plan, the walls of a residence, for instance, may be made only of concrete, omitting the lath and plaster, and then stained with the chemicals in such a way as to closely resemble an ordinary wall.

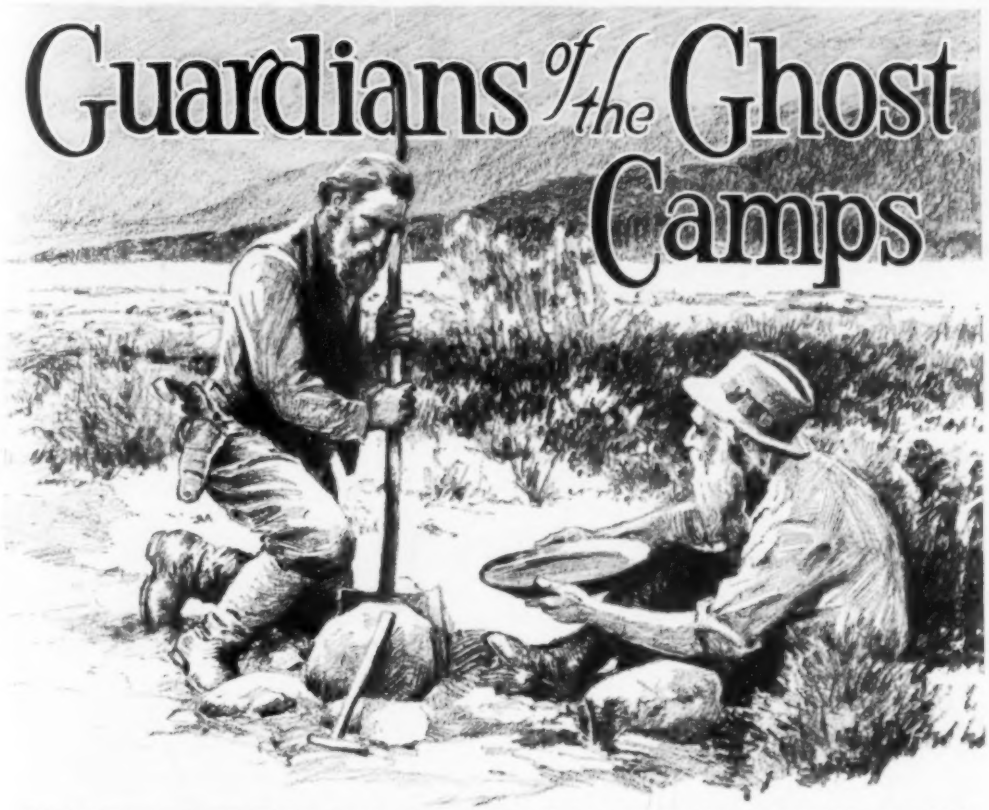
CYCLE AMBULANCE TO AID FIRE VICTIMS

For emergency service, a Berlin fire department has equipped a special motorcycle and sidecar as an ambulance. It is useful in making quick trips where the traffic is heavy, is cheaper to operate than an automobile and is especially serviceable in work among fire engines and hose lines.

© Henry Miller

Motorcycle Sidecar Ambulance for Emergency Service in the Berlin Fire Department

Guardians of the Ghost Camps



Grizzled Desert Rats Still Plod the Burning Sands of Death Valley, the Panamint and Funeral Ranges behind Patient Burros, to Chip Rock and Pan Sand in Search of Gold

By KATHLEEN CAESAR

GOLD panning, the oldest and most primitive form of mining, is still carried on in the west. Nearly every "ghost camp" of romance still has its old-timers who are "scratching around" as in early days and finding wages in gravel that no longer attracts the adventure seeker who wants to make his fortune in a hurry.

These men are the one connecting link between the old and the new in mining. Generally they are veterans of the early gold rushes. Talk with them and you will get thrilling tales of the times when millions were being scooped out at the grass roots. Theirs is the saga of buckskin sacks filled with nuggets, of wide-open towns and of gulches that swarmed with men who were busy with the pick and pan and rocker and sluice.

Without exception, these man are confident that the old camps are going to "come back"—that new deposits of placer gold will be found, or that the surface riches will be outdone by lode discoveries of permanent value. No doubt this is the real lure which keeps them in the camps that were long ago deserted by the great hordes of gold seekers. Meantime they pan out enough golden residue to keep them going. Their wants are few—a little cabin in the hills, sufficient bacon and flour for a bachelor's needs, and tobacco enough to help a man dream of the gold that may show up in tomorrow's panning.

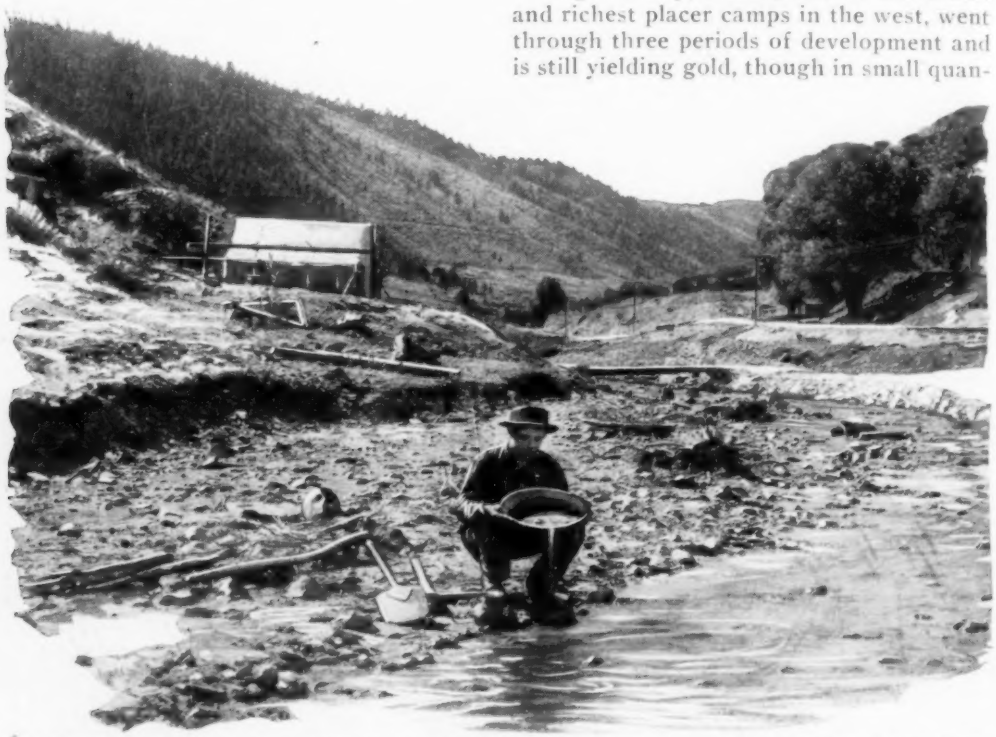
Drop in on one of these old-timers and you will think you are back in the days of Bret Harte. You will be allowed to pan for yourself. You will see the shovelful of dirt scooped out at bedrock and will be taught the trick of "sloshing" the water around the pan until the sand and lighter gravel disappear over the rim. Then you will get the thrill of seeing the yellow specks in the bottom of the pan.

By the time you have finished a single panning, your back aches. You have been twenty minutes or more in getting a few flakes of gold. The miner picks them up carefully on his finger tip and puts them in the palm of your hand. You have earned ten or perhaps fifteen cents, is the verdict. Not much of a pan, but may be the next one will be better. There is the catch in it—the next one. The pan is wiped out carefully and put in the sun to dry for a few minutes. Then the pay dirt is thrown in and the operation is begun all over again. The miner does it this time, and he works with surprising deftness. The panful of dirt dwindles steadily, the gold, being heavier than the surrounding contents, sinking to the bottom.

Many deep-mining camps of today were placer "diggings" in the beginning. This is particularly true in California. In Colorado the first great discoveries were made by panners on the Platte, near the present site of Denver. Then two intrepid prospectors, Jackson and Gregory, made richer discoveries in the mountains, a few miles west of the first diggings. These rich placer discoveries were on top of enormous ledges of gold-bearing ore. Both Idaho Springs and Central City, the scenes of the Jackson and Gregory discoveries, have been deep-mining camps for years and yielded millions when ways and means of smelting the ores were found. But, though the great rush of placer miners subsided years ago, "color" can still be taken out of some of the creeks adjacent to these old camps. Only recently it was announced that a miner had been making good wages out of a creek near Denver which was supposed to have been exhausted of its riches years ago.

Leadville, at first known as California Gulch, was a placer discovery. When its surface riches no longer yielded plentiful returns, the few hopeful miners who were left there began digging deeper and found the rich ore on which Leadville was built. The same kind of faith animates the "ghost camp" guardians today. Every one of them is confident that he has another Leadville at his feet.

Virginia City, Mont., one of the oldest and richest placer camps in the west, went through three periods of development and is still yielding gold, though in small quan-



A Tent Camp for the Summer, Pick, Shovel and Pan Form All the Equipment Needed to Work the Placer Sands at Idaho Springs; Auto Road Near By Offers the Only Company

A Veteran of Virginia City's Palmiest Placer Days Still Twirls His Gold Pan beside the Creek, to Extract Day Wages and an Occasional Overlooked Nugget

tities, to a faithful few who will not believe that the sands which have made many millionaires are "through." The first miners who flocked to the camp, on its discovery in 1863, took out millions with gold pan, rocker and sluice. Then, after the camp began to slump and most of the miners had left, there came a horde of Chinese, working over the old diggings. In turn the Chinese disappeared, and then came the gold dredge, making what appeared to be the final "clean-up."

Virginia City was located under most romantic circumstances. It was discovered by Bill Fairweather, who, with a party of fellow prospectors, had been driven out of the Crow Indian country, farther east. The Indians did not encourage prospecting. On their way back to the camp of Bannack, from which they had started, Fairweather and his companions camped in a gulch near the Tobacco Root mountains, about eighty miles northwest of the present west entrance to Yellowstone national park. Fairweather, with the true prospector's instinct, panned some gravel—with astonishingly rich results.

The prospectors went back to Bannack, after having sworn to keep their discovery secret. But the news leaked out and, when they started back to the scene of

Compare This with the Patient Panner Above; the Hydraulic Gun of the Placer Diggings Washes Whole Hillsides into the Sluice Boxes under the Force of Tremendous Pressure

their discovery, they were followed by almost the entire population of Bannack. A meeting was held, and Fairweather and his companions agreed to let the others in on the bonanza if the discoverers were given the choice of locations. This was agreed to, and soon Alder Gulch, as it was called, swarmed with miners. Virginia City was the metropolis, and was the scene of wild life outdoing the violence of the California mining camps. For months there was no law. Among the 30,000 gold seekers who flocked to the new diggings there were many outlaws. The only medium of exchange was gold dust. More than $10,000,000 in dust was washed out of the sands in the first three months of the camp's existence.

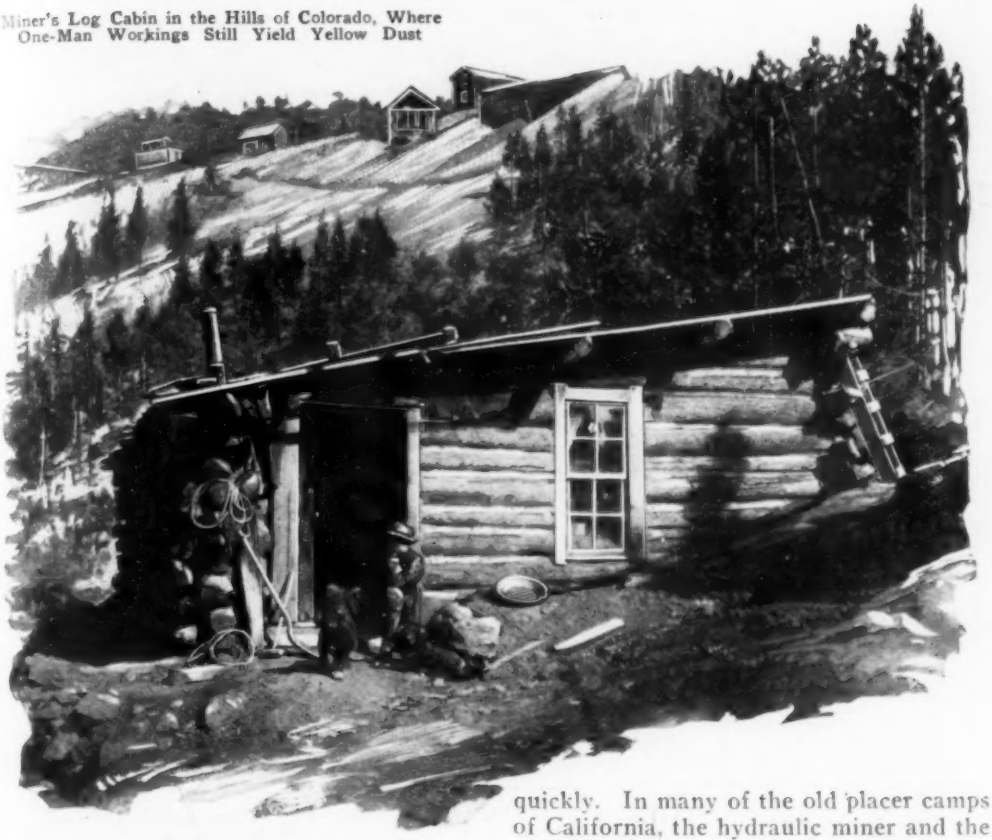
Then came the bandits, or "road agents," as they were called. Miners who had "made their pile" and had started back for the "States," were robbed and murdered. More than 200 of these returning miners were known to have fallen victims to bandits. The road agents were organized under the direction of Henry Plummer, a California gambler and outlaw, who had been elected sheriff of both Bannack and Virginia City. The miners' courts, which were held in the open, offered no relief. The entire camp was helpless under the domination of Plummer's strong, oath-bound organization.

Then the Montana "vigilantes" were secretly organized. Raids were made on the "Robbers' Roost" and other headquarters of the road agents. Confessions were obtained which implicated Plummer and all the other "officers" of the road-agent gang. A score of them were hanged, one of the first being Plummer.

Today Virginia City numbers about 350 residents. For miles there are great piles of gravel—melancholy reminders of the visitation of the gold dredges. If you wander along the gulch, you may see an occasional miner panning in the little creek which at one time literally had a golden bed. If he is fortunate enough to find a rich deposit that has been overlooked, he may make an easy "stake," but such chances are slim. About the best

Working the Last Remaining Sluice at Virginia City, in a Gulch That Yielded Millions a Few Years Ago

Miner's Log Cabin in the Hills of Colorado, Where One-Man Workings Still Yield Yellow Dust



he can hope for is "wages." Yet there is always the element of chance—the gamble that keeps men striving against odds.

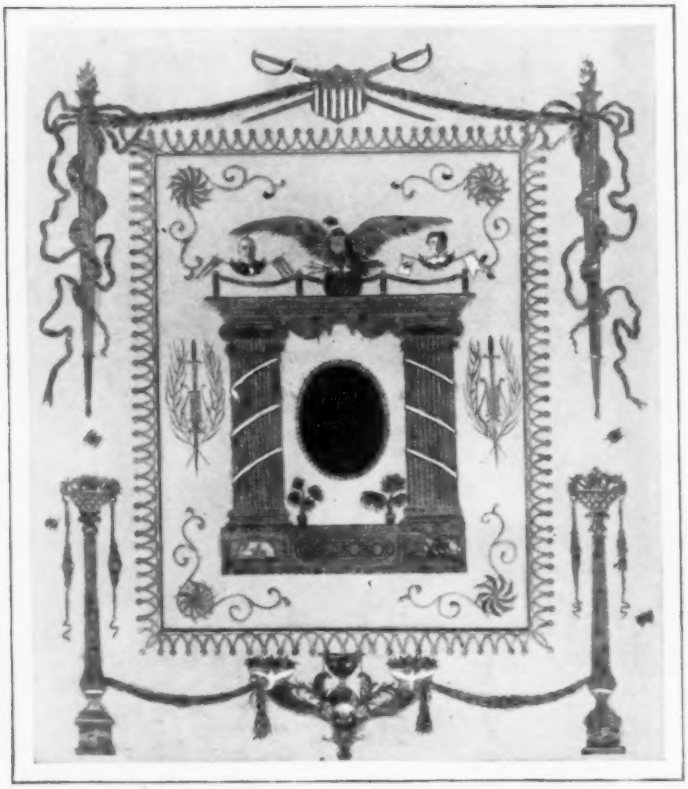
If a miner finds something in an old camp which has been overlooked, he may put in a sluice and conduct his operations on a more extensive scale. The sluice is a long, roughly constructed trough, in the bottom of which are cleats, or "riffles." Dirt from bedrock is thrown into the sluice, and, as it is carried down by the water, the gold is deposited in the riffles. Recovery is made by quicksilver.

Optimism is the main motivating instinct behind all these men who give a flesh-and-blood semblance of reality to the old "ghost camps" of the west. Idaho has numerous camps which have come and gone, but you will be almost certain to find in each one at least one cabin inhabited by a miner who will tell you of the glories that he thinks are certain to return.

The same is true of many of the gold camps of Nevada, which rose and fell quickly. In many of the old placer camps of California, the hydraulic miner and the gold dredger have driven out the gold panners. But, in spite of this constant moving on to make room for up-to-date successors, the gold-pan miner has managed to survive—one of the few living reminders of the early gold rushes.

POCKET BATTERY-TESTING UNIT SAVES TIME AND TROUBLE

Carried in the coat pocket, a storage-battery tester, somewhat resembling a tire gauge, quickly indicates the condition of the battery on a tabulated extension. It is operated simply by placing the two points on the battery terminals.



Brightly Colored Bits of Thousands of Postage Stamps Were Cut and Mounted to Form This Picture Frame

PATTERN IN POSTAGE STAMPS DECORATES PICTURE

Postage stamps of many colors and designs have been used by a Pennsylvania man in fashioning an ornate picture-frame pattern. About two years were required to finish it, spare time only being given to the work, and several thousand pieces of stamps were used. Those printed or embossed in fadeless ink were selected, and the original hues of the decoration have been well preserved.

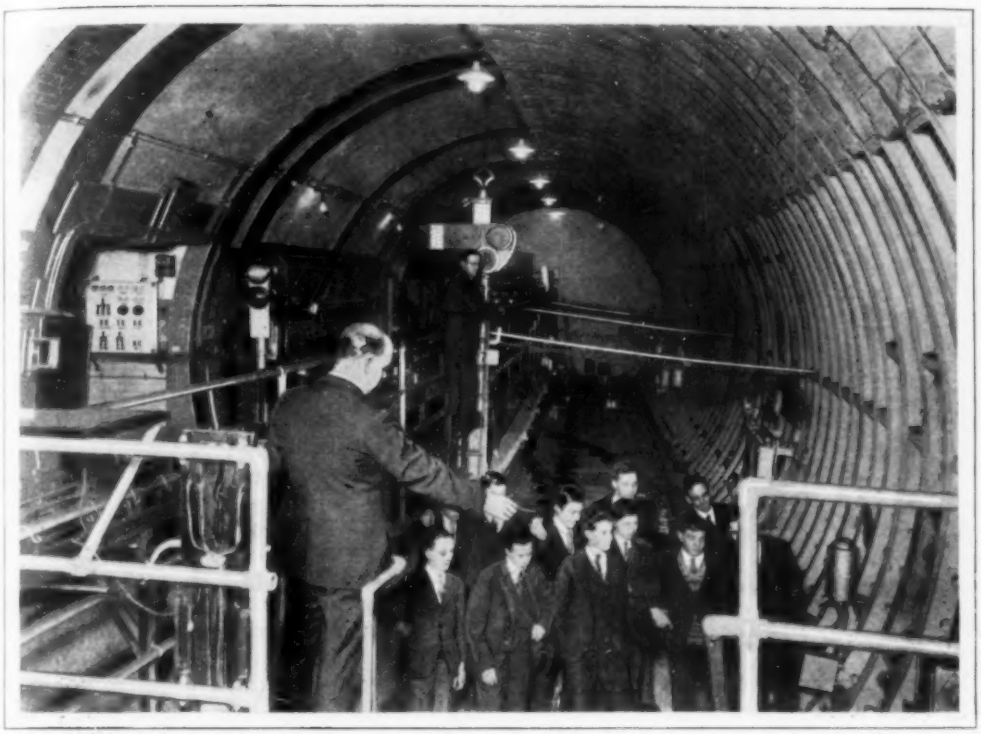
SWARMS OF ARCTIC MOSQUITOES TORMENT EXPLORERS

Arctic regions are popularly supposed to be nearly devoid of plant and animal life, but at least one hardy insect is found in far northern latitudes in great abundance. That is the mosquito, which has seriously hampered many explorers. Recently Lieut. Comm. Donald B. MacMillan added his testimony to that of many others who have ventured into the far north. He wrote from his winter quarters in Labrador: "It is quite warm and pleasant. But the mosquitoes! For the last two nights I have had hardly an hour's rest. I am one mass of bites from head to foot. I put up my bed curtains to keep them out, but they would get in and seemed to make the curtains an excuse for not getting out." Other explorers before MacMillan reported frequent assaults by the pests. Alfred H. Harrison records the case of two dogs that were stung to death by mosquitoes in northern Canada.

BUTTONHOLE VASE KEEPS FLOWER FRESH

Concealed behind the coat lapel, a small vase, partly filled with water, keeps the bouquet from withering. The holder is simply a slender metal tube and is held securely in an upright position to prevent the contents from spilling.

Close View of the Lapel Vase, Showing How It Is Concealed, and Flower in Position



Subway Schoolroom Where Members of the Operating Staff of a London Underground Railroad Receive Training in Various Duties; It Is Equipped with the Apparatus of a Regular Station

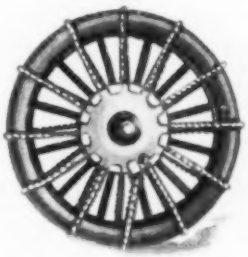
SCHOOL IN SUBWAY STATION TEACHES SAFETY SIGNALS

Trains never arrive at a certain subway station in London, for it is not a station at all, in the ordinary sense of the word, but a school where members of the operating staff are taught the various signals employed and other important details of operation. The room is completely equipped with all the paraphernalia of a regular station so that the students can see just what occurs under running conditions.

SEND COLORED PICTURE BY WIRE ACROSS THE CONTINENT

Successful transmission of a colored picture by wire from New York to San Francisco, is one of the latest developments of the wire-transmission process. The feat was accomplished by using three negatives, a red, a blue and a yellow, each being sent separately and then put together at the receiving end. The entire picture was transmitted in thirty minutes. Another development of sending illustrations by wire was recently tested in handling pictures, reading matter and a map and then assembling all the units into the form of a complete advertisement.

HOLDER FOR AUTO SKID CHAINS LATEST SAFETY UNIT



Simplicity and added safety are claimed for a pressed-steel rack attached to the auto wheel for connecting skid chains. It permits the use of chains of various types and combinations to attain the best result, as many as forty different ways being available with the holder and as many as twelve treads. It is not necessary to jack up the wheel to attach the chains and as the rack is self-centered, the strain is uniformly distributed.

HAND-CRANK ORANGE SQUEEZER SAVES WASTING JUICE

A Turn of the Crank Squeezes the Orange, Protecting the Hand from Juice and Reducing Waste

Practically every drop of juice is said to be extracted from oranges with a hand-cranked squeezer recently introduced. It operates on the same principle as the larger power outfits, protects the hands and saves time.

ELECTRIFIED DUST STORMS OF THE WEST

Dust storms, which charge barbed-wire fences to a high voltage, stall automobiles by interfering with their ignition systems and add new worries to radio listeners by causing even worse static than thunderstorms, are among the curious phenomena that visit sections of the great plains east of the Rockies in dry seasons. In northwestern Kansas, during one of these disturbances, a man became curious about the amount of electricity his aerial was collecting and connected it with the ground wire through a thirty-two-candlepower light. He obtained as brilliant light as when it was connected with his automobile battery. No thunder or lightning occurs during these electrified dust storms, nor is there any known relation between them and earth magnetism. Any metallic object insulated from the earth seems to become highly electrified as the fine dust blows past it. One rancher relates an instance of driving cattle in one of these odd electrical displays and seeing a glowing light at the tips of the horns of each steer. When autos were new to the country, drivers were puzzled to find their engines stalled in these disturbances and nothing apparently wrong with them. Finally, one ingenious man guessed the trouble and tied a chain to the rear axle of his car. The static was promptly dissipated and the car ran properly. For a long time it was believed that "wind friction" was the cause of the electrical display. Probably the first person to attempt a scientific explanation was Prof. W. A. Douglas Rudge, who conducted experiments in South Africa. He removed both ends from a five-gallon can and stretched a fine wire gauze over one end. A considerable portion of the dust blowing into the can was retained and the charge of electricity it carried was given up and carried to an insulated sphere. This was invariably found to be positive. Another conductor took on the negative potential of the air. On some occasions sparks three-fifths of an inch in length were obtained, showing at least 40,000 volts. This indicated quite clearly that the electricity with which metallic objects were charged was carried from the surface of the earth by the minute dust particles.

Unusual View of an Approaching Dust Storm; It Often Produces Interesting Electrical Effects

By EARL CHAPIN MAY

A SUAVE showman, whose white hair framed a broad forehead and whose bright eyes gleamed with the enthusiasm of an impressario, announced in true ringmaster style:

"This, ladies and gentlemen, concludes the performance of Heckler's original flea circus, which must be seen to be believed. Thank you for your kind attention. Please give the doortender fifteen cents as you pass out."

The worldly wise New Yorkers, who had clung to a brass rail around the illuminating exhibition while Prof. William Heckler put his trained fleas through their paces, filed out, each depositing fifteen cents with the guardian of the gate before mingling with the throngs in Forty-second street. It was the only time I'd ever seen an audience in Manhattan's celebrated theater district pay real money after seeing a show.

"Don't your patrons sometimes refuse to pay?" I suggested to the professional gentleman.

"Not when they have beheld the wonders I perform," he declared convincingly. "I give my public its money's worth. You see, I've made a scientific study of fleas, and of humanity, for nearly thirty years. My fleas are all skilled professionals.

"The two facts which are featured at the very top of my printed program are, 'Every action is visible to the naked eye,' and 'No danger of desertion.' The first refers to the brilliantly illuminated white table upon which my stars do their acts. I do use a small magnifying glass to show some of the finer points of my company, but the juggling, boxing, racing, and other things which add to my circus' popularity, are easily discernible by anyone with ordinary eyes. And there are no desertions from my company. Once I have made an actor out of a flea, that actor remains in my service for the rest of its natural life.

"You see this bottle filled with cotton and raw recruits. Well, after they have been with me a little while I take a few of them and put them in a short glass tube. Although there is no apparent superdevelopment of the legs, a healthy flea can jump what would be to us the equivalent of half a mile. It is the nature of a flea to jump. My kindergarten fleas therefore begin to jump as soon as their feet are on something hard and smooth. But after they have jumped and hit their backs and

heads on the glass, they begin to favor a more sedate gait. Walking is good enough for them.

"Then, one by one, each is given its liberty, with reservations. It is turned loose with a tiny collar around its neck and to this collar a tiny gold chain is attached. Each time the liberated flea essays to leap, it finds the chain's weight retarding it. In a day or so, if it is an intelligent flea, it gets tired of jumping and becomes a mere pedestrian. But it wears a collar and is attached to a cart or cannon or something heavy after that. Hence no member can desert my troupe.

"Although a common animal flea must devour some blood about every six hours to keep in condition, a human flea can get along without sustenance for four or five days. But I never put my pupils to the test. I time their feeding largely by the number of performances. Naturally the more energy consumed in entertaining, the more fuel I must feed them to sustain their strength. So, on exhibition tours, I usually feed them once each day."

Suiting the action to the word, Prof. Heckler turned up the cuff of his dinner coat, and with tender solicitude lifted, by its collar and his own small pincers, each member of his troupe gently into his left arm, where they settled down for dinner.

Although he was inspired by that youthful vision of a trained-flea exhibition in Germany many years ago, the dean of flea-circus ringmasters entered the profession accidentally. Fate brought him to Coney island and his mechanical skill led him into the building business. From reconstructing residences he began to manufacture devices carried by traveling carnivals.

In the course of time he went on the road as a carnival concessionaire. One day, in Florida, he found himself possessed of a flea-circus concession among other features designed to gather the dimes while money flowed along the Midway. But the youth engaged to exploit the trained fleas lacked showmanship. Business was not good. So Mr. Heckler took over the exhibit designed to prove that fleas have intelligence.

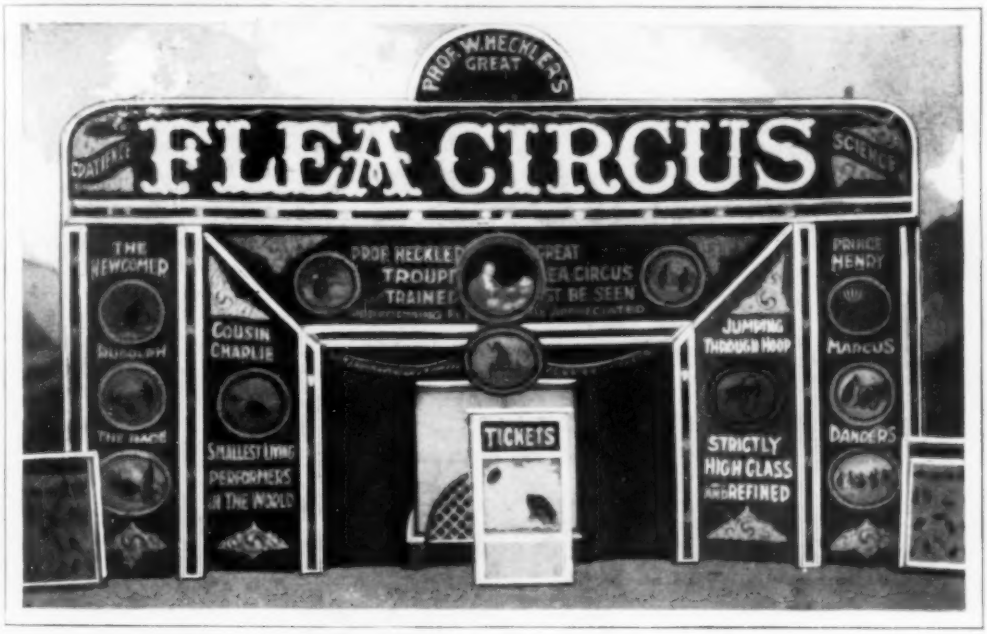
Football Players, Soldiers, Acrobats, Cyclists and "Society People," Greatly Magnified from the Flea Circus' Galaxy of Performers

"I won't say this intelligence is unlimited," he admits, "but I will insist that each flea has a pronounced individuality. I can tell by watching a new candidate whether it will be adept at juggling or do better in a sparring match. Once I have determined on some new flea's professional activities, I concentrate on that flea. Hence you find that 'George Hough,' one of my stellar performers, will, at the word of command, pick up a large pith ball weighing twenty-five times as much as 'George,' and juggle it like a Japanese. It takes three weeks to train a flea and few of them live in harness more than three months.

"I found, two months ago, that 'Rudolph von Hapsburg' was a natural strong man among its kind. So I hitched it to the tiny merry-go-round which, though only two inches in circumference, weighs 5,000 times as much as it. At first I made 'Rudolph' pull that dead weight. Then I got to figuring that it was doing all the work with its two front feet. So I contrived a harness by which the merry-go-round could be pushed around.

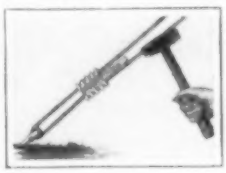
"Is there money in the flea-circus enterprise? There is if you study it scientifically. I took in $250, in dimes, in one day at the Rochester exposition. Almost any Friday at a good county fair is good for $100 in cold cash.

"A man named 'Mueller' put on the first trained-flea circus in America at the old Stone and Austin museum in Boston nearly forty years ago. Another German named 'Auvershleg' had the first traveling flea circus in this country thirty years ago. In addition to fairs and museums, I get as high as $25 for a private exhibition."



CLAMP TO HOLD GUY WIRES SAVES MUCH TIME

Based on a method followed in the logging camps to keep the guy wires of derricks used in handling the big logs from slipping, a wedge clamp has been adapted for similar purposes with electric-line poles. It is much more quickly applied than bolt clamps, and tests have shown that the lowest strain at which it slips is 9,000 pounds. Under ordinary conditions, on a three-eighths-inch strand, it is said to hold as much as two three-bolt clamps, and another advantage claimed is that it can be attached in one-fourth the time.



By Pushing the Bars Back and Forth, Passengers Propel This Boat at Considerable Speed and Receive Beneficial Exercise; There Is a Small Propeller at the Rear

HAND-PROPELLED WATER SLED GIVES HELPFUL EXERCISE

Speed of six to nine miles an hour can be attained in a water sled recently introduced in Paris. It carries two persons and is propelled with a slide bar that is pushed back and forth. This action turns a small propeller at the rear. This double-pontoon hull promotes safety and easy riding.

ALASKAN SEALS ON INCREASE LATEST CENSUS SHOWS

Seals on the Pribilof islands, off Alaska, increased 47,589, or 6.25 per cent, last year over the preceding year, according to a careful government census. The count shows that there were 808,870 seals in the rookeries. Last summer, 263,566 pups were born, but there was an unusual death rate among them. Males for the breeding reserves were given hair bobs and hundreds were tagged with metal markers. During the season, 27,000 seals were killed for the pelt market.

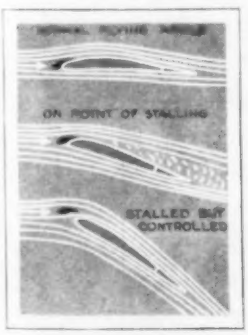
THREE-IN-ONE BANJO PLAYED LIKE A UKULELE

Features of a tenor banjo, a banjo mandolin and the ukulele banjo are combined in a recently introduced instrument which has a metal keyboard to simplify playing, an aluminum bridge in place of the ordinary wooden one and several other distinctive details. It is strung and played like a ukulele and is constructed like a banjo. A metal resonator and an adjustable metal tone chamber and head tightener are special features. The calf-skin head is adjusted with a nut. The instrument is said to be very easy to play and produces a wide variety of pleasing tones.

Different Views of the Combination Banjo with Its Metal Resonator, Aluminum Bridge and Metal Keyboard

AIRPLANE RIGHTS ITSELF WITH SAFETY SLOT

An automatic slotted wing, which, without any assistance on the part of a pilot, keeps a plane in level flight, even when it is moving at less than flying speed, and prevents "stalling," which usually ends in a side slip or tail spin and an accident, has been perfected in England. The slotted wing was developed as far back as 1925, but the control mechanism remained too complicated to permit its general adoption. The new device works of itself. In principle, the so-called wing slot is a short section of movable wing attached on top of the regular wings of the plane, at the front edge and near the wing tips. There it occupies about the same position as the movable ailerons or flaps at the rear of the wing. In normal flight, the flap of the slot lies flat against the top of the wing, with the air currents flowing over it. But when the tail of the plane drops and flying speed is lost, the air currents lift the flaps off the wing, and open the slot beneath them, the effect being to increase the wing surface. Stalling is followed immediately by one side of the plane dropping, and, as the pilot moves his control stick to correct this, a connecting wire closes the slot on one side, killing the extra lift on that wing, while the opposite one, on the wing which has fallen low, remains open and furnishes the necessary extra lift to level the plane. The U. S. army has purchased the American rights to use the device on all war planes.



Courtesy Pennsylvania Railroad

Men Using the Tampers, Close View of the Air-Compressor Outfit and of One of the Tamping Units at the Right

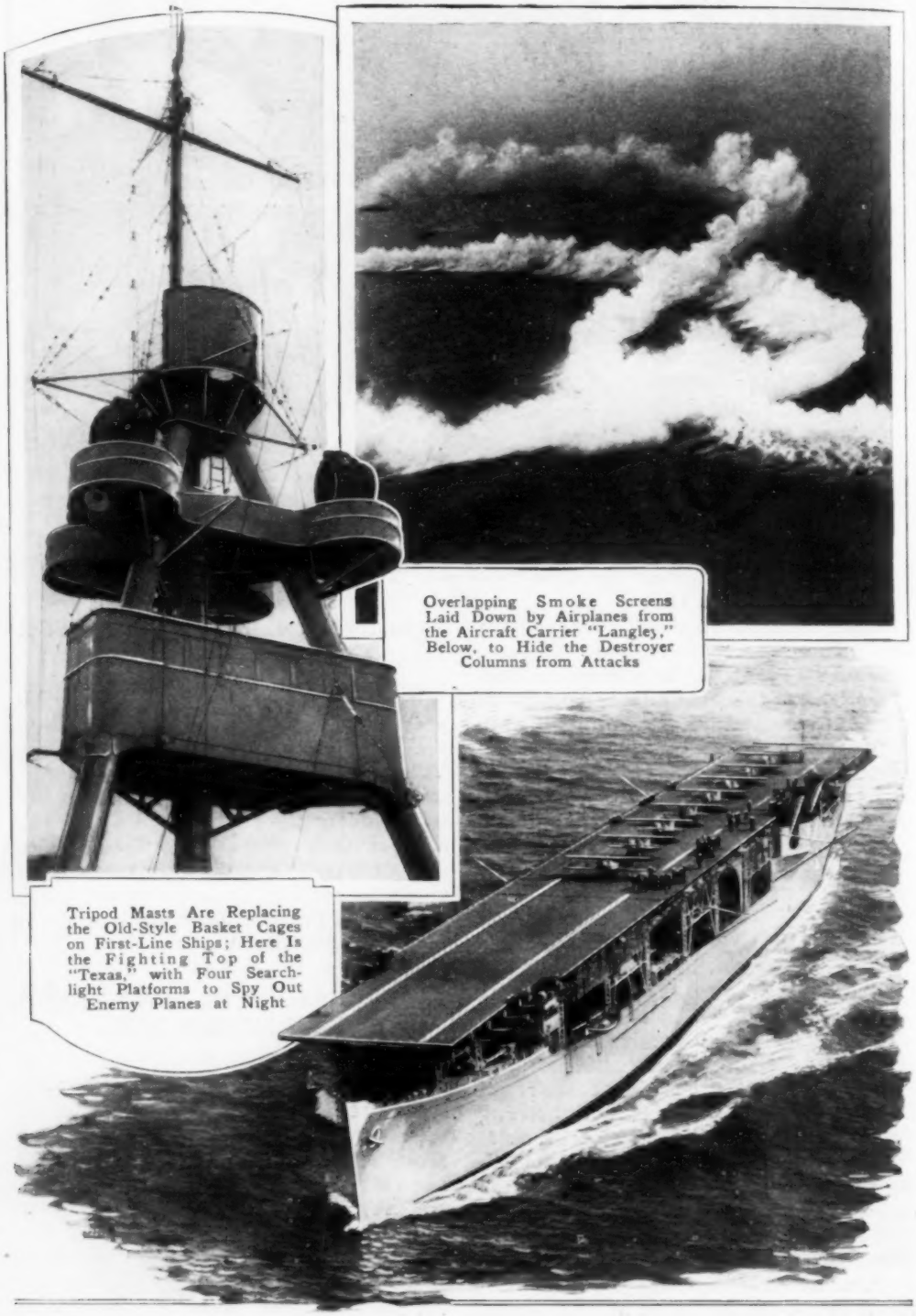
AIR-DRIVEN BALLAST TAMPER AIDS RAILROAD WORK

Patents have been granted on a compressed-air driven tamper to pack down the gravel and cinders used for railroad ballast. It replaces hand work and is said to permit the introduction of the materials under the ties in such a way that a better track results, being more uniform and stronger. The outfit is easily rolled along the sod line by two men and is said to do three times as much work as can be done by hand methods.

TAPE MEASURE IN LEAD PENCIL IS ON SPRING REEL

Always ready for use, a tape measure in the end of a lead pencil shows inches on one side and centimeters on the other. A spring reel facilitates manipulation of the tape.

NAVY TUNES UP FOR AIR OFFENSE AND DEFENSE



Overlapping Smoke Screens Laid Down by Airplanes from the Aircraft Carrier "Langley," Below, to Hide the Destroyer Columns from Attacks

Tripod Masts Are Replacing the Old-Style Basket Cages on First-Line Ships; Here Is the Fighting Top of the "Texas," with Four Searchlight Platforms to Spy Out Enemy Planes at Night

GIANT SEA WALL COSTS THREE MILLION

One of the greatest engineering tasks ever attempted in the south is nearing an end in the completion of the twenty-four-mile reinforced-concrete wall that protects the Old Spanish trail between Biloxi and Pass Christian, Miss. It cost $3,400,000 and has been financed chiefly by funds from a gasoline tax. Among the materials required were 7,000 tons of steel, 185,000 barrels of cement and thirty carloads of drain pipe. The wall guards the paved beach highway that skirts the shore and insures safety for a number of beautiful and historical spots along the trail. Spaces between the barrier and the road have been filled in with material pumped up by dredges and are being converted into park areas.

Al Wilson Climbing to Airplane Wing from Automobile without the Aid of a Ladder; Stunt Also Tested Pilot's Skill

LEAP FROM AUTO TO AIRPLANE DONE WITHOUT LADDER

With airplane and automobile going at about seventy-five miles an hour, Al Wilson, stunt man for the movies, swung from the car to the wing of the plane and climbed safely aboard the ship as it zoomed upward. This feat has been performed a number of times with a rope ladder but never without, the stunt historians declare. Another of Wilson's exhibitions involves roping the landing gear of one airplane while standing on the top of another below it.

ELECTRIC PRESS FOR TROUSERS REDUCES TAILORS' BILLS

Operated by current from a lighting socket, an electric presser for home use is said to give a tight, smooth crease, prolongs the life of the cloth and is simple to operate. The trousers are clamped between the two units of the press, the electricity turned on and, in a few moments, the garments are neatly smoothed. But little current is consumed, the manufacturers assert, and there is practically no danger of scorching the articles.

Creasing His Trousers with Electric Current

¶Names and addresses of manufacturers of articles described in this magazine will be promptly furnished, free, by our Bureau of Information.

Mowing Down Trees with a Tractor; a Cutter Attachment in Front Slices Off the Brush and Small Growth

TRACTOR THAT MOWS TREES HELPS CLEAR LAND

Preparing millions of acres of fertile land, in southern Manitoba, Saskatchewan, Alberta and other sections, for cultivation, can now be done at reduced cost with a tractor that pushes a powerful cutter ahead of it to slice off the small poplar, willow and other trees that grow in great abundance. Clearing this land by hand methods has been slow and laborious, preventing the farmer from enjoying the benefits of one or more seasons' crops. The cutter consists of two four-foot knives sliding diagonally along the ground on either side of the tractor in an "A" frame. The trees fall in windrows for quick burning. After they have been cut, the tractor is hitched to a big breaking plow which pulls up the roots so that they can be collected and burned, or it covers them up so that they will not interfere with later cultivations. The chief advantage of the tractor equipment, the manufacturers point out, is that the land can be made ready for growing crops years earlier than with hand methods.

TEN-MILE ICEBERG IN MAGELLAN STRAITS

Due to severe storms off Cape Horn, a number of large icebergs were driven into the Straits of Magellan, late last fall. Navigators reported as many as thirty during the passage through the 300-mile course of the straits. One was ten miles long and several reached a height of 1,000 feet. The region is 2,500 miles from the south pole and is not uncommonly visited by icebergs, but seldom are there so many and such large ones as were seen last season, sailors declare.

SAFETY VALVE ON BLOWTORCH PREVENTS EXPLOSIONS

Greater Safety Is Claimed for This Blowtorch with Automatic Valve; It Burns Gasoline or Kerosene

Fitted with an automatic safety valve, which is said to eliminate danger of excessive pressure and to prevent explosions, a blowtorch now on the market burns gasoline or kerosene and has adjustments to give the best results from different grades of fuel. A single opening in the tank eliminates unnecessary holes for pump, brackets and filler plug. A pistol-grip handle fits the hand.

Man Made Wings Change World's Face

All Globe Pictures © Rand-McNally Co.

Proving That Tokio Is Northwest Instead of West of New York; the Shortest Air Route Leads over Hudson Bay, the Arctic Ocean and Wrangell Island, off the Siberian Coast

By J. EARLE MILLER

"THE flyers are following the great-circle course," to London, Paris, Rome or Hawaii, as the case may be. That announcement has appeared so often in the newspapers of late, that navigation, once a technical subject for mariners, has become of prime public interest.

What is a great-circle course, and why do they follow it instead of a straight line?

To begin with a great-circle course is a straight line—the shortest distance between two points. But the charts of the flyers' course, say from New York to Paris, show them going northeast from New York, up over New England, Nova Scotia, Newfoundland, and out over the Atlantic, to circle down again over Ireland and England, and thence southeast to Paris. The answer is that the charts, being flat projections of a portion of a globe, necessarily distort a straight line into a curve.

Studying the world as an entire globe, instead of a series of individual maps of different countries, revises many preconceived ideas about geography. For example, if you asked a New Yorker to point his finger in the direction of Japan, he undoubtedly would point west, because the usual route to Japan lies westward across the continent and the Pacific. Actually the direction to Japan from New York is northwest over Ottawa, Canada, the western side of Hudson bay, across the Arctic ocean north of Point Barrow, the northernmost point in Alaska, over Wrangell island, a frozen waste in the Bering sea, and down across Siberia and over the Sea of Okhotsk, far to the northeast of Vladivostock. The rail and steam course to Japan measures 7,800 miles and the direct route about 6,000 miles.

That's the shortest possible route from New York to the capital of Japan, and possibly, some day, it will be plied regularly by giant air liners. The world was stirred a few years ago by a story of unequaled

The Air Route from New York to Singapore Passes Directly over the North Pole; at Right, a Globe Maker Pasting the Gores in Place

privation and death that came out of the Arctic when an Eskimo woman, survivor of a little party left on Wrangell island by Stefansson, the explorer, was rescued to tell of the death of her white companions. Everyone wondered why an explorer wanted to colonize and lay claim to a barren ice island in the far north.

Next, an American party took over the job of holding down Wrangell, and hoisted the American flag. The first word of them to reach the outside was the report of their arrival in Vladivostock, after having been forcibly removed from the island by a Soviet gunboat, which left a Russian party in their place and hoisted the red flag instead of the Stars and Stripes. Why, the world asked, were people fighting for such a useless island? The answer is that it is potentially one of the most useful landing fields in the world, for many of the future air-trade routes will pass over or near Wrangell.

The flight of Amundsen, Ellsworth and Nobile over the north pole in the dirigible "Norge" was a magnificent feat but, at first glance, it had no practical value. The men who made it, however, had studied geography from globes and realized that the north pole would be a landmark on many valuable trade routes of the future.

Mercator's projection of the rounded surface of the globe onto a flat plane, which is the standard used today for most maps, including those from which geography is taught in the schools, is the best all-around map yet devised, but it has resulted in some erroneous ideas about the shape of the continents and their relation to each other. Study a flat map and there appears to be no reason why an airplane leaving New York should go over Newfoundland, for the province appears to be but little farther east than New York city, and far off the course to Europe. But refer to a globe and you will find

Planes Flying from New York to Bombay Will Pass over the Tip of Greenland and Cross Northern Russia on Their Way to India

Newfoundland actually is far to the east of the Atlantic coast of the United States. Stick a pin in the globe at New York city, tie a string to it and then stretch the string across to London and you will have a straight line. Continue the string on around the globe until the other end comes back to New York and you will have a true great circle, of which the New York-to-London portion is an arc.

Look at a flat map and, because of the distortion which becomes greater and greater the farther you go from the equator, Canada appears to be vastly larger than the United States, whereas the actual difference is but slightly over 700,000 square miles. The same map shows the United States as, apparently, at least twice as large as Brazil, whereas the South American republic is actually the bigger. Africa, about half again as big as all North America, appears to be smaller, and all Europe, roughly the area of either the United States or Brazil, appears twice as large as the United States and about four times as big as Brazil.

Why a Straight Line Becomes a Curve; the New York-London Air Route on the Globe and as It Appears on the Gores, at the Left

Draw an equator around an orange, and then cut the peel down in segments, from both "poles" almost to the equator line. Remove the peel and flatten it out and you have the answer, for the map maker has simply filled in the vacant spaces between the gores with land and water, distorting the actual land available to make it fit the hole. If you draw another line on your orange before you peel it, connecting two points representing the relative positions of New York and London, you will see, when you flatten it out, why this straight line becomes the curve shown on a chart as the great-circle course across the Atlantic.

Suppose you wanted to go from New York to Singapore by the shortest possible route. Singapore is almost on the equator. New York is almost halfway between the equator and the north pole. Yet the shortest route from one to the

Draw a Straight Line around an Orange, Corresponding to the New York-London Great-Circle Course, and You Get This Effect after Peeling

Byrd and Amundsen's Jumping-Off Place in Spitzbergen Will Be a Stop on the New York to Calcutta Air Route Some Day

other is directly over the north pole. The reason is that Singapore and New York are, within a few miles, exactly opposite each other on the earth. That being true, if you fly due north from New York to the pole and then due south from the pole to the equator, you will reach Singapore over the shortest possible route, about 9,700 miles, as compared with 12,000 miles by steam routes.

The "Norge" took off for its flight over the pole, as Byrd did for his flight to the pole and return, from King's bay, Spitzbergen, an island in the Arctic ocean far north of Norway and east of the northern end of Greenland. King's bay some day will be another important fueling station on a world air-trade route, for a plane flying to Calcutta from New York will pass over it, while a plane en route to Bombay would pass north of Iceland, over upper Norway and Finland, and then down across Russia far to the east of Moscow. The difference between the air route from New York to Calcutta and the sea route, by way of Gibraltar, the Mediterranean, Suez canal, Red sea and Indian ocean, is about 3,000 miles, as much as the distance from New York to Gibraltar.

Since Lindbergh hopped across the Atlantic and introduced great-circle courses to the front pages of the newspapers there has been a big demand for globes. In one of the larger factories where a great part of the maps and globes for schools are made, extra shifts are working overtime to turn them out. The making of a globe is a long and tedious process, requiring hand labor in the main. The first globes, which became popular immediately after the discovery of America, were either engraved on copper or painted by hand. Columbus, in his later voyages, and Magellan, both carried such globes in lieu of present-day ships' charts.

In 1507, though, Waldseemuller revolutionized the globe-making art by producing a globe covered with a map printed on segments, or gores, and his method is still used today.

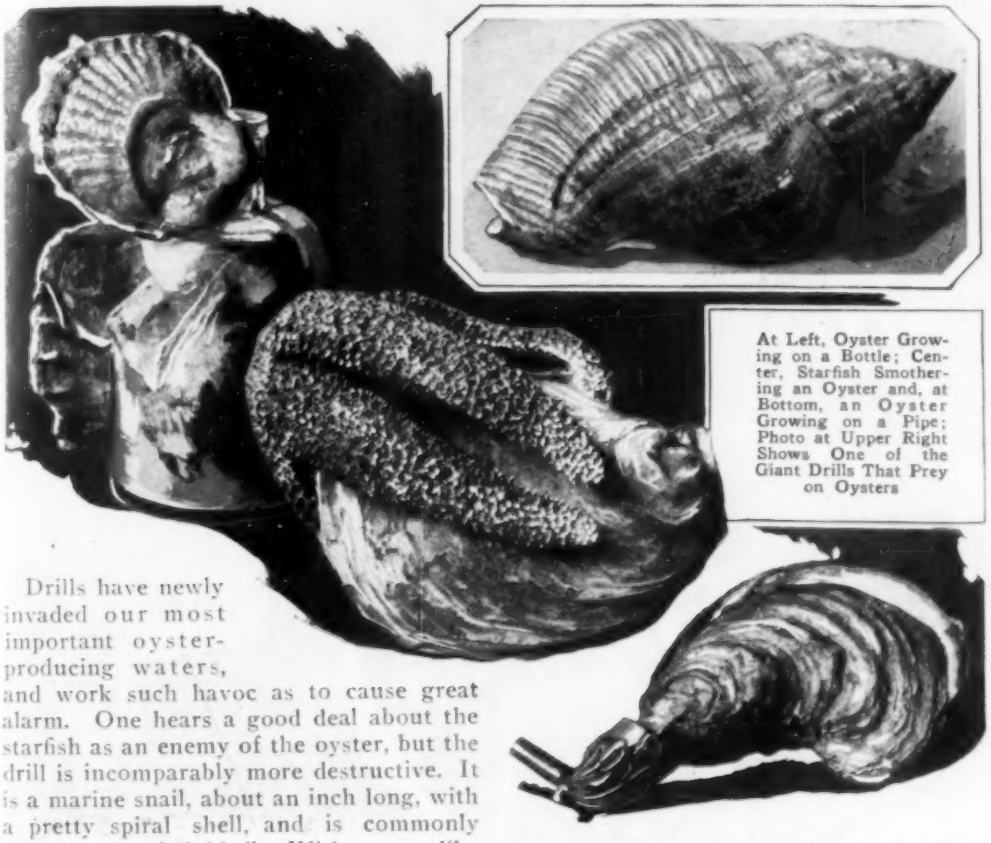
AIR-DRIVEN LOG PLANER SPEEDS BUILDING OF SHIPS

Capable of doing the work of six to eight men, a log planer driven by compressed air, has been introduced in ship yards and in plants where poles are prepared for lighting and power lines. It smooths the bark from a large forty-foot pole in about thirty minutes and operates at greatest efficiency under air pressure of eighty-five pounds. For planing timbers, smoothing decks, masts and spars or finishing other large units, the planer is intended to save time and work. It weighs

Planing a Big Log by Air-Driven Smoother; the Bark Is Quickly Taken Off without Damaging Wood

but sixteen pounds, has few parts and is simple to operate.

SCIENCE BATTLES "BURGLAR" OF THE OYSTER BEDS



At Left, Oyster Growing on a Bottle; Center, Starfish Smothering an Oyster and, at Bottom, an Oyster Growing on a Pipe; Photo at Upper Right Shows One of the Giant Drills That Prey on Oysters

Drills have newly invaded our most important oyster-producing waters, and work such havoc as to cause great alarm. One hears a good deal about the starfish as an enemy of the oyster, but the drill is incomparably more destructive. It is a marine snail, about an inch long, with a pretty spiral shell, and is commonly called a "periwinkle." With a rasplike organ, protruded from its mouth like a tongue, it drills a hole through the oyster's shell, and then, extending the "tongue" into the body of its victim, it sucks out the flesh. The drill is nothing new. In Long Island sound and elsewhere it does enormous damage to oyster beds. But not until within the last three years has it been known in more inland waters. Having invaded those waters, in particular the Chesapeake and rivers flowing into that bay, it seems to have found them specially suited to its requirements, and is multiplying with amazing rapidity. In some localities it has killed fifty per cent of the oysters. So serious is the situation that the bureau of fisheries has undertaken an investigation. This work is now being conducted in a laboratory on Craney island, in the harbor of Norfolk, Va. Several hundred drills have been collected from near-by waters and placed in tanks for observation. It is the very young oysters that are attacked by the drills. Newly hatched oysters are free-swimming animals, very minute, of course, drifting about with the tides and currents for two or three weeks before they settle upon a shell or other hard object and adopt a sedentary mode of life.

HUNDREDS OF KINDS OF CHEESE MADE IN FRANCE

France produces as many as 365 different kinds of cheese, but the chief of them all is Roquefort. This variety is protected by the government and made under specified conditions. Forty per cent of the 15,000,000 pounds prepared annually is exported. While much of the milk comes from Corsica, the enormous quantity of cheese is ripened in natural caves above the town of Roquefort. America takes most of the export and the best quality.

Descending from the Derrick in Safety Car, and a Close View of the Rig, Showing the Brake by Which the Speed of the Carrier Can Be Regulated; Three Men Can Ride on the Platform

CABLE CAR TO SAVE OIL MEN TRAPPED ON DERRICK

Men trapped on an oil derrick by fire can slide to safety on a small tramcar introduced by a California engineer. It runs on a cable anchored some distance from the derrick and is governed by a brake to regulate its speed. From one to three men can ride in it. Without such an arrangement, the usual means of escape was by sliding down a rope and this often landed a man in the midst of the flames. Actual tests have proved that the rig works efficiently and, when not in use, it is easily stowed out of the way.

Unloading Lumber as One Unit

AUTO TRAILER DUMPS LUMBER WITHOUT BREAKAGE

An automobile trailer for handling lumber and unloading the entire cargo at one time, without danger of breakage, has been invented by a Milwaukee lumber-yard official. The trailer

has cut handling costs from $2.50 to $1.24 per thousand feet through speeding up loading and deliveries. The trailer can be connected to the fore part of a horse-drawn wagon and hauled through the yards while assembling the load, the tractor trucks picking up the complete load for delivery. At the other end, the trailer bed is tilted and the entire load slides down as a unit. The truck then moves ahead and lowers the front end gently to the ground. Heavier loads are possible without violating highway restrictions, as the burden is distributed over six wheels instead of four. Six tons can be carried, with two and a half tons resting on the tractor truck and the balance on the trailer.

CHECKER PATTERN ON SCHOOL REVEALS ANCIENT FEUD

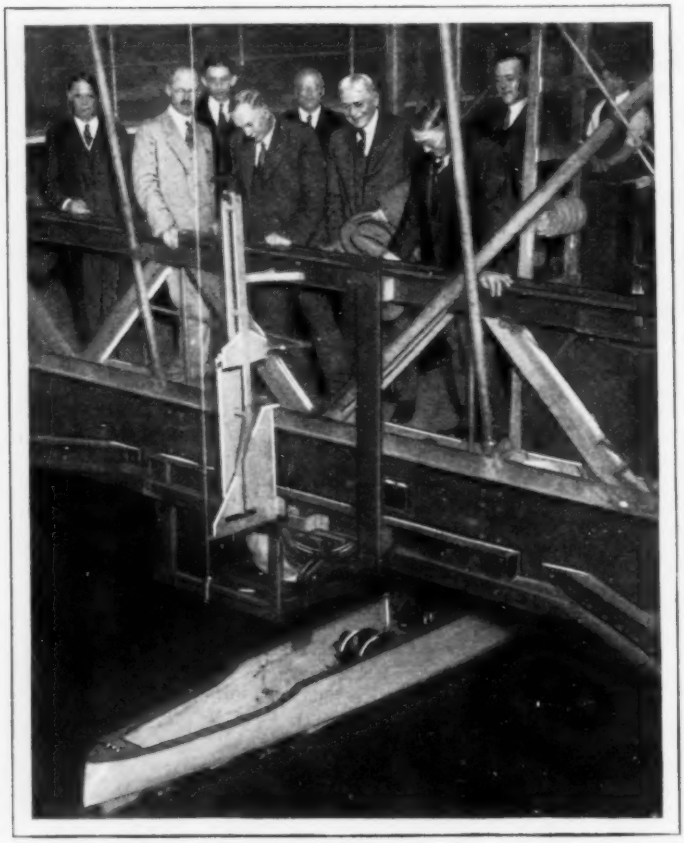
Near Franklinville, N. Y., a country schoolhouse with checker-patterned walls, serves as a landmark and recalls an amusing dispute that agitated the district more than eighty years ago, when the present building was erected. Some wanted it white and some wanted it red. The supporters of the white won at an election but the "reds" worked one moonlight night, painting crimson checks over the white sides. The pattern was allowed to stand. Not many years ago, the checkers were painted over with a modest gray, but old settlers created such a furore that the original decoration was restored.

Landmark for the Community and Evidence of a Rural Quarrel; the Checkerboard Schoolhouse Built More Than Eighty Years Ago

Model of Huge Statue of Columbus for the Port of Palos, Spain, Whence the Discoverer Set Sail

HUGE STATUE OF COLUMBUS WILL CONTAIN SHRINE

A monument in honor of Columbus is to be erected at the Port of Palos, Spain, the town from which the discoverer started on his voyage to the new world. It is being designed by Mrs. Gertrude Vanderbilt Whitney and will cost approximately $500,000. With its pedestal, it will be 114 feet high. The figure of Columbus alone will be seventy feet in height. Large statues of King Ferdinand and Queen Isabella will be incorporated in the base, which will also house a shrine about twenty feet square. Its walls will be decorated with maps of the world as it was supposed to be in the days of Columbus. The monument will be of granite. Dedication is planned for Columbus Day this year.



Officials Watching from the Crane Bridge as Model of Transatlantic Hull Is Tested in Towing Basin

FOUR-DAY ATLANTIC LINERS PROMISED BY TEST

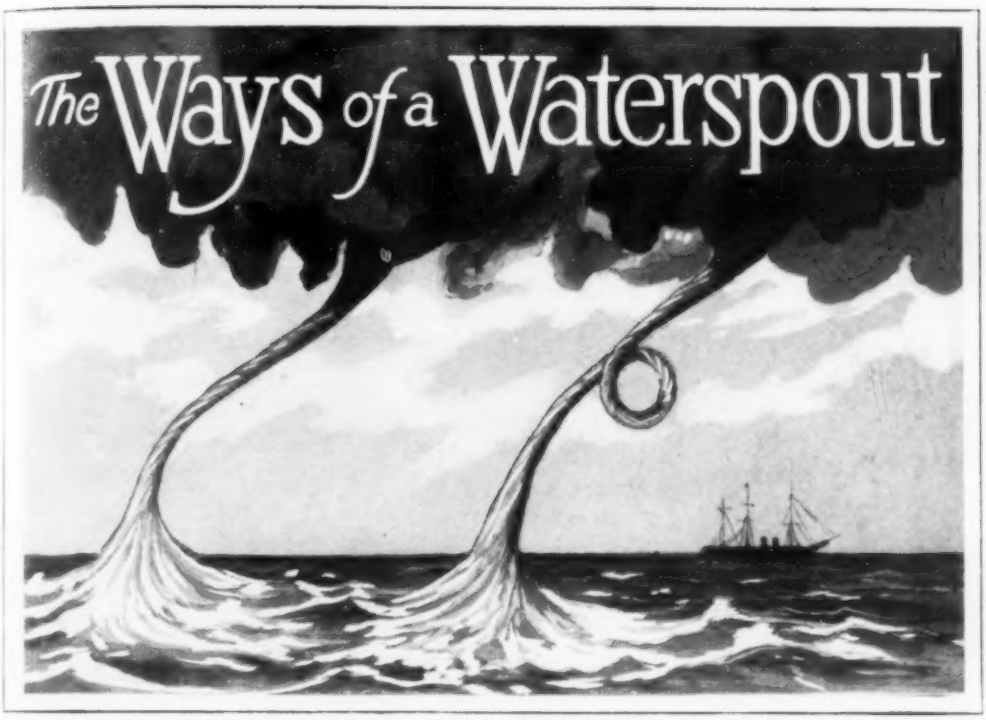
Keels for ten passenger liners, the fastest ever built, will be laid in American shipyards next spring, if present plans are carried out, as the first step to link America and Europe with four-day passenger service. Even that record may be speeded up in good weather by using airplanes to reach the ships hundreds of miles at sea, and to leave them at equal distances from the coast. Each vessel is to be provided with a landing deck for airplanes. Plans for the high-speed ships have been drawn, and the hull model already tested in the towing basin at the Washington navy yard. The ten ships will cost $150,000,000. The four-day service will be made possible by eliminating the tedious passage down New York bay and up the coast of Long Island, and by building the ships to operate at thirty-one-knot cruising speed and thirty-five-knot full speed. Instead of sailing from New York, it is planned to make New London, Conn., an ocean passenger port again. New London is only two and a quarter hours from Grand Central terminal by rail, but several hours away by water.

FURNITURE VAULT SAVES HANDLING IN STORAGE

Furniture is stored in portable vaults under a plan recently introduced, saving repeated handling of the same piece and making it unnecessary to wrap each article as completely. The vault is carried on a motor truck, the goods loaded in, the vault sealed and then stored as a unit in the warehouse until the furniture is wanted. Each vault is fire and dustproof, has a separate lock and is moved about on wheels.

Sliding Loaded Vault from Truck into Warehouse

The Ways of a Waterspout



Pair of Twin Waterspouts, One of Which Tied a Knot in Itself, Observed off the Coast of New South Wales by Capt. Richard Taplin and Reported to the Royal Society

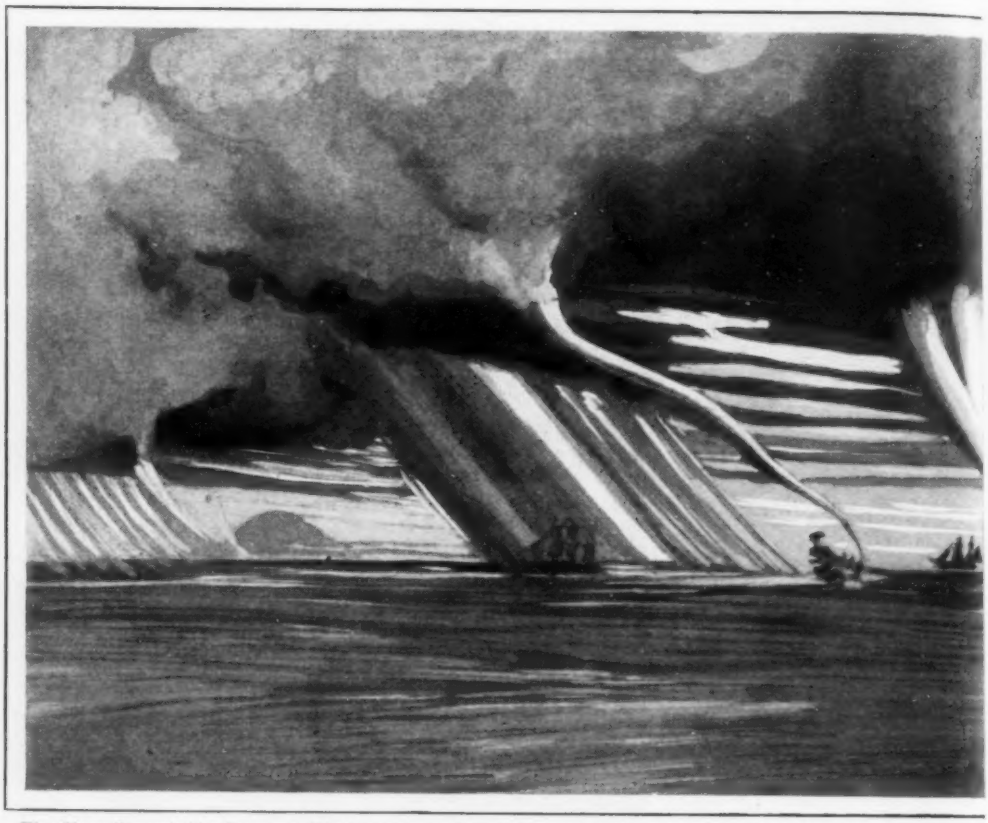
By CALVIN FRAZER

A DANGLING funnel of vapor protrudes downward from the clouds. The water beneath, churned round in violent turmoil, hurls up a pyramid of spray. The two meet in a slender slate-gray column that advances majestically over the sea, spinning on its axis like a dancing dervish. Five minutes—ten minutes—and the frail shaft collapses in a momentary deluge of rain. Such is a waterspout.

Fascinating to watch at the safe distance of a mile or two, the waterspout, at close quarters, is a thing to terrify the stoutest heart. No mariner runs into one from choice. Records, showing that few vessels, except the smallest, have ever been seriously mishandled by these monsters, cease to be reassuring when the writhing colossus, half a mile high and scores of hundreds of feet in diameter, comes charging down on your ship. After all, the records tell only of the vessels that have survived.

Let us dismiss briefly the elementary facts about waterspouts. The visible column is only a cloud. It is no more a solid pillar of water than is the spout sent up by a "blowing" whale. In both cases invisible water vapor is condensed into liquid droplets by cooling. The whale's warm, moist breath is condensed by the chill of the atmosphere. The cloud of the waterspout marks the location of a swiftly revolving vortex, which, by flinging the air away around it, forms a partial vacuum. The rarefaction of the air causes "dynamic cooling." Hence the condensation of moisture. Most ordinary clouds are formed by the cooling of air that expands in rising.

The visible waterspout is exactly the same thing as the so-called "funnel-shaped cloud" of the tornado on land. There is no essential difference between waterspouts and tornadoes. It is a mere accident of language that makes most people think of them as entirely distinct phenomena. It is not uncommon for a tornado to form on land and then pass over water, becoming a waterspout. Or a



The Most Remarkable Group of Waterspouts on Record, Above, and on the Opposite Page, as They Were Sketched by an Eye Witness near Stromboli, on the Mediterranean, June 22, 1827

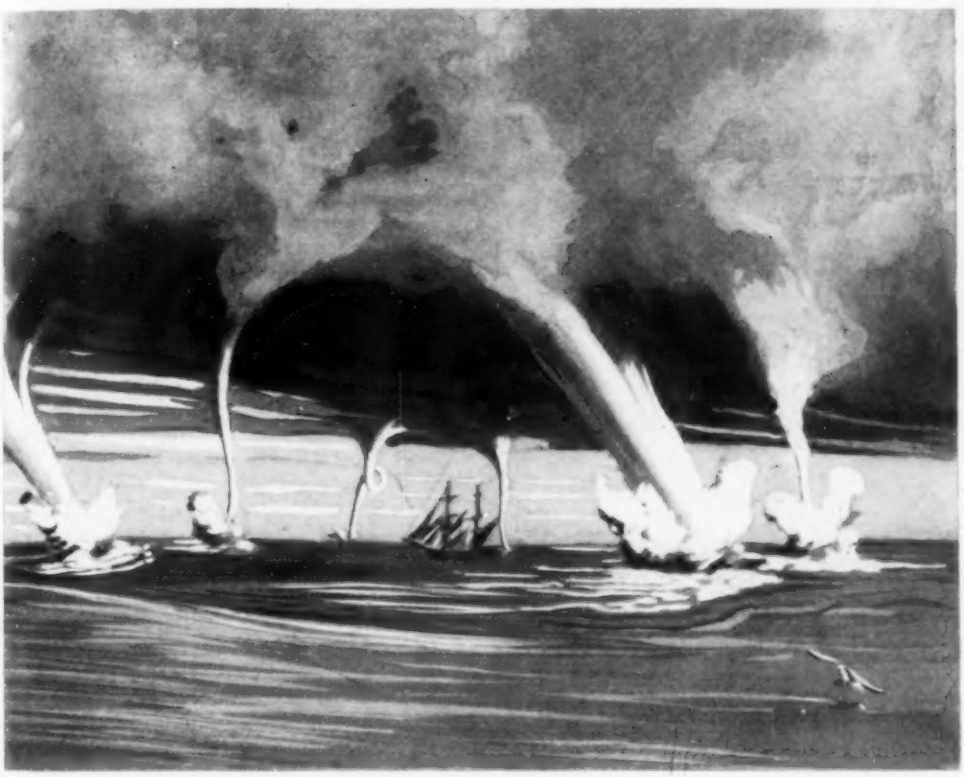
spout may form off shore and travel inland, uprooting trees, demolishing houses, and giving ample evidence of the fact that it is a full-fledged tornado.

Spouts, whether of land or water, are born in the clouds. They form aloft in the turbulent region between two streams of air flowing in different directions or at different velocities, especially when these streams differ markedly in temperature and humidity. Local whirls are set up at the boundary surface. Most of these die in the upper air, but some of them are so strongly developed that they work their way down to earth.

The trade-wind belt is a favorite breeding ground of waterspouts, which are formed by the conflict between the easterly trades and the westerly countertrades blowing above them. In our latitudes an elongated "trough" of low barometric pressure, with oppositely directed winds on either side of it, furnishes ideal conditions for the origin not only of waterspouts and tornadoes, but also of squalls and thunderstorms.

When a waterspout is forming, and while the cloud still dangles in mid-air, the water beneath is suddenly thrown into violent agitation. Often a saucerlike depression can be seen, around which is built up a mound of spray. This means that the aerial vortex has already pushed its way down to the water, though the visible column of vapor does not yet extend so far. Even in the fully developed spout, the vapor column is sometimes so thin that distant objects can be plainly seen through it.

The lifting powers of waterspouts have been exaggerated by some writers and underrated by others. There is a strong updraft of air in the core of the spout. It is undoubtedly sufficient, in a big waterspout, to suck up a considerable amount of sea water to a height of several hundred

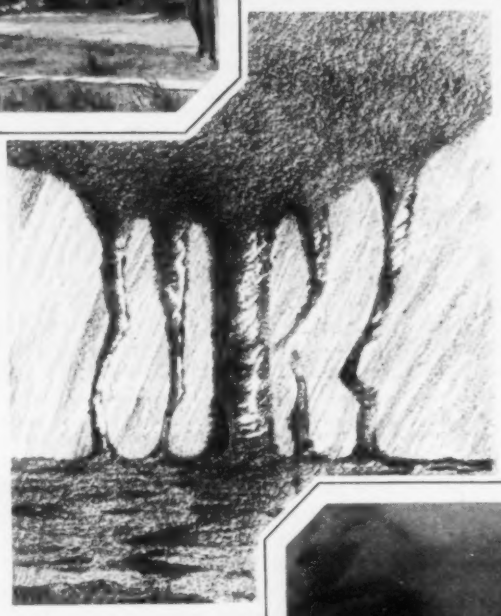


Caught in Such a Group of Whirling Towers of Thousands of Tons of Water, the Fate of Small Sailing Ships Was Problematical, Which Made the Spouts Feared by Mariners

feet. In fact, this water, thrown from the spout by centrifugal force, may often be seen forming a lofty cataract around the base of the column. Solid objects can also be carried aloft, just as they are in tornadoes. Whether a waterspout could carry up a small boat or a sailor, whisked from the deck of his ship, as tornadoes sometimes carry up the roofs of houses, wagons, cattle and human beings, is unknown. Apparently no such feats have ever been recorded.

Then there is another class of phenomena of somewhat similar appearance but quite different origin, to which the name waterspout is often misapplied. Occasionally, in calm weather, small whirlwinds will start from the surface of a body of water and build up columns of spray and vapor to a considerable height. They do not often extend up to the clouds and, in fact, they are sometimes seen with a perfectly clear sky overhead. They are similar in character to the little dust whirls that form over dry roads and the larger columns of dust and sand formed over deserts. On land, such whirls are due to the overheating of the ground and the formation of a layer of stagnant hot air at the surface, which suddenly breaks upward through a colder layer above it. A water surface does not heat up like a land surface, but it may remain warm while the air a few feet above it is rapidly cooled, giving the same unstable condition—warm, light air next to the water and cold, heavy air farther up. The whirls on land are made visible by the dust they carry, but in the moister air over water a cloud of vapor may be formed, as in the true waterspout.

It is not uncommon for waterspouts to appear in pairs or groups, and as many as twenty have been seen at one time. A very unusual case of multiple waterspouts was reported a few years ago to the Brit-



ish meteorological office by J. B. Hewitt, chief officer of the steamship "Carston." About five o'clock one afternoon, while near Guantanamo, Cuba, the ship ran into a severe thunderstorm. Hardly had this subsided when the clouds began sending down tapering arms on all sides of the vessel, and several of these formed complete waterspouts. Finally there were nine large spouts, perfectly formed, within a short distance of the ship. Then a curious sight was witnessed. Around some of these spouts two or three—and in one case, four—slender, weedy-looking spouts were formed. They not only traveled with the big spouts but at the same time circled slowly around them, like satellites revolving about a planet. Their movements were erratic; sometimes they approached the central spout, and sometimes receded from it, at the same time undulating with great violence.

In recent years many accurate measurements have been made of waterspouts, both from ships and from shore. On Dec. 28, 1919, a large waterspout was observed from the British steamship "War Hermit." Measurements with a sextant showed the distance between the base of the cloud and the surface of the sea to be 4,600 feet. The width of the column tapered from 500 feet at its junction with the cloud to 150 feet at the sea. Spray was thrown up to a height of more than 300 feet over an area 250 feet in diameter. In this case the observers reported the spout to consist of a central column inside a hollow tube. When the spout was breaking up, the central column appeared to be lifted as a whole into the clouds, while the walls of the outer tube dissipated into spray. This double structure of waterspout columns figures in several other descriptions, but has never been satisfactorily explained.

In ancient times waterspouts were believed to be living monsters—dragons of the deep. Long before the invention of gun-

A Waterspout over Land Is a Tornado; Freak Spouts near Guantanamo, Cuba, May 7, 1920, and Spout Photographed on Lake Winnipeg

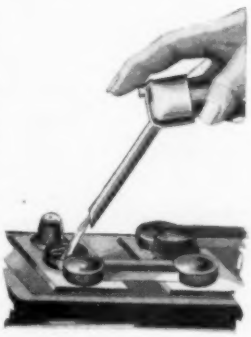
powder, several noise-making procedures were in use among sailors to keep these creatures at a distance. The mariners who sighted a spout would shout, stamp on the deck, beat drums and gongs, or clash their swords to frighten it away. When cannons were introduced, they provided an additional means of making a noise and were used for the same purpose then as well as later.

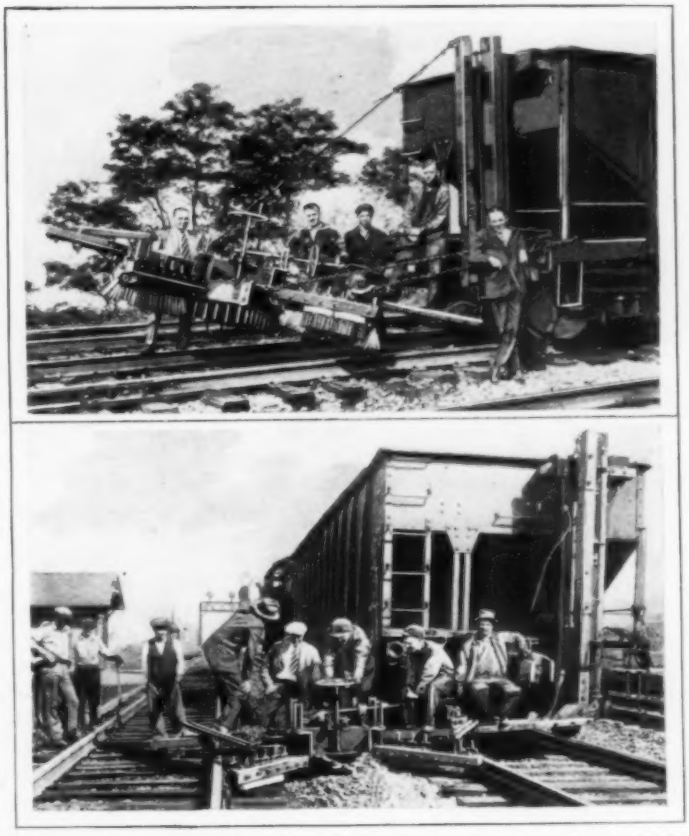
RADIOED MESSAGES TO BE SOLD BY THE INCH

Since typed or printed pages, checks and other documents can now be sent as a unit by wireless, a British authority predicts that charges in the future may be based on the square inch instead of by word or line. This method will be as common as to sell butter by the pound, he declares, and believes that great developments in speedier and more accurate radio are under way. Photographs, etc., sent by wireless between Great Britain and the United States have been charged for on a size basis.

BATTERY FILLER CAP PREVENTS SPILLING WATER

Designed to fit the top of any distilled-water bottle, a filler cap prevents spilling when supplying the storage battery. A tip is pressed by the fingers to stop the flow at any point. When this is released, the water pours out.



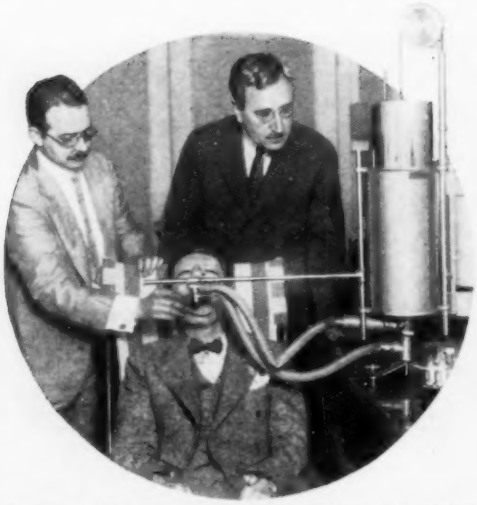


Ballast Spreader Devised by Foreman of the Pennsylvania Railroad; It Is Based on Principle of Farm Harrow

LEVEL BALLAST ON RAILROAD WITH TIMESAVING RIG

Railroad men have adapted the principle of a familiar farming implement to level ballast as it is dumped on the tracks for distribution between them and the ties. The unit is intended to replace the pick and shovel of the section gangs and is an application of the old-fashioned V-shaped soil harrow. It operates on a pivot so that it can be swung out of the way when trains pass and is attached to the hopper car that dumps the ballast. Flanged rollers, resting on the adjoining rail of the parallel track, help guide it and there is a series of sweepers, brooms and wire track brushes to clear the tops of the ties from the scattering pieces of ballast as the working gang advances.

¶Feeble magnetic properties have been noted in gases.



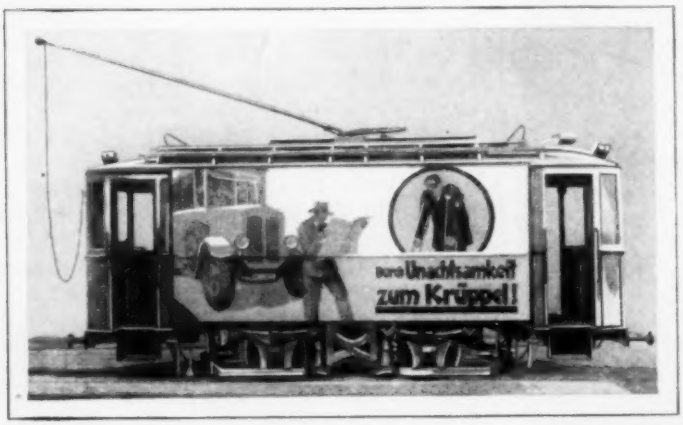
Measuring Oxygen Consumed by Patient in an Effort to Determine the Cause of Stammering

TRACE CAUSE OF STAMMERING WITH BREATHING GAUGE

University of Pennsylvania professors, after an extensive study of speech defects, report that one of the causes of stammering and other impediments, is low oxygen consumption. In making their tests, they employ a breathing gauge which shows how much oxygen the subject uses during normal respiration.

CARS SPREAD SAFETY MESSAGE WITH BIG PAINTINGS

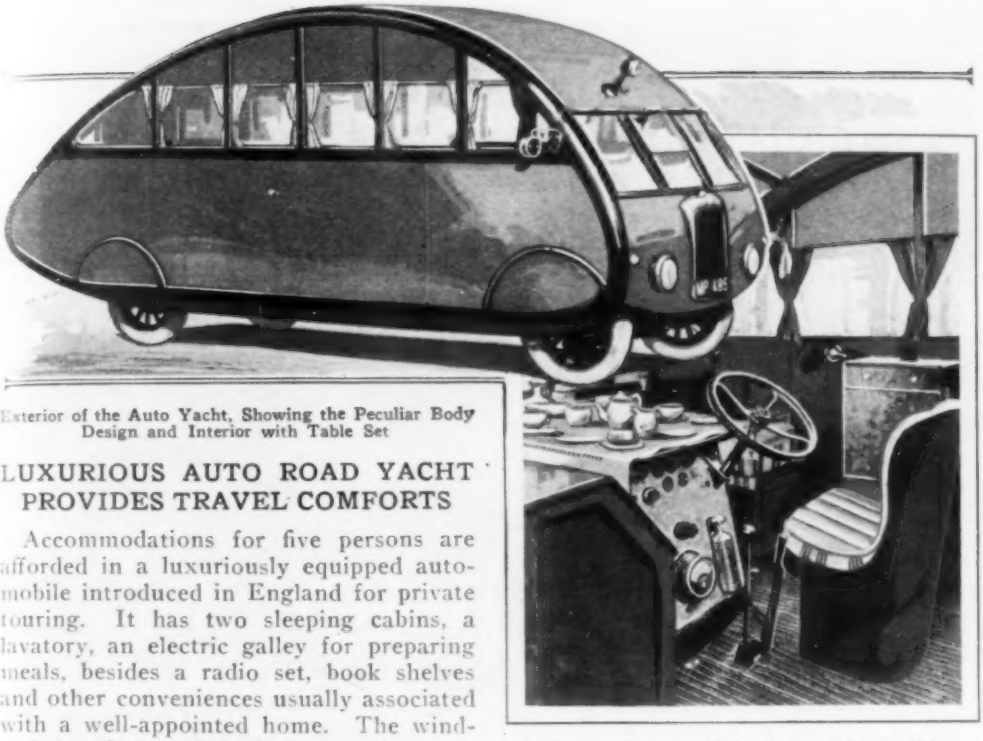
Life-sized paintings, illustrating some of the risks that pedestrians and others commonly take, are attached to the sides of the cars used for track and street-cleaning purposes on the surface lines in Breslau, Germany. The vivid posters can be seen from a considerable distance and, since the cars move slowly, their message is the more emphatically impressed.



Spreading Safety Propaganda with Street Cars; Poster on Side Warns Pedestrians of Dangerous Risks

PASSING TRAIN REPORTS SELF THROUGH RADIO "MIKE"

Using radio microphones so that distant trains can announce their passage to the dispatcher at headquarters is being tried out successfully on the Missouri-Kansas-Texas railroad. The automatic reporters take the place of telegraph operators in stations that are closed at night. A microphone is mounted in a box beside the track and the thunder of the approaching train is reproduced by a loud speaker at the dispatcher's office in a distant city—for some of the divisions are as much as 400 miles long. Three of the outfits, working automatically, are placed outside yard terminals to report to the dispatcher when a train that has been ordered is actually made up and clears the yards. Fifteen others are used to replace night telegraph operators along the line. When the dispatcher expects a train in the neighborhood of one of the microphones, he "cuts" the "mike" into his loud-speaking telephone line, in the same way as an ordinary telephone connection would be established. Then he goes about his other business until the rumble of the loud speaker announces the train is approaching. Speed can be calculated by counting the clicks of the wheels over the rail joints, and even the number of cars in the train accurately counted. If the freight stops to do any switching, the dispatcher hears it, and also hears the engineer's farewell whistle when he gets under way again. With that information it is possible to arrange passing connections and other details to be handed down at the points along the road where all-night order operators are on duty.



Exterior of the Auto Yacht, Showing the Peculiar Body Design and Interior with Table Set

LUXURIOUS AUTO ROAD YACHT PROVIDES TRAVEL COMFORTS

Accommodations for five persons are afforded in a luxuriously equipped automobile introduced in England for private touring. It has two sleeping cabins, a lavatory, an electric galley for preparing meals, besides a radio set, book shelves and other conveniences usually associated with a well-appointed home. The wind-resisting design of the body is an interesting feature of the outfit, and the car can develop a speed of forty-five miles an hour.

MOVING WINDOW DISPLAY RUN BY LIGHT-SOCKET MOTOR

Moving effects are produced for the show window with a motor operated by a lighting circuit. It runs at slow speed and with little expense. There are few parts and the motor requires practically no attention after it has been installed. The hookup with the devices that are to be moved, is accomplished by a small pulley on one end of the motor shaft and an eccentric on the other. Connection between the display and the motor is made with a fine linen string or thread. When this is the color of the background, it is hardly visible so that the articles appear to move by some mysterious means. Dancing dolls, cutting scissors, and moving fountain pens are a few of the displays that are made possible by this simple unit.

MOISTENER TO WET STAMPS HELPS GUARD HEALTH

For convenience and greater cleanliness, a moistener to wet stamps and envelope tabs is worn on the finger like a thimble and supplies sufficient liquid for the work through a sponge at the end of a small reservoir. A valve keeps superfluous water from dripping through. The unit is made of material that will not rust or break, and stands upright on the desk or table.

Digging for Diamonds

The Famous Jagersfontein "Excelsior" Diamond as It Appeared When Found; the Span of the Fingers Clasping It Gives a Good Idea of the Enormous Size of the Uncut Stone

By RENE BACHE

THE cost of producing diamonds in South Africa is $12 a carat. So says a recent report made to its stockholders by the Diamond syndicate, which controls the entire supply.

A cut diamond of one carat, bought at a jeweler's shop, costs $300 to $500, according to quality. The price, however, ascends in a sort of geometrical progression with increase in size, so that a fairly large stone is worth a fortune.

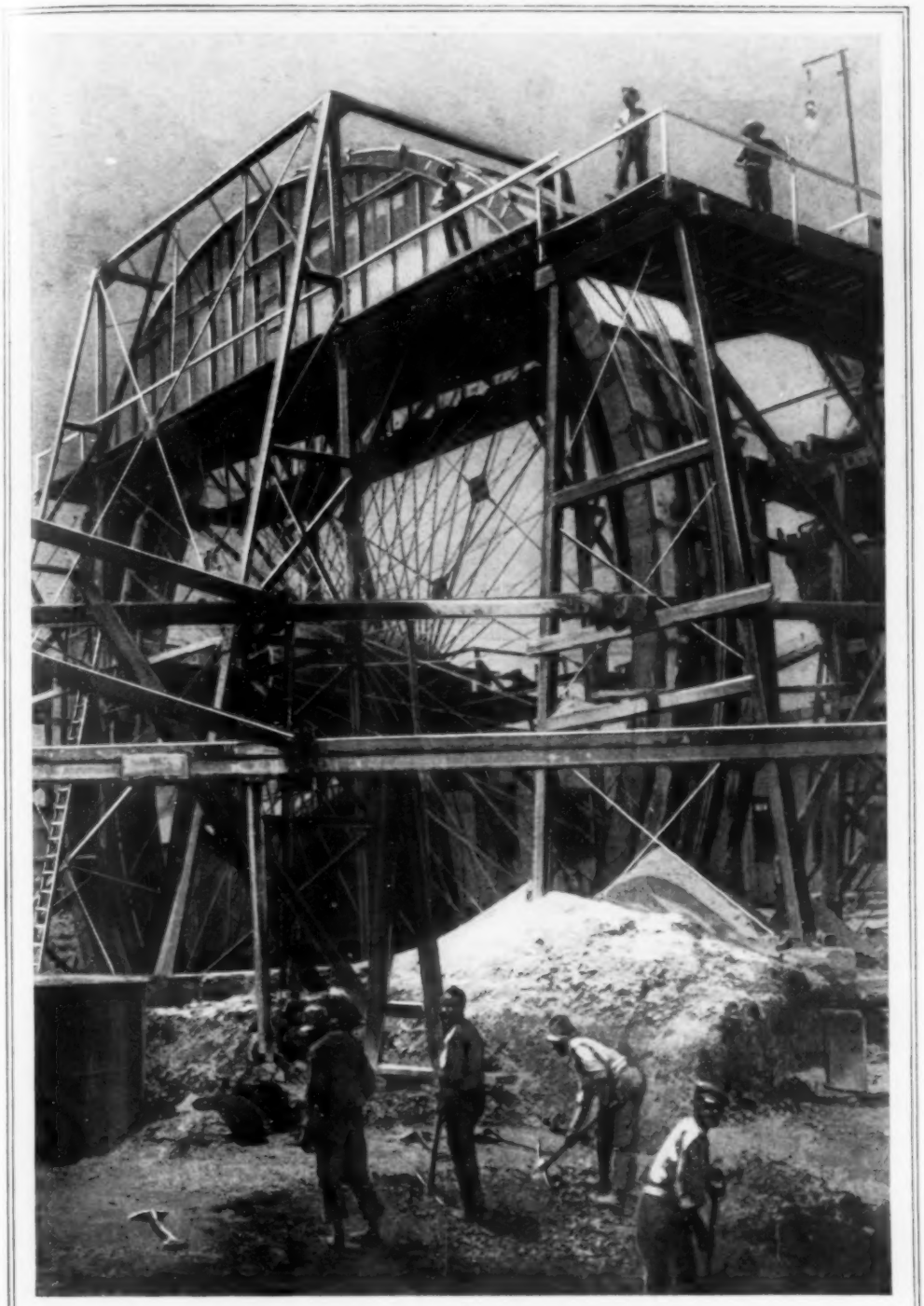
The South African mines controlled by the syndicate yield ninety-six per cent of all the diamonds produced in the world. In effect, it is a monopoly. If they put on the market all the diamonds they are able to produce, the stones would be comparatively cheap. But the price is kept high by limiting the output and the number permitted to be sold.

There was, in 1870, a farm, about 600 miles north of Capetown near the Vaal river, which was called Dutoit's Pan, because of a curious circular depression that covered several acres of the land. The Boer farmer's humble dwelling was plastered with clay. His children, playing about, noticed some small glittering pebbles in the plaster, and picked them out. They proved to be diamonds. When that fact had been ascertained, the farmer proceeded to dig in the place where the clay had been obtained, which was inside the rim of the above-mentioned depression, and more of the gems were turned up by his pick and spade.

As now known, the circular depression was the mouth of a volcanic pipe which led down into the bowels of the earth. In an earlier age, when all that country was probably under water, the pipe was filled up with volcanic mud which contained diamonds crystallized by enormous heat out of rocky material rich in carbon.

Today, in the place of the circular depression, there is a monstrous hole, nineteen acres in surface extent and nearly a quarter of a mile deep. It is the great Dutoitspan diamond mine, its enormous shaft following the volcanic pipe downward into the ground.

Presumably the pebbles found in the



Gold and Platinum Have Become as Important in South Africa as the Diamond Fields; This Huge Wheel Carries the Powdered Gold Ore Up to Be Dumped in the Cyanide Separation Tanks

The "Baby" Washing Machine Cleaning Gravel in Search of Diamonds beside a Stream Bed at Mafeking; Diamond Mining Is Much Simpler Than Taking Minerals from Ore

clay plastering of the Boer farmer's house would have attracted no particular attention save for the fact that already much excitement had been caused in that region by the discovery of many valuable diamonds in the gravels of the Vaal and Gong-Gong rivers.

The first discovery of the kind, purely accidental, owed its occurrence to a child. In 1867, an Irishman, John O'Reilly, on a hunting trip south of the Orange river, stopped for a night at the house of a Boer named Van Neikirk. The Boer's little daughter was playing with some bright pebbles on the floor, and O'Reilly asked if he might have one of them. He picked out the biggest one, which he afterward sold at Capetown for $1,000, a small fraction of its real value.

Two years later, a Dutch trader in that region learned that a certain Kafir witch-doctor had in his possession what was supposed to be a magnificent diamond of great size. He sought to purchase the stone, offering a span of oxen for it, but the dealer in magic and spells valued it highly as a charm of special potency and refused to sell. The trader added to his offer his tent wagon and appurtenances, and finally, stripped of all his belongings save gun and ammunition, he departed with the gem. It weighed eighty-three and a half carats, and eventually passed into the hands of the Earl of Dudley, who paid $125,000 for it. This diamond is known as the "Star of South Africa."

The diamonds found in the river gravels had evidently been washed out of rocks somewhere, but it was not until 1870 that one of the sources from which they originally came was discovered on the Dutoit's Pan farm. There were other sources, for the volcanic pipe there located was not the only one. There were a number of such pipes in the same district, known as Griqualand West, which is now a part of Cape Colony. One of them is marked today by the great De Beers diamond mine, the mouth of which has a surface extent of thirty-five acres. The principal center of the diamond-mining industry is Kimberley, a city of 400,000 inhabitants.

No sooner did the Dutoit's Pan discovery become known than a rush to the scene began, and the Boer farmer found his land occupied by diggers who paid no attention to his efforts to warn them off. The whole diamond-producing area was

marked out in claims thirty-one feet square, held under miners' law. The diamonds were found in a yellow earthy material down to a depth of forty-odd feet. Then a soft bluish-gray rock was struck, and many of the diggers, supposing it to be barren, sold out.

As a matter of fact, this rock was the real matrix of the diamonds, the so-called "blue ground," which today produces the glittering wealth of the South African mines. It is friable stuff, and, fetched to the surface and exposed for some months to sun and weather, it becomes so disintegrated as to be easily subject to treatment for separating out the gem stones which the ancient volcanic mud contains. At depths exceeding 1,200 feet, its productiveness is undiminished, and diamonds are distributed through it so uniformly that 100 cartloads of the material may usually be counted on to yield 100 carats of the stones.

In June, 1893, a Kafir laborer in a diamond mine at Jagersfontein, loading a cart with blue ground which had undergone the weathering process, espied a huge diamond, and managed to secrete it on his person. Apparently it was not his intention to steal it, for, later on, he handed it over to the superintendent, and was rewarded with a gift of $750 in cash and a horse and saddle.

Gold Driller on the Rand and Two Famous Stones, the "Cullinan," Top, Largest Ever Found, and the "Jubilee," Cut from the "Excelsior"

This was the famous Jagersfontein "Excelsior" diamond, an irregular crystal which looked like the broken-off end of an icicle. It was pure white, and weighed seven and a half ounces. Near its center was a black spot, and, to get rid of this defect, the stone was chopped in two. From the larger piece was cut the "Jubilee" diamond, presented to Queen Victoria on the fiftieth anniversary of her accession to the throne. It was of 239 carats, one and five-eighths inches long, one and three-eighths inches broad, and one inch in depth. The lesser fragment was split into ten pieces, the three largest yielding gems—a "pear," a "drop," and a "marquise"—weigh-

ing 158, 147 and 130 carats, respectively.

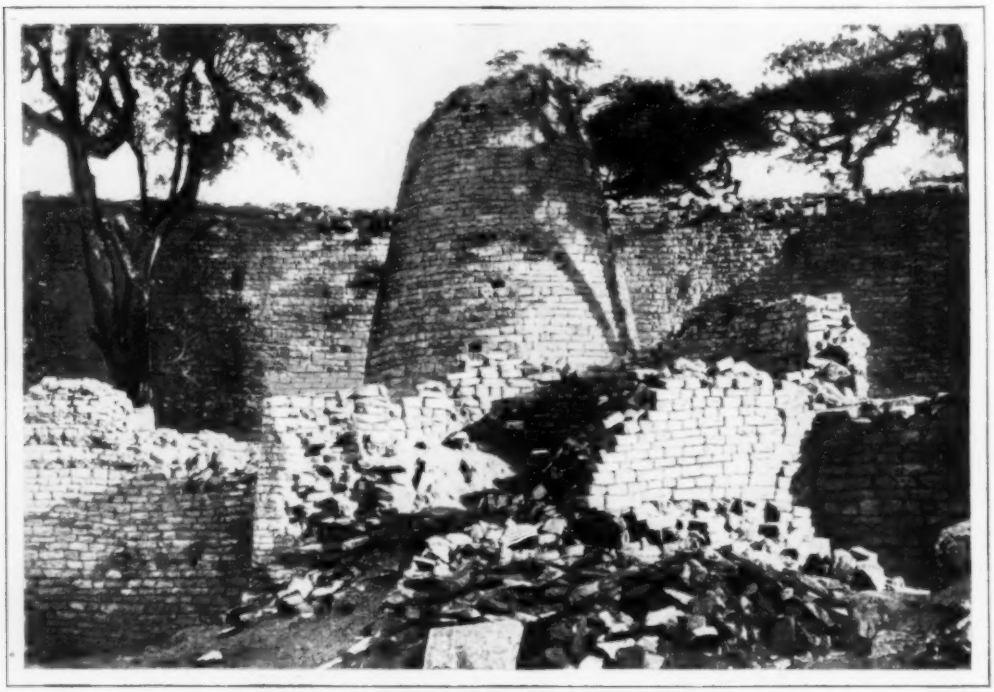
The idea of chopping up a diamond was entirely new, a thing previously unheard of. But something much more remarkable in that line was destined before long to follow, in connection with a stone so gigantic that its weight was reckoned in terms of pounds! That stone was the "Cullinan," by far the largest diamond ever known, which came from the Premier mine, in the Transvaal.

The manager of the mine, Fred Wells, was strolling idly about when he caught sight of a great white stone lying in the blue ground which was spread over a wide area to weather. It was four and a quarter inches long, two and a half inches broad, and one and a half inches thick; it resembled a piece of very transparent glittering ice, and weighed nineteen ounces. It was too large to be marketable. According to the rule for reckoning value in relation to size, it was worth about $45,000,000. The problem of its disposal was solved by presenting it to King Edward VII on his sixty-sixth birthday, as a gift from the South African government. To get rid of two flaws, it was split into several pieces, the object sought being to obtain from it a single cut stone of largest possible size and absolute perfection, the lesser fragments yielding gems big enough to be of high value.

The principal stone, when cut, was a pear-shaped drop-brilliant of 516½ carats, valued at $2,500,000. From the next-biggest piece was obtained a square brilliant of 310 carats, itself much larger than any cut diamond previously in existence, and weighing seventy-one carats more than the "Jubilee." Other fragments yielded six very big gems and sixteen smaller ones.

No fictional tales of wealth discovery can approach in romantic interest the true story of South Africa. For there is also the land of gold. During many recent years it has been pouring out a continuous flood of gold, a greater quantity annually than the entire world's production of that precious metal up to the time of the development of the mines of the Witwatersrand, in the Transvaal.

When the Queen of Sheba made her historic visit to King Solomon, she brought with her, for a gift to that monarch, nearly half a ton of gold. She was an Arabian



One of the Ancient Conical Towers at the Fabled King Solomon's Mines; Much of the Precious Stones and Metals of Biblical Days Presumably Came from Southern African Fields

queen, and her little kingdom, occupying the southwestern part of that peninsula, had for its principal seaport Aden, which was a transit point for all the sea-borne commerce that passed into and out of the Red sea. The gold fetched to Jerusalem by the queen came from South Africa—to speak more exactly, from southern Rhodesia, where her people and their neighbors, the Himyarites, had operated productive mines for several centuries. The scene of those operations is marked today by the ruins of what was manifestly a large and populous town, covering several square miles. In the middle of it, an isolated granite "kopje," 250 feet high, was crowned by a fortress built of hewn stone. It was an impregnable stronghold, protected on one side by a sheer precipice, ninety feet in height, while its inner defenses were guarded by a maze of labyrinthine passages so narrow that attackers would have been obliged to pass through them in single file.

The ruins include a great temple and conical towers of hewn stone, the latter presumably the "high places" (such as the Bible speaks of), to the tops of which the priests ascended to offer sacrifices. But much more interesting are the remains of extensive workshops for handling the gold brought in from the mines. Some of the furnaces used for melting it are still in position. Also there are crucibles and molds for casting gold bars. A number of gold ingots were found in the shops, and, in the temple, a considerable quantity of raw gold dust.

Solomon was born about 1000 B. C. Participation of the Israelites in the South African mining operations does not seem to have continued long after his death, for it was brought to an end by the destruction of their fleet and dockyards at Ezion-Geber, 900 B. C. But, within the last few years, the quartz reefs of that same area have been attacked by modern engineering methods, and the mines now yield more gold than California.

For New Notes in Jazz Music; the Elongated Banjo That Is Said to Produce Softer Tones

LONG-BODIED BANJO PRODUCES SWEETER JAZZ TONES

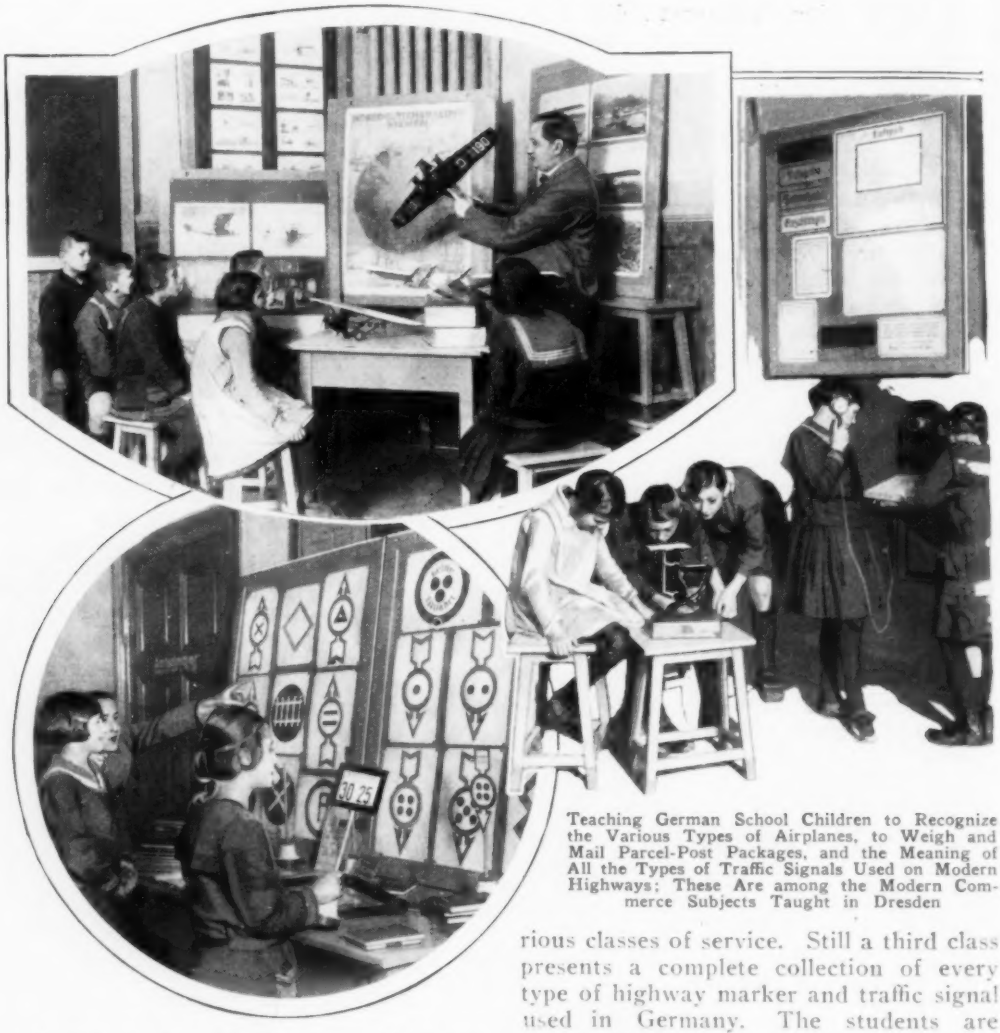
With a body about a yard long, a banjo-like instrument, invented by an eastern musician, is said to produce tones of a softer and sweeter quality than other stringed units, and is especially suited for jazz orchestras. It has four strings.

CHECKERS PLAYED WITH POLES LATEST OUTDOOR SPORT

One of the games popular at summer resorts in Great Britain this season was checkers played on a large "board" with felt pieces, three inches thick. They were moved about with the aid of poles inserted in loops at the top.

Fishpole Checkers, One of the Latest Outdoor Amusements at Summer Resorts in Great Britain; the "Men" Are Felt Disks

MODERN LIFE BRINGS NEW LESSONS TO THE SCHOOL



Teaching German School Children to Recognize the Various Types of Airplanes, to Weigh and Mail Parcel-Post Packages, and the Meaning of All the Types of Traffic Signals Used on Modern Highways; These Are among the Modern Commerce Subjects Taught in Dresden

School children in Dresden, Germany, receive special courses of instruction to prepare them for such modern things as flying, parcel-post rates and obeying a multitude of traffic signals when they become automobile drivers. In one class, models of all types of airplanes are used to impress their features, so that the student may recognize a plane in flight. Interest is added to the subject by having the pupils build model planes of their own. Another class is devoted to the use of the mails, with special attention given such subjects as weighing letters and parcels and computing the correct postage for various classes of service. Still a third class presents a complete collection of every type of highway marker and traffic signal used in Germany. The students are taught to recognize each and name its purpose, and then, on highways laid out on the floor, stage imaginary traffic problems and work out the correct solutions. By the time the pupils are large enough to operate automobiles, they will be thoroughly grounded in traffic rules, and, as pedestrians, they will run less danger of being injured.

¶Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

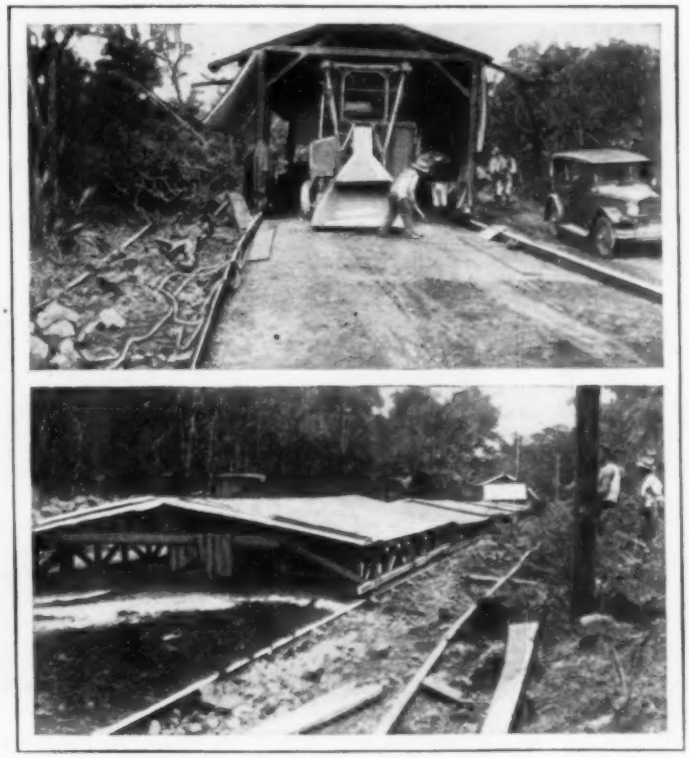
NEW AID FOR AIR NAVIGATION

Determining the position of an airplane while in flight without the necessity of elaborate mathematical calculations is now said to be possible with the aid of a sextant devised especially for aviators. It functions in a manner similar to that of the instrument used on ships, and the observer's position may be read directly from the sextant without any further work.

LIGHTS ON BUMPER FOR SAFE DRIVING

Heavy-duty automobile bumpers with lights on each side, have been introduced for greater safety and convenience in driving at night or in foggy weather. The lights are equipped with special lenses that make them efficient under difficult conditions. A broad beam of light, sent below the fog, illuminates the road for a considerable distance ahead. The rays penetrate the less dense mist at this level while the usual headlights cannot overcome the fog higher up.

Lights That Help in Driving through Fog Are Installed in Bumper



Courtesy Christian Science Monitor

Laying the Concrete Road, and Portion Covered with the Portable Roofs, to Protect Surface from Hard Rains

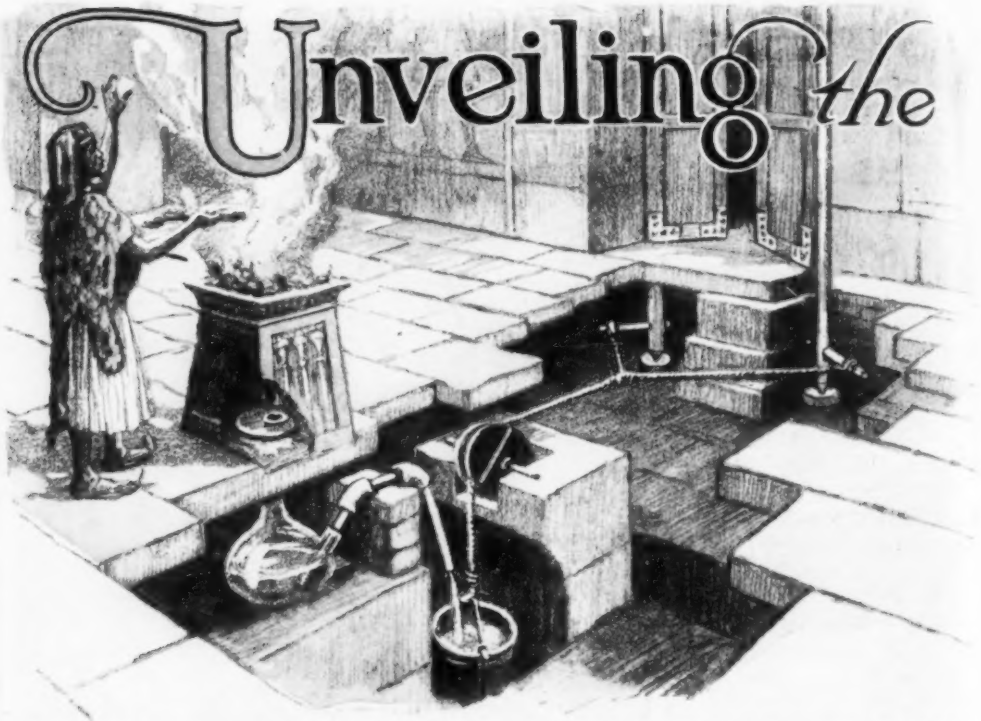
PORTABLE ROOFS FOR ROADS PROTECT FRESH CONCRETE

In the Hawaiian islands, where the rainfall is heavy, considerable difficulty has been experienced in building cement roads. To keep the fresh cement from being flooded or washed away, portable coverings have been devised. They are mounted on wheels and the canvas stretched tightly over wooden frames, shielding the concrete until it has set sufficiently.

ENDLESS BELT IN RESTAURANT SAVES WAITERS WALKING

To expedite service, and save the waiters needless steps, an endless-belt carrier has been installed in an eastern restaurant to convey food from the kitchen. Dishes are ordered by number from the menu, a button being pressed to signal for that particular article. The chefs place the platters on the belt which carries them in to the waiters in the dining room.

Unveiling the



A "Miracle" by Compressed Air, One of the Tricks Used by the Egyptian Priests to Impress the Faithful by Causing Temple Doors to Open Mysteriously When the Fire Was Lighted

By W. T. HAROLD

IS there any truth in the weird stories of magic and spirit-raising performed by pagan and mediæval necromancers, and handed down in the works of classical authors?

This question is likely to suggest itself to many Americans when they recall the collection of 5,147 volumes and very rare manuscripts which the late magician, Harry Houdini, collected from all over the world and bequeathed to the library of congress, where they are now installed.

One night, about 350 years ago, a Florentine goldsmith, Benvenuto Cellini, accompanied by a necromancer, went to the ruins of the Colosseum at Rome. The necromancer said he wished to find a cache of buried treasure, but Cellini merely was curious to witness a seance in which the powers of darkness and the black art were to be invoked. The necromancer, using drugs and burning incense, apparently called forth hosts of demons, goblins and giants. Cellini was convinced that the manifestations were real.

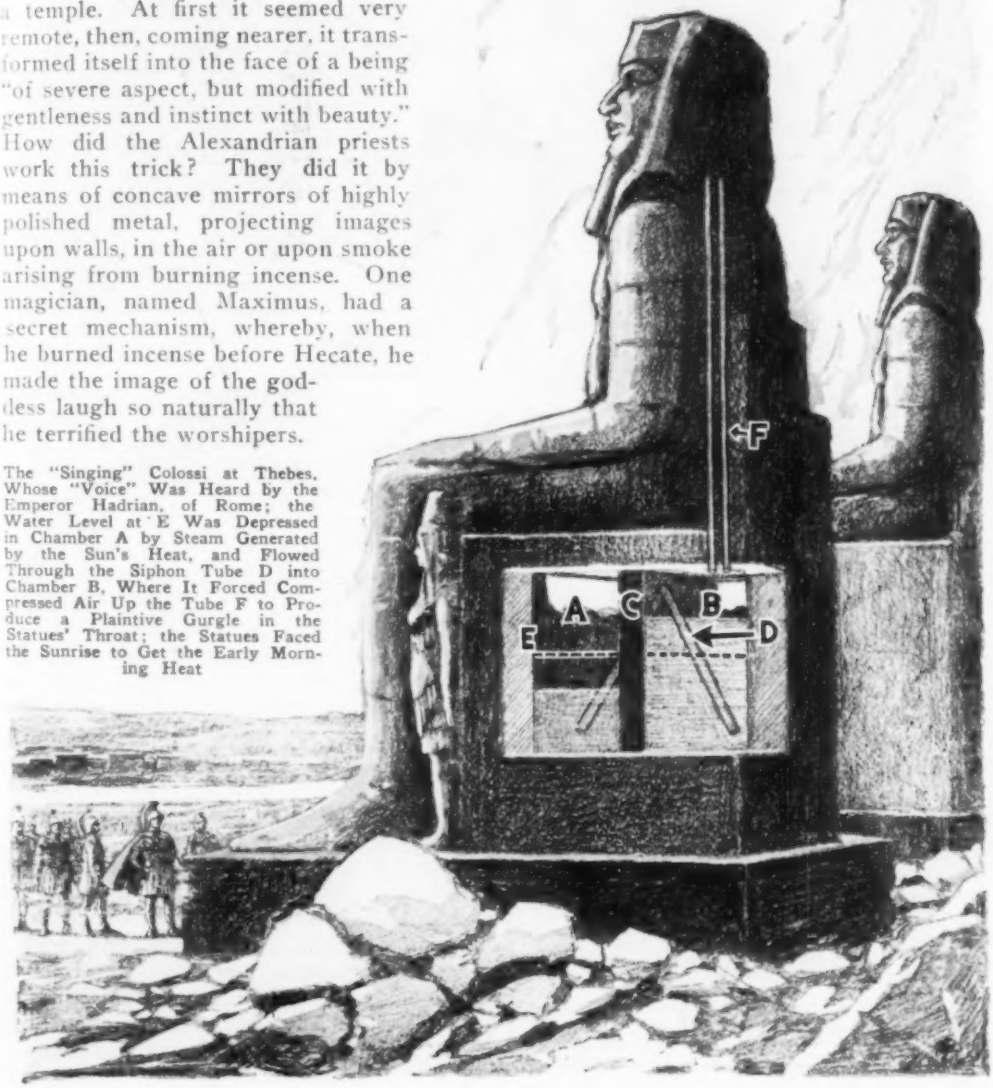
"Oh," says our more skeptical age, "their imaginations were so wrought upon by the magic ceremonial and the unearthly surroundings in those ancient ruins, that they fancied they saw hosts of specters." But this is not quite the explanation of the strange affair.

Benvenuto Cellini was the victim of one of those phantasmagorias kept profoundly secret by the ancient Egyptian priests, which were mainly based on chemistry, acoustics, hypnotism, magnetism, optics, hydraulics and the creation of stage machinery to produce illusions. The famous colossal statue of Memnon, near Thebes, gave out a sound like the breaking of a harp string when the sunlight fell on it at dawn. Even today, there is still a mystery about the cause of this sound. Some classical authors say that at one time the statue greeted the dawn with a human voice. One theory of the origin of Memnon's dawn sounds is that when the solar rays fell on the mouth of the statue, they expanded concealed metallic rods, which

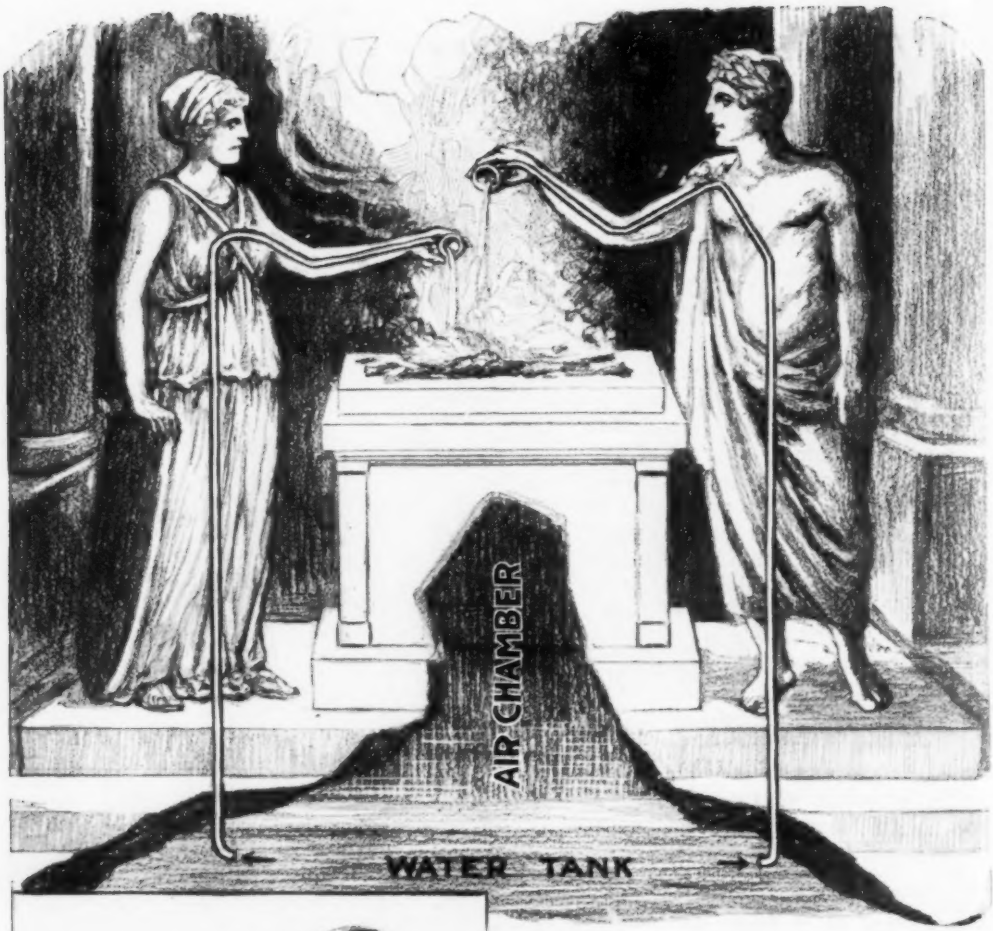
Mysteries of Pagan Magic

acted on a keyboard and gave out the notes.

The keepers of the ancient temples of the Pharaohs could rival the modern movie man in creating startling close-ups. Damascius, a Greek philosopher, was awed by a mysterious mass of light shining on the wall of a temple. At first it seemed very remote, then, coming nearer, it transformed itself into the face of a being "of severe aspect, but modified with gentleness and instinct with beauty." How did the Alexandrian priests work this trick? They did it by means of concave mirrors of highly polished metal, projecting images upon walls, in the air or upon smoke arising from burning incense. One magician, named Maximus, had a secret mechanism, whereby, when he burned incense before Hecate, he made the image of the goddess laugh so naturally that he terrified the worshipers.



The "Singing" Colossi at Thebes, Whose "Voice" Was Heard by the Emperor Hadrian, of Rome; the Water Level at E Was Depressed in Chamber A by Steam Generated by the Sun's Heat, and Flowed Through the Siphon Tube D into Chamber B, Where It Forced Compressed Air Up the Tube F to Produce a Plaintive Gurgle in the Statues' Throat; the Statues Faced the Sunrise to Get the Early Morning Heat



Slot Machine Dispensing Temple Water to Worshipers, and, Above, Statues That Poured Magic Libations

Mechanical devices worked some of the best tricks of the old priests of Thebes and Memphis. In the celebration of the mysteries of the goddess Isis, they announced that victims were carried off by the gods, when machinery had really removed them. Other deceptions were furnished by the aid of sound. There was a labyrinth in or near the temple of Thebes, so built that when the doors were opened, a roar like thunder greeted the worshipers. The priests imitated thunder in subterranean temples to suggest supernatural agencies. Many ancient temples possessed chambers whose existence was known only to the priests, and which served to produce their illusions. Such a chamber was called the "adytum," meaning a "sacred spot not to be trodden on." Today, in the ruins of an ancient temple at Alba, visitors to Rome may see an ady-

St. James the Elder Combating the Diabolical Enchantments of a Magician, from a Sixteenth-Century Print; Below, "Magic Lantern," Which Frightened Besieging Soldiers Who Saw the Glowing Demon by Night

tum in a fair state of preservation. This secret chamber was located under the apsis, or the large semicircular niche sheltering the image of the god or goddess. The priests gained entrance by a secret door. Between this hiding place and the interior of the temple, a number of tubes pierced the walls and by this means a mysterious voice could be heard in any part of the building.

Travelers who have visited the remains of the temple of Ceres, near Athens, where the celebrated mysteries of Eleusis were performed, have noticed a curious fact. The pavement of its cella, or principal part, is rough and much lower than the level of the adjoining porch, which indicates that a wooden floor, on a level with the portico, covered the present floor, and hid from sight a secret vault designed to operate a mechanism, moving the floor. Vertical and horizontal grooves, as well as holes, were made in the side walls of this temple, to facilitate the motion of the temple floor by the aid of pulleys and counterweights. This floor, allied to phantasmagoria of vivid and terrifying scenes, created an illusion in the mind of the person, initiated at midnight into the strange mysteries of the goddess, that he was

plunged into yawning abysses and shot up to the mountain tops, when all the time he was really standing on the level.

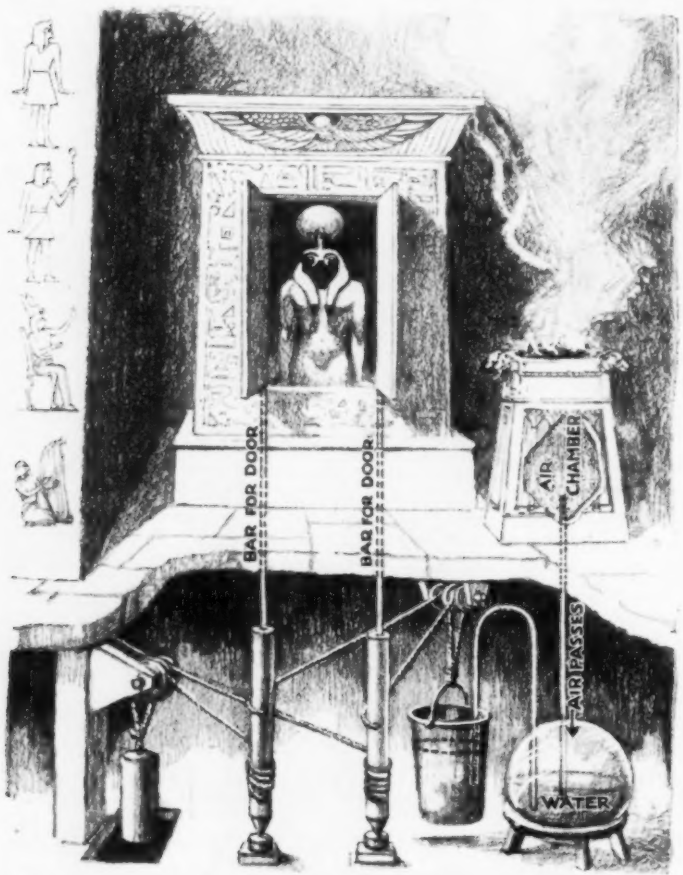
This idea may have been borrowed from India's temple magicians. Apollonius of Tyana, in Asia Minor, a wonder worker who lived in the first century A. D., visited an Indian temple in his travels through Egypt, Mesopotamia and the near east. He was met at the temple doors by Indian priests who led him to the altar of their god, chanting hymns in solemn procession. They struck the earth with batons and the ground moved under them like the waves of a restless sea. The floor rose up to the height of two feet, and then sank to the original level. The striking of sticks was the signal to hidden operators who set machinery in motion elevating the floor of the temple.

Among the buildings uncovered at Pompeii, the famous city buried under a volcanic eruption in Italy, nearly 1,850 years ago, is a temple of Isis, which tells the tale of the mysteries of that Egyptian goddess. It shows a secret stair up which the priests unseen climbed to an opening back of the statue of the goddess, through whose marble lips pretended oracles were given and warnings uttered.

The lands of the magi—old Chaldæa of the Assyrians and the country of the dark white race of the Mediterranean peoples and the Phœnicians—were the home of magic. They are said to have invented a composition resembling gunpowder, and it seems to be a fact that the ancient wonder workers of Chaldæa in wartime actually employed tubes throwing out a brilliant fire with a noise like thunder.

But the magi struck a snag when they tried to deceive the prophet Daniel. The Babylonian king, Nabonidus, challenged Daniel to prove his assertion that the priests of Bel of Babylon were fooling him when they said that the god Bel actually ate and drank offerings of meat and wine. Daniel took up the challenge and set an ingenious trap for the priests. The latter asked the king to order that meat and wine be set out for the god in an underground vault, and to seal the door with his own ring. On the next morning, if he did not find that the god had eaten and drunk the offerings during the night, they would suffer death; otherwise Daniel was to lose his life.

The priests of Bel were not worrying, for they had a secret entrance into the vault by which they were in the habit of coming in to consume the offerings. Daniel merely sprinkled with ashes the floor of

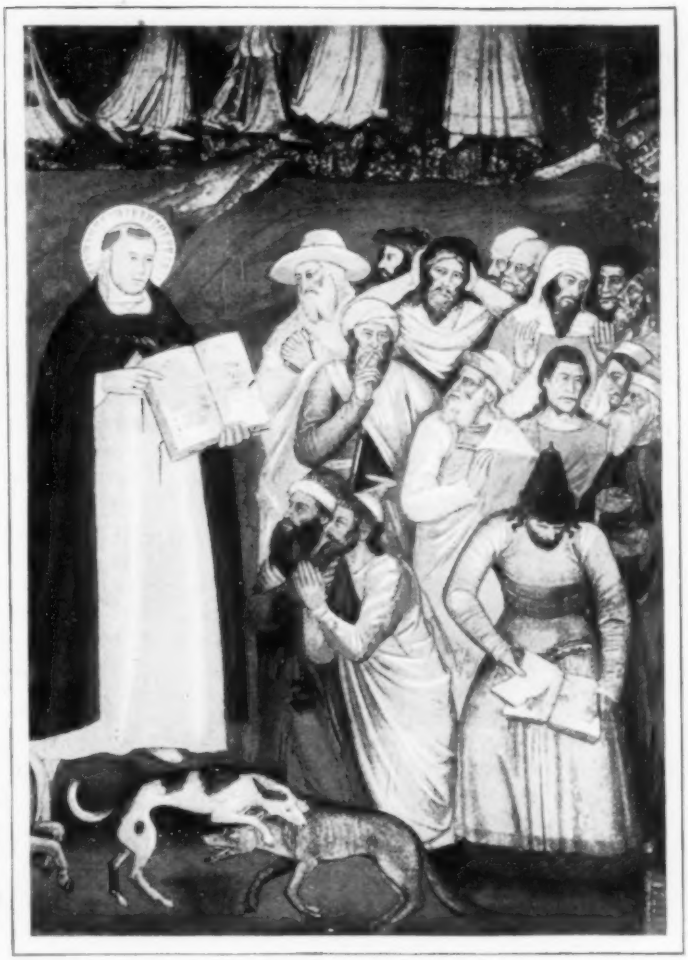


One of the Elaborate Early Compressed-Air and Hydraulic Systems Used to Open Doors, as if by Magic, When Altar Fires Were Lighted

the sealed room in the temple's subterranean regions, and when the king came in the morning he saw the footprints of the tricksters in the ashes.

Some of the best deceptions of the ancient pagans came from their knowledge of sound. The clear and limpid voices of women sounded in the courts of the temple at Delphos, Greece, but there were no singers to be seen. A stone from the river Pactolus gave out trumpet notes which scared away robbers seeking hidden treasure. At Lesbos island, in the Aegean sea, a speaking head of marble uttered oracular responses. Speaking trumpets were known to the temple magicians.

Hydrostatics also entered into temple magic. A marvelous fountain in the isle of Andros discharged wine for seven days and water for the rest of the year. When Augustus, the Roman emperor, came back from the Sicilian wars, a spring of oil was artificially caused to burst forth in Rome to welcome his return. In the city of Elis, at the annual feast of the wine god Bacchus, three empty urns filled themselves with wine, while weeping statues and perpetually burning lamps were all ancient pagan applications of the effects of the equilibrium and pressure of fluids.



Sixteenth-Century Print, Showing Group of Arabian Magicians Repenting of Their Sorceries; One Is Apparently Destroying His Books of Magic

Hero, of Alexandria, the son of a cobbler, gave great help to the temple magicians of Egypt, 120 years before the birth of Christ. He was the first man to use steam to give a rotary movement to a hollow sphere. He describes an apparatus to blow a trumpet on the opening of a temple door. This overawed temple worshipers not in the secret. When the temple door opened, a system of cords, rods and pulleys caused a hemispherical cap, to the upper part of which the trumpet was attached, to sink into a vessel of water. The air, compressed by the water, escaped through the instrument, causing it to sound musical notes.

In another temple, he set up an apparatus which automatically opened the doors, when the fire was lighted on the altar and shut them when the fire was extinguished. The altar was hollow, and when a fire was lighted, the air contained in the interior expanded, and began to press upon the water with which a globe, situated underneath, was filled. The water then rose through a bent tube that conducted it to a pot into which it fell. The pot was suspended upon a cord and,

when the water from the globe entered it, the weight was increased and it sank, pulling upon the cords wound round the cylinders in such a way as to open the temple doors.

This is how the doors were made to close automatically: The bent tube connecting the globe and the pot formed a siphon, the longest branch of which entered the globe. When the fire on the altar went out, the air contained in the interior of the hollow altar and in the globe cooled and diminished in pressure. The water in the pot was then drawn into the globe, and the siphon operated until all the water in the pot had passed over to the former. As the pot grew lighter, it rose under the action of the counterweight, and the latter, in its descent, closed the doors by pulling on the cords wound around the cylinders.

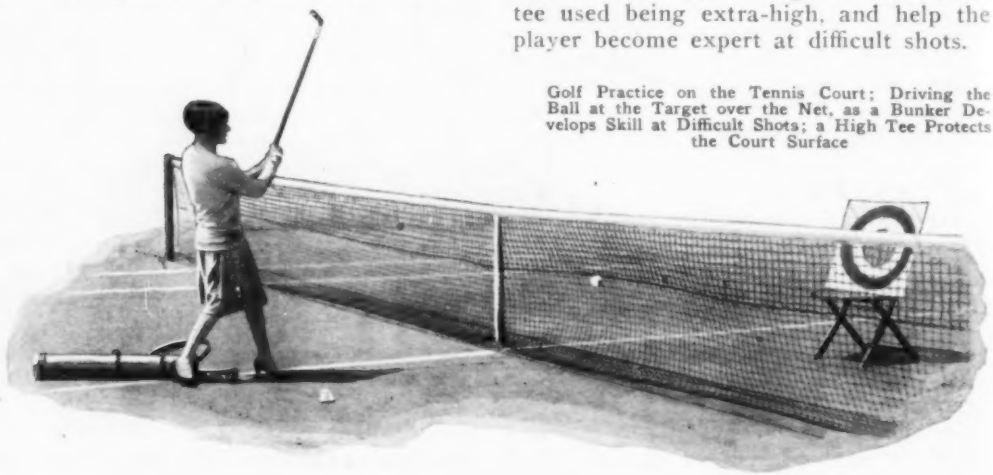
Hero also tells of an altar where, when a fire was lighted, statues at the sides poured out libations. The statues were on a pedestal and the altar closed in all sides. A central tube connected the pedestal with the altar, and other tubes led through the statues to cups held in their hands. Water was poured into the pedestal through a hole, which was then at once stopped. When the altar fire was lighted, the air inside expanded, entered the pedestal through the central tube, and forced out the water, which passed up the tubes into the cups in the hands of the statues. They poured out libations as long as the altar fire was alight. When the fire went out, the libations stopped, but as often as the fire was lighted, the libations flowed.

MYSTERY OF "GROWING" ROCKS EXPLAINED BY FREEZING

Numerous inquiries are received by the geological survey from various parts of the country, asking for explanation concerning the apparent tendency of rocks to "grow" in cultivated and other fields. Farmers report that bowlders appearing at the surface are removed, only to be replaced a few seasons later by others. That the farmers' observations are true, the survey realizes, but the rocks, instead of growing in the usual sense of the word, are simply pushed out by the alternate freezing and thawing of the ground. Ice expands when freezing. If it forms under the rock, this tends to push it up and, when ice thaws, the bowlder does not settle back to its original position, as loose soil and other obstructions prop it up. In time, this process may force the stones to the top of the ground. Often these are larger than those that were taken out at first, giving greater foundation for a belief that the rocks actually do grow.

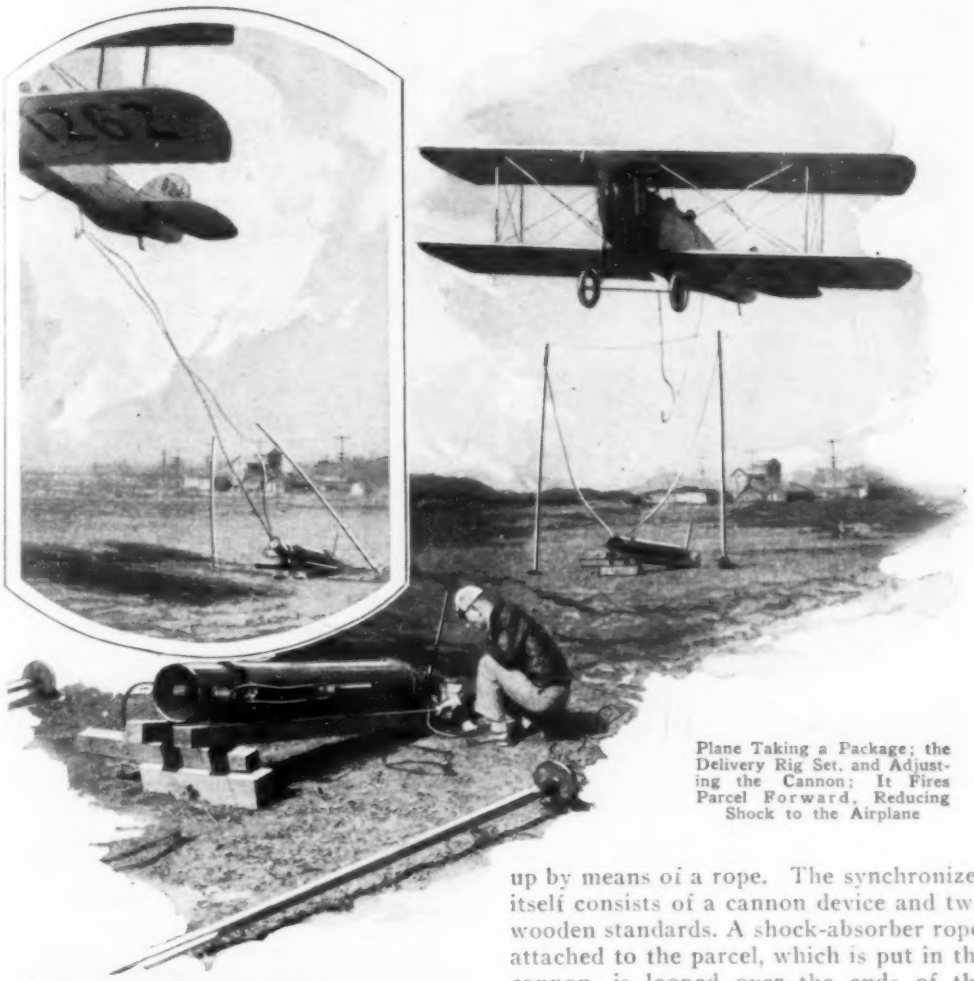
TENNIS NET AS GOLF BUNKER HELPS IMPROVE GAME

Golf practice on the tennis court has been adopted by a California player to give her skill in getting out of sand traps. The net serves as a bunker, and the ball, placed on a tee, is aimed at a bull's-eye target on the other side of the barrier. The trials do not damage the court, the tee used being extra-high, and help the player become expert at difficult shots.



Golf Practice on the Tennis Court; Driving the Ball at the Target over the Net, as a Bunker Develops Skill at Difficult Shots; a High Tee Protects the Court Surface

AIRPLANE PICKS UP PACKAGES SHOT FROM CANNON



Plane Taking a Package; the Delivery Rig Set, and Adjusting the Cannon; It Fires Parcel Forward, Reducing Shock to the Airplane

After years of experiment, a Kansas City aviator has patented a device—a "synchronizing cannon," he calls it—that will enable an airplane to pick up gasoline, air mail, express packages, or other parcels weighing up to 100 pounds while flying at top speed. This feat is not so simple as it sounds. Without such a device an attempt to pick up even a few pounds from a flying field would result in throwing the plane off balance and possibly end in a crash. By means of the cannon, the inventor recently picked up a dozen eggs without a single one being cracked or broken. For demonstration purposes, the airplane was equipped with a long retrieving hook, suspended from the landing gear and drawn up by means of a rope. The synchronizer itself consists of a cannon device and two wooden standards. A shock-absorber rope, attached to the parcel, which is put in the cannon, is looped over the ends of the standards. As the hook takes hold of the rope when the plane passes over it, the standards are pulled over, causing an electric contact which releases a spring. This causes the parcel to be hurled from the mouth of the cannon at a speed of 500 feet a second. As the airplane zooms upward the shock-absorber rope takes up the recoil and lifts the parcel into the plane.

THE BIGGEST SILVER BELL

What is reported will be the largest silver bell ever cast has been ordered for the British warship "Nelson." It will weigh 168 pounds and is being made by an old firm of silversmiths.

Where a Locomotive Takes the Air; Swinging Work Engine across Canyon on Steel Cables

ENGINE RIDES ON STEEL CABLE ACROSS DEEP CANYON

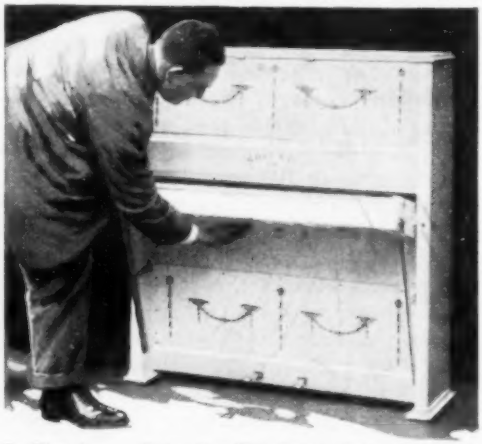
An aerial cable was employed to good advantage near Yakima, Wash., recently in transporting supplies for building a government dam across a canyon several hundred feet deep. The wire was so strongly adjusted that it safely supported the weight of a small locomotive.

WIRED WIRELESS SAVES ROAD MANY MILES OF WIRE

Utilizing wired wireless, or a carrier-current system for long-distance telegraphy and telephony, the Canadian National railroad is saving 24,500 miles of wire—almost enough to girdle the earth at the equator. Eventually the system, which now extends from the headquarters offices at Montreal to Winnipeg, Man., will be continued westward to Vancouver, on the Pacific coast. The part already in service, without adding a single mile of wires and pole line, has added ten two-way telegraph channels, two composite Morse direct-current telegraph circuits and a long-distance telephone circuit. The latter has the distinction of being the pioneer telephone line between eastern and western Canada. It is not to be used for commercial purposes, however, but is reserved for railroad business. The carrier-current system utilizes radio tubes and equipment to broadcast the voice or telegraph signals, but, instead of sending them out into the air, they follow the company's telegraph wires. One unusual thing about the wired wireless is that it is not stopped by breaks or storm trouble, nor is it bothered by the northern lights, which frequently put east-west telegraph lines out of business for many hours. During a recent flood, when a large section of the telegraph line, including both wires and poles, was covered with water, the carrier current got through, when all the usual telegraph facilities were at a standstill.

PIANO WITH FOLDING KEYBOARD SAVES APARTMENT SPACE

When closed, a piano with folding keyboard, recently introduced in England, has a depth of but ten inches. It is especially adapted to yachts, bungalows, small apartments or other places where space is limited. It is about as large as a small bookcase when closed.



It Slips into a Space but Ten Inches Deep; the Tiny Piano with Folding Keys

FAME and FORTUNE Awaiting INVENTORS

The Splash Has Been Removed from Salad-Dressing Mixing by This New French Device, Which Insures More Complete Combination of the Ingredients without Any Loss

AN English society woman not long ago took out a patent on a new burglar alarm. Every door and window in the house was electrically connected to a motor driving a phonograph turntable. If a burglar tampered with any of the connections, the motor would be started and the phonograph begin to play a record in which a whole pack of savage dogs barked lustily.

With the same expenditure of mental effort and ingenuity, she might have produced the automatic phonograph that changes its own records and promises to earn a fortune for its inventor.

The problem of what not to invent grows more acute every year as the flood of patent applications pours into Washington in constantly increasing streams. They have already reached the total of 80,000 or more a year, and at least 50,000 are being granted. Within a short time the patents issued will reach 1,000 a week.

Out of that vast number, thousands are doomed to disappointment, for they have patented things which the world doesn't want, and therefore find no market awaiting them. The energy wasted on ingenious and impractical inventions is enormous. To reduce such losses, a co-operative organization of English inventors compiles lists of things which, in their opinion, would prove useful and commercially practical, and issues them each year. Their latest annual booklet, "What's Wanted," lists 151 ideas of things which appear to be urgently needed.

Take umbrellas, for example. At first glance that doesn't appear a fruitful field for effort, but the "Institute of Patentees," as the organization is called, points out that both fame and fortune await the inventor who perfects a practical folding umbrella, which can be condensed in a small enough space to drop into the overcoat pocket.

Or perhaps someone can produce a machine that will lay bricks and eliminate the tremendous amount of hard hand labor involved in this occupation. A mechanical brick layer, as the institute sees it, would require the services only of an attendant to keep it supplied with bricks and mortar.

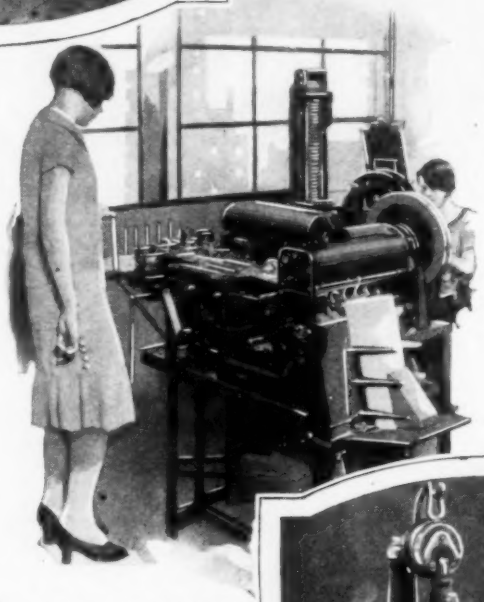
The list of proposed devices range from the simplest to the most complex, but al-

ways either a time, labor or material-saving is emphasized as the reason why they would prove both practical and profitable. A method by which bottles could be uncorked without using a corkscrew and destroying the cork is cited as an example of a simple thing to save material. A device for turning the pages of music on a music rack would save time. A fountain paint brush, holding a couple of pounds of paint at a filling, would be a labor saver.

There is a demand for a non-fouling paint for ship bottoms which would repel barnacles, a cheap and practical device for stirring the contents of pots and pans on the kitchen stove, and even an unbreakable shoe lace would bring a handsome award.

Always the institute stresses practicability, though its efforts appear to have done little to stop the flood of weird and wonderful things that appear at every inventors' show. A recent exhibition had, among its displays, a machine for catching ghosts, though the proud inventor who demonstrated it failed to explain what he planned to do with the ghosts after they were caught! Beside it was a vast device, as complicated and probably about as expensive as a battle tank, designed to destroy moths.

The best invention, usually, is the one inspired by necessity. A housewife who noticed that, when the perambulator was brought in after a rain, it dripped muddy water on her hall floor, perfected a simple tray to be placed under the wheels, and had no trouble selling her patent on a royalty basis. Another mother, discovering the baby woke up when lifted from its buggy, invented a detachable perambulator body which could be carried upstairs without disturbing the infant.



Some industrial fields have always been quick to take over worthwhile ideas and develop them, while others are slow to absorb new ideas. Transportation has al-

Three Fertile Fields, Transportation, Top, Labor Saving, Center, and a Non-Kinking Coil Guard for the Telephone Cord

NEW IDEAS BEING SHOWN AT INVENTORS' MEETING

Fireproof Asbestos Suit, Gloves and Dust and Fire Masks Demonstrated at a Los Angeles Industrial Conference

An Inventor's Model of His Railroad Crossing Gates, Which Work by Gravity and Eliminate the Services of an Attendant; Transportation Offers a Good Field for New Ideas

Demonstrating a Small Model of a Safety Device for Rescue Work by Firemen, Left, and a Bullet-Proof Windshield, Above: the Invention of Glass That Is Safe against Both Bandits and the Dangers of Accidents Is of Importance to the Automobile Industry; Some Cars Are Now Equipped to Prevent Serious Injuries to Their Passengers in Event of a Crash

The Automatic Printing Telegraph, Operated from a Typewriter Keyboard, Is Typical of Inventions That Have Won Their Owners Both Fame and Fortune

ways been a good field for inventors. Railroad safety devices, new signals, and even an improvement on some minor part of a car or locomotive are soon placed in service. The modern freight car, for example, is a collection of patented parts that represent the work of many inventors. There are patent doors with patent locks, patent roofs and sides, and all the mechanism beneath the floor has been slowly evolved bit by bit as inventors have added and improved.

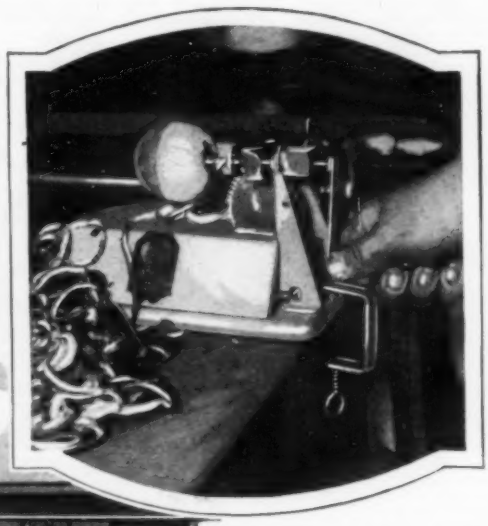
At the other extreme in size, cameras have offered financial awards. The inventor of the simple device known as the autographic back, which permits writing on and dating each picture as it is taken, is reported to have obtained $300,000 for his patent. Another inventor quite recently brought out a camera in which it is impossible to take two pictures on the same film, for the action of taking one automatically moves the film up for the next exposure.

Considering the number of people who have hunted in vain to find a permanent paint or polish for stoves, it isn't hard to compute the possible financial award for the man who may succeed. A similar reward may await the man who invents a non-slippery floor polish, an unbreakable, unblurable and flexible glass, or a means of cleaning windows by machinery.

The inventive genius who perfects a chemical composition to absorb the carbon monoxide and carbon dioxide which make the air of a closed room unhealthy after occupancy for some time, is scheduled to reap his reward, for such a discovery would have widespread use in many other fields. There are fortunes also for the first to perfect 100-per-cent hole-proof stockings, and for the man clever enough to solve, once for all, the problem of pipes that freeze in winter.

Some housewife may discover how to raise cakes and bread without the use of yeast or baking powders, and another may be the one who will solve the problem of laying carpets without the use of tacks, and in a manner that will permit their being taken up and cleaned as easily as loose rugs are removed.

Typists will appreciate an attachment



Corkscrew That Keeps the Cork from Expanding, so It Can Be Replaced; an Automatic Picture Studio and, Top, a Vegetable Peeler for the Home

...r the typewriter that will sound a warning signal just before they reach the bottom of the page. Some of the other things the institute sees a future for are a less brittle and more easily repaired tortoise shell or imitation tortoise shell, and a floor covering that will permit furniture to be moved at will without the necessity of lifting it.

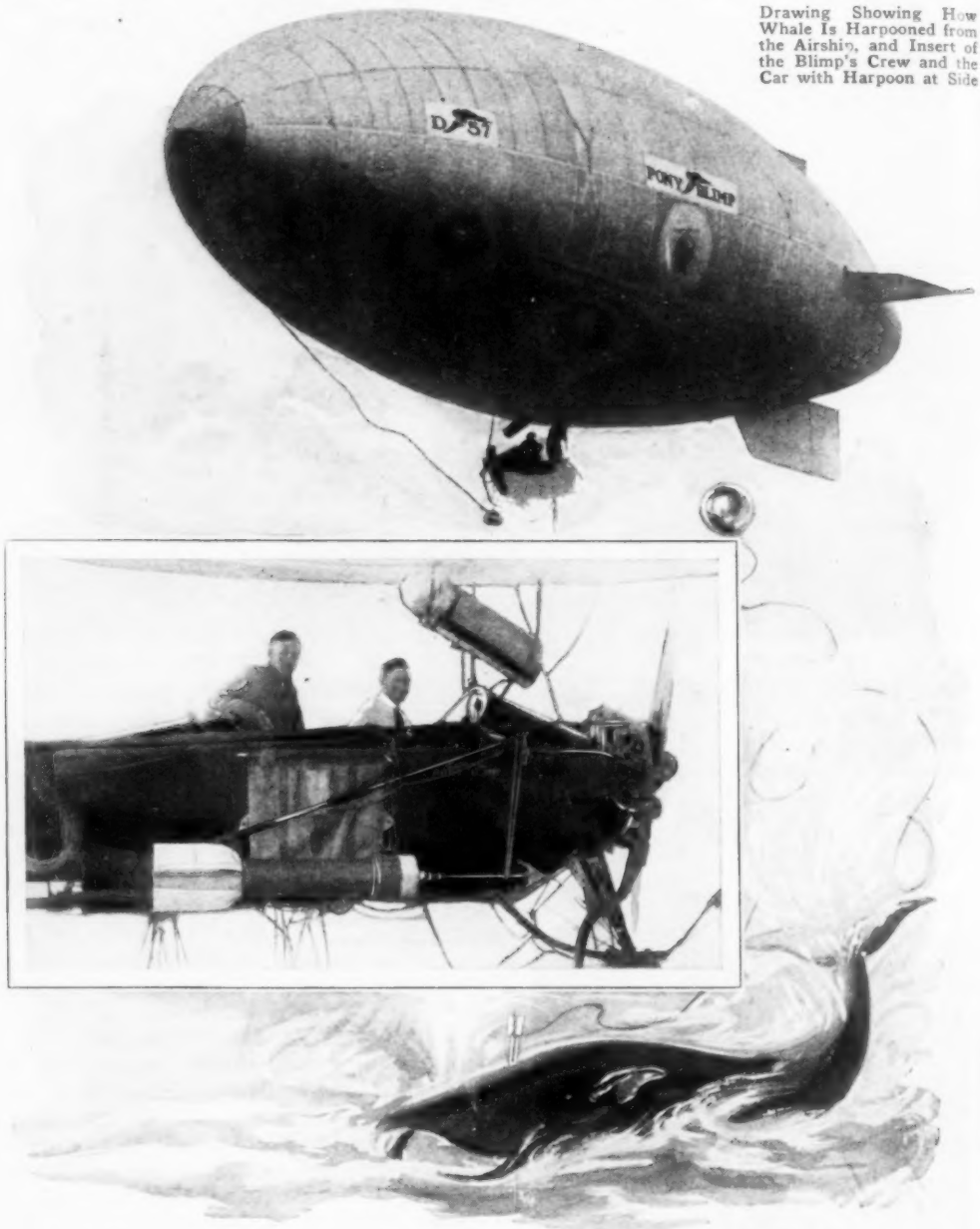
New and improved devices for communication, for saving time and labor in offices, factories, homes and on the farm are almost sure of being well received.

One which probably would find immediate favor in street-railway circles is an arrangement which would prevent passengers stepping off a car while facing in any direction except that in which the car is moving. Getting off backward is a cause of many accidents. Photographers would welcome a type of plate holder that would prevent the admission of any light to the camera while the holder was being inserted or removed. There is also a demand in the photographic field for self-toning papers and better and quicker developing processes. The young Russian inventor who recently sold an automatic camera in New York for $1,000,000 is a typical example of the high rewards paid for inventions which possess such a wide-spread appeal and so many various fields of utilization as pictures do.

Even the lowly collar button can stand further improvements, as there probably would be an excellent field for one of some other design than the pivoted-head type, which could be inserted and removed without damaging the collar.

The point for the inventor to remember is that the cost must not be out of proportion to the benefits derived and that the saving in time, labor or material must be so apparent that the invention will overcome the sales resistance it will meet.

HUNTING WHALES FROM AIR LATEST FLYING IDEA



Drawing Showing How Whale Is Harpooned from the Airship, and Insert of the Blimp's Crew and the Car with Harpoon at Side

Small blimps may supplement boats in the whaling industry if plans of a California man materialize. He proposes to use the small dirigibles to scout over the sea and locate the whales. A harpoon would be thrown from the gondola of the airship and attached to the dart would be a small rubber buoy which would be inflated from a compressed-air tank. This buoy would serve as a marker for the guidance of men in the killing boats as it would rise every time the whale rose to blow during its fight for life and when it died. Tests have shown that the plan has practical

possibilities. A small dirigible was flown out over the Pacific off southern California. A raft, towed by a motorboat, was used as a target. In eight throws out of twelve, a harpoon stuck into the raft, although it was towed in a zigzag course as the motorboat sped along at a rate of twelve miles an hour.

PAINT FROM WOOD

Making roof paint and other by-products from pinyon wood is the interesting process a western man has patented and with which he has had considerable success. His homemade outfit has already yielded a return of $1,500, it is said. A cord of the wood will produce forty gallons of paint and a like quantity of other materials, including creosote, turpentine and similar fluids, in five hours. One of the first stages in the process is to cook the wood and extract the materials in a retort specially constructed for the purpose.

VACUUM TO CLEAN EXTERIORS KEEPS BUILDINGS BRIGHT

As a substitute for washing, a vacuum cleaner designed by a German inventor, to keep the exteriors of buildings free from dust and soot, operates from a lighting socket and is easily carried about. Extensions are provided for reaching nearly all parts of the walls from the windows. The outfit is also suitable for cleaning the inside of autos and for household use.

Cleaning the Outside of a Building with the Vacuum Apparatus; It Operates from a Lighting Socket

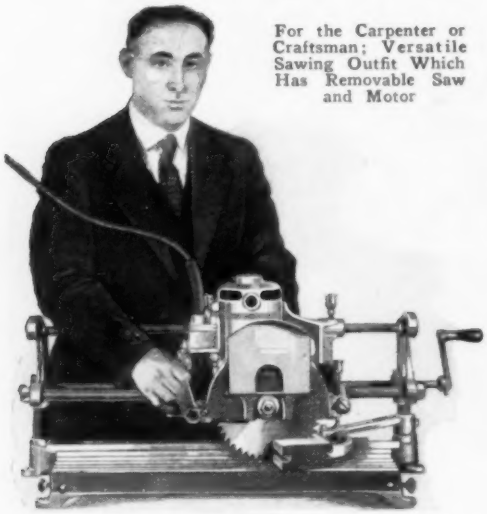
As Pupils Speak into the Mouthpieces, a Visual Reproduction of the Sound Waves Is Made in Table Cabinet

PICTURES OF VOICE HELP DEAF IN LEARNING SPEECH

Sound is an almost unknown quantity to a person who is extremely deaf, consequently it is difficult for teachers of deaf children to make them use their vocal organs in the proper way. This task has been simplified at a Pennsylvania school with the aid of a small instrument which translates the vibrations of the voice into visible light waves. Thus, by looking into the mirrors of the unit, the pupil may see the "picture" of the teacher's voice and then strive to make an exact copy of it by his own tones. The apparatus is said to have improved both the volume and tone of the deaf children's voices as well as aided in making their progress in intelligible speech more rapid.

¶Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine.

PORTABLE AND STATIONARY SAW COMBINED IN ONE



For the Carpenter or Craftsman; Versatile Sawing Outfit Which Has Removable Saw and Motor

Constituting a small woodworking plant in one unit, a combination stationary and portable saw, now on the market, has a stand for single and double angle cuts as well as for ripping up to depths of two and three-fourths inches. The saw may be quickly removed from the frame when it is to be used as a portable tool. Power is supplied through a one-half-horsepower motor operated from a house socket. The outfit is also supplied with a jigsaw attachment, and a drill chuck or emery wheel may be connected, if desired, after removing the saw from the arbor.

OVER QUARTER MILLION VOLTS CARRIED FOUR HUNDRED MILES

Carrying electric power of 380,000 volts over a 400-mile transmission line without leakage (corona) losses is the feat accomplished by German engineers in a new overhead system. Power is generated at both ends and at intermediate points and the system is thus a co-operative combination, coal being used for generation at the west-German end and hydroelectric plants at the southern end, especially in the summer and fall when the Alpine streams furnish abundant water. The salient feature of the installation is the use of specially designed hollow metallic tubes for conductors instead of solid-copper wires, which would have to be of enormous size, and hence costly. The line cost about $38,000 per mile, or about the same as a railroad, but as hundreds of millions, and eventually billions, of kilowatt-hours will be supplied, the price per unit to consumers will not be abnormal. The masts carrying the conductor are 100 feet tall and occupy a ground space, at their base, about thirty-three feet square.

DE-PUCKERING PERSIMMONS

By sealing them in waxed papers, persimmons are freed of their bitter taste while in shipment, a California professor has found. This is believed to be due to the action of gas liberated from the fruit. The same sweetening effect is obtained by placing the persimmons in tightly sealed containers. There are various vapors and gases that will remove the "pucker," but it was found that these sometimes gave the fruit an objectionable taste and also discolored it.

SAFETY LADDER FOLDS FLAT LIKE AN IRONING BOARD

Safety and convenience are combined in a stepladder that folds up like an ironing board, when not in use, and weighs but fifteen pounds. It is said to support a load of 500 pounds without hazard, a rubber base prevents slipping, and the top step is protected by hand and leg braces. It is fifty-two inches high.

Ladder Folded and Extended; It Collapses Flat like an Ironing Board

The Huge Manta, or Giant Ox Ray, Largest of All the Ray-Fish Family, Yields a Fine Quality of Leather, Though It Has Not Been Found in Sufficient Numbers to Start an Industry

By HAMILTON M. WRIGHT

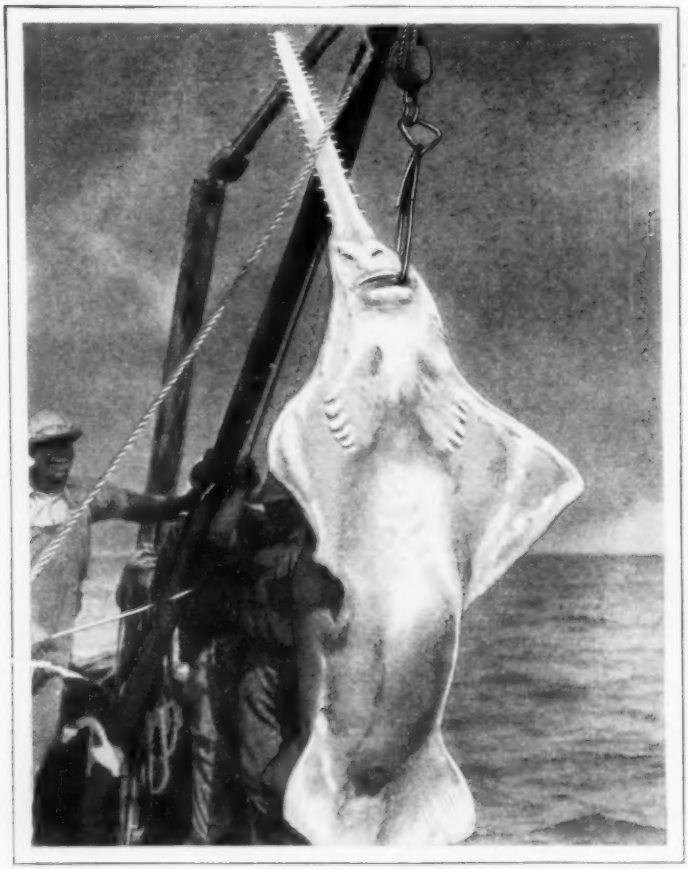
IF a buyer had been told a few years ago that inexhaustible supplies of the finest leather were to be had from the sea, requiring no pasturage, superintendence, or other financial outlays, he would have considered his informant an idle dreamer.

Wholesale leather dealers, however, are now obtaining marine leather from man's traditional enemy, the shark, and the sawfish, a huge member of the ray family and closely allied to the sharks, has recently been added to the list of commercial leather producers. It yields a leather pronounced quite as valuable, commercially, as that of the shark. Shark leather, owing to its peculiar fabric and crossweave, has far greater strength than most other animal leathers. When treated and tanned, it becomes very soft and pliable, yet tough, and shows great resistance to stretching. Made into shoes, it is as nearly indestructible as any material which can be manufactured into comfortable footwear. It is also finding use for upholstery and luggage covering.

Many sharks yield leather of beautiful hue. The leather of the dreaded leopard shark, with its exquisite markings, can be used in the most ornamental upholsteries and is so tough as to be practically indestructible.

The abundance of sharks in many parts of the tropical oceans, the ease and economy with which they can be captured, as well as of the proximity of the shark-fishing stations to ports from which the hides can be exported without reshipment to the great leather centers, are attracting many to the possibilities of shark leather as a world-wide industry. That shark leather presents the basis of a big industry not possible in the case of many other marine animals is pointed out. Though other creatures of the sea, such as the walrus, a mammal, yield valuable pelts, their quest is often attended by numerous difficulties and dangers.

The walrus which yields a valuable pelt is generally found in arctic and antarctic waters, remote from lines of travel and therefore reached at considerable expense. While the aggregate yield of walrus pelts amounts to considerable value, the supply comes in slowly from scattered stations.



Landing a Giant Sawfish off Key West, Where the Sea Yields Many Specimens Suitable for Conversion into Leather

Walruses are not taken in sufficient numbers in any one location to render their hunting commercially attractive, and the catch is usually limited to certain seasons of the year. This condition is true of whales, porpoises and many other forms of marine life which, though existing in large numbers, are normally so thinly distributed as to be unattractive to a large industry. Sharks, however, are often found localized in vast numbers where the food supply is abundant and where their depletion through fishing is made up by other sharks attracted by the presence of food.

Several years ago a shark-tanning station was established on Big Pine key, one of the larger islands in the chain which extend from the southern tip of the Florida peninsula. Another station has recently been started in the vicinity of Key West. In order to see at first hand this strange industry, the writer and a companion made an entire circuit of the Florida keys, and watched the shark fishermen at work.

The annual catch of edible fishes in this region reaches many millions of pounds. It is no unusual thing in the Florida keys for sharks to cause a fisherman who uses hand lines to abandon his anchorage for the day, so vicious and persistent is their attack on the fishes which he and his men are pulling in. Although the sawfish will seldom rob fish lines, it is scarcely less detested by fishermen.

All sharks and sawfishes large enough for commercial leather are caught in gill nets. Hand fishing or spearing would be too slow. The capture of a big shark with a heavy line is strenuous and often dangerous. A big shark can tow an ordinary-sized launch for several hours. It could easily pull a man from a wharf or moored launch, while, if an attempt is made to snub the line and bring it up short, the shark will bring its weight against the rope and break the heaviest sash cord as though it were a piece of cotton thread. Gill nets, therefore, furnish the only expeditious means of commercial shark fishing. They are enormous affairs, several hundred yards in length, twenty feet or so in depth, buoyed up at the top with cypress plugs and weighted at the bottom with lead.

When a shark is caught he raises a fearful commotion in the net. He lifts the leaden slugs from the bottom as he surges forward and pulls the cypress buoys beneath the water. The net of heavy cord slips neatly behind his gill crevices, restricting his breathing. When hauled to the surface, the sharks are almost invariably dead, having drowned themselves in

A Day's Catch of Sharks and Sawfish on a Landing Platform at a Shark Station, Ready to Be Flayed as the First Step in Producing Marine Leather; Below, a Party of Fishermen Are Preparing to Cast Their Shark Nets Sixty Miles off Key West

In Their Desperate Fight against the Nets, the Sharks Drown Themselves and Are Pulled Aboard without a Struggle; Here Is a 1,600-Pound Specimen Caught by the Key West Leather Fishermen; It Belongs to the Leopard-Shark Family; Shark-Fishing Industries Are Thriving in Several Parts of the World, Including Australia

their frantic efforts to escape. As the meshes of the net are of similar size, there is considerable uniformity in the size of the sharks which are brought to the surface when the nets are hauled up in early morning. Sharks prowl around most ac-

Worth a Dollar Each When Sold for the Chinese Food Trade; a Pair of Shark Fins

tively at night, and usually follow the tide. Fishermen are well aware of this habit. As many as three hundred big sharks have been taken in a single night at Big Pine, but there is no record of any man having been attacked by sharks in these regions.

The sawfishes, which are more lethargic than the sharks, are found alive in the nets. They are hauled to the surface by a block and tackle on the fish boat, and are then clubbed to death. Their long, flat snouts are sawed off, and the huge bodies, weighing from 600 to 1,900 pounds, and from thirteen to twenty feet long, are hoisted upon the big, wide fishing boats, the nets are raised from the water and also hoisted aboard, and the launch sets out for the skinning station.

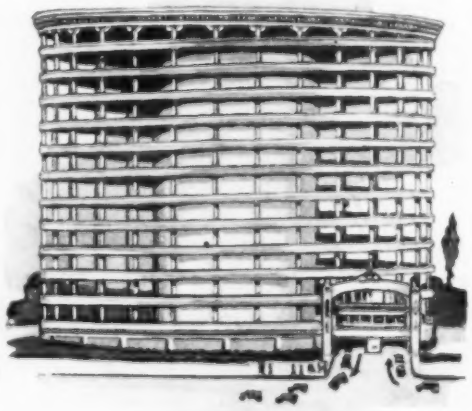
Arrived there, the nets—the fishermen's first care—are raised to the docks and spread on racks to dry and also for the repairs which are necessary in the capture of such powerful and savage fish. Then the great bodies are hoisted to the dock by winches.

The skin of both sharks and sawfishes is then rapidly flayed from the body. The operation requires only a couple of minutes by expert hands, and the hide is placed, inside out, over a cylindrically shaped table and all adhering flesh is carefully removed. It is then salted and set out in the sun to dry for twenty-four hours, when it is removed to the shed to await export to the north, where the final touch in finishing is applied. When salted and dried, the flesh of the shark is of the consistency of dried codfish and almost pure white in color. The oil, it may be observed, is almost entirely confined to the liver, and is not apparent in the flesh. The head, when boiled, yields a large amount of glue, while from the pancreatic gland a rich content of insulin of value in the treatment of diabetes may be taken. The enormous bones of the jaws, when stripped of flesh and cured, make trophies for which good prices are paid, while walking sticks can be made of the backbones.

The ordinary run of sharks taken in the Florida keys yields a pelt much smaller than that of a grown steer, thirty-six to forty inches each way being a fair average. The enormous head and great tail, which add immensely to its size, do not figure in the cutting of leather, which is taken from the larger circumference of the body. The sawfish, being characterized by great girth, yields a larger pelt than the shark.

SPIRAL SKYSCRAPER FOR AUTOS HELPS PARKING PROBLEM

As a solution of the automobile parking question, a western inventor has devised a skyscraper roundhouse for storing cars. It is simply a large spiral with wide passageways for running the autos up or down, and with storage space for many machines on each floor. The spiral has an easy grade, requiring little effort to ascend, and exits may be made in safety.



Drawing of the Proposed Spiral Garage for City Parking; Wide Storage Space Is Provided on Each Floor

Model Flying Field and Tiny Ships Closely Fashioned after the Real Planes; Part of Collection of an Aviation Enthusiast Who Marks Changing Styles in Aircraft with His Faithful Replicas

COLLECTION OF MODEL PLANES SUGGESTS NEW HOBBY

Aviation has introduced many new ideas, among them a possible addition to the wide field of collecting. An eastern enthusiast has assembled an interesting group of cardboard models of real planes on a replica of a landing field. The tiny ships are fashioned to the scale of about a quarter of an inch to the foot, and present a graphic picture of the development and progress in flying.

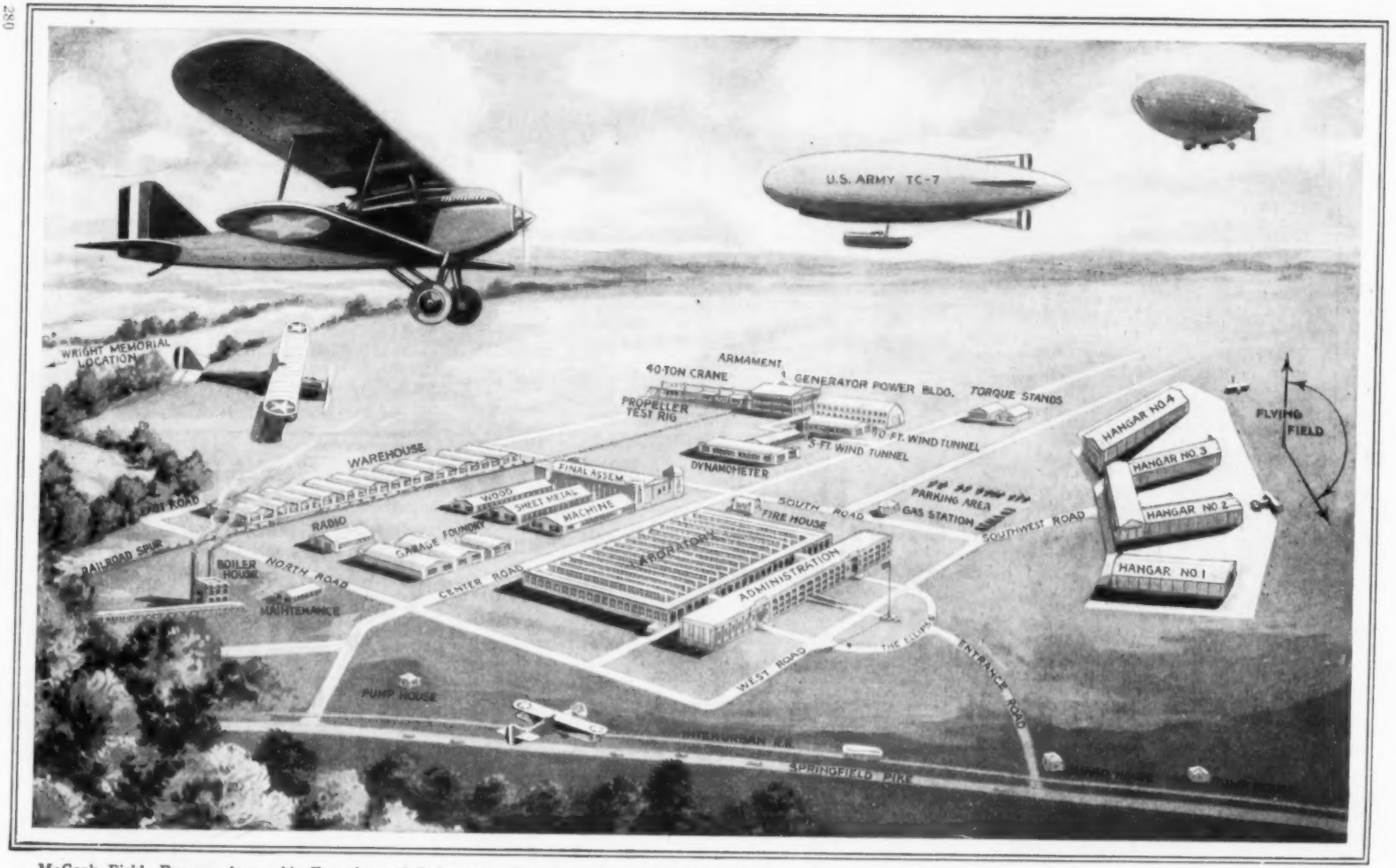
A PULMOTOR FOR TREES

Trees weakened by insufficient oxygen, due to obstructions or surplus water about the roots, are restored to vigorous growth by a special "pulmotor" treatment which is said to have been administered with good results. It consists in forcing air currents about the roots. This is done with the aid of a compressor operating at about 100 pounds' pressure and a long hollow "gun" with a shut-off. The gun is forced into the ground to the depth of the roots as far from the tree as the ends of the branches. The air is then turned on and off, the action of the air being visible to the operator by the rise and fall of the earth. This draft not only supplies the tree with needed oxygen, but drives away poisons that have accumulated in the soil. Leaves which have withered resume their freshness in a short time, and trees that apparently were dead have taken on new life after forty-eight hours of the pulmotor treatment.

PEELER AND CORER FOR APPLES SPEEDS MAKING PIES

One of the appliances which saves time and labor in large bake shops is a mechanical apple peeler, corer and slicer. It prepares the fruit for pies.

To Help the Pie Baker: Apple Corer and Peeler for Preparing Large Quantities of Fruit



McCook Field, Famous Army Air Experimental Laboratory, Has Been Superseded by Wilbur Wright Field. Above, the First Complete and Systematically Planned Laboratory, Factory and Flying Ground; It Is Built on the Site Where the Wright Brothers Did Their First Dayton Flying

PAPER FROM WILD PINEAPPLE

For many years, natives of Brazil have relied upon the fibers of a species of wild pineapple to supply them with twine for their fishing lines and nets, and now government scientists here have turned to the plant as a possible source of paper, suitable for the printing of bonds and currency. Tests by the bureau of standards have shown that the product has a bursting strength about the same as that specified for the finest papers made from rags or rope. At present, there is no great cultivation of the pineapple plant, but investigators believe that an abundant supply could be obtained should the demand arise. Aside from its fibers, the growth is said to yield valuable gum, oil, balsam, pitch and acid.

A Living Shelter for the "Old Oaken Bucket"; About 15,000 Plants Are Included in This Well-House Display

TINY HOUSE OF LIVING PLANTS POPULAR PARK DISPLAY

Containing about 15,000 live plants, a model well house is one of the attractive features of a park in Buffalo, N. Y. Inside is an "old oaken bucket" with roller and crank. The house is about twelve feet square and approximately the same height. Each supporting pillar for the roof contains nearly 1,200 plants.

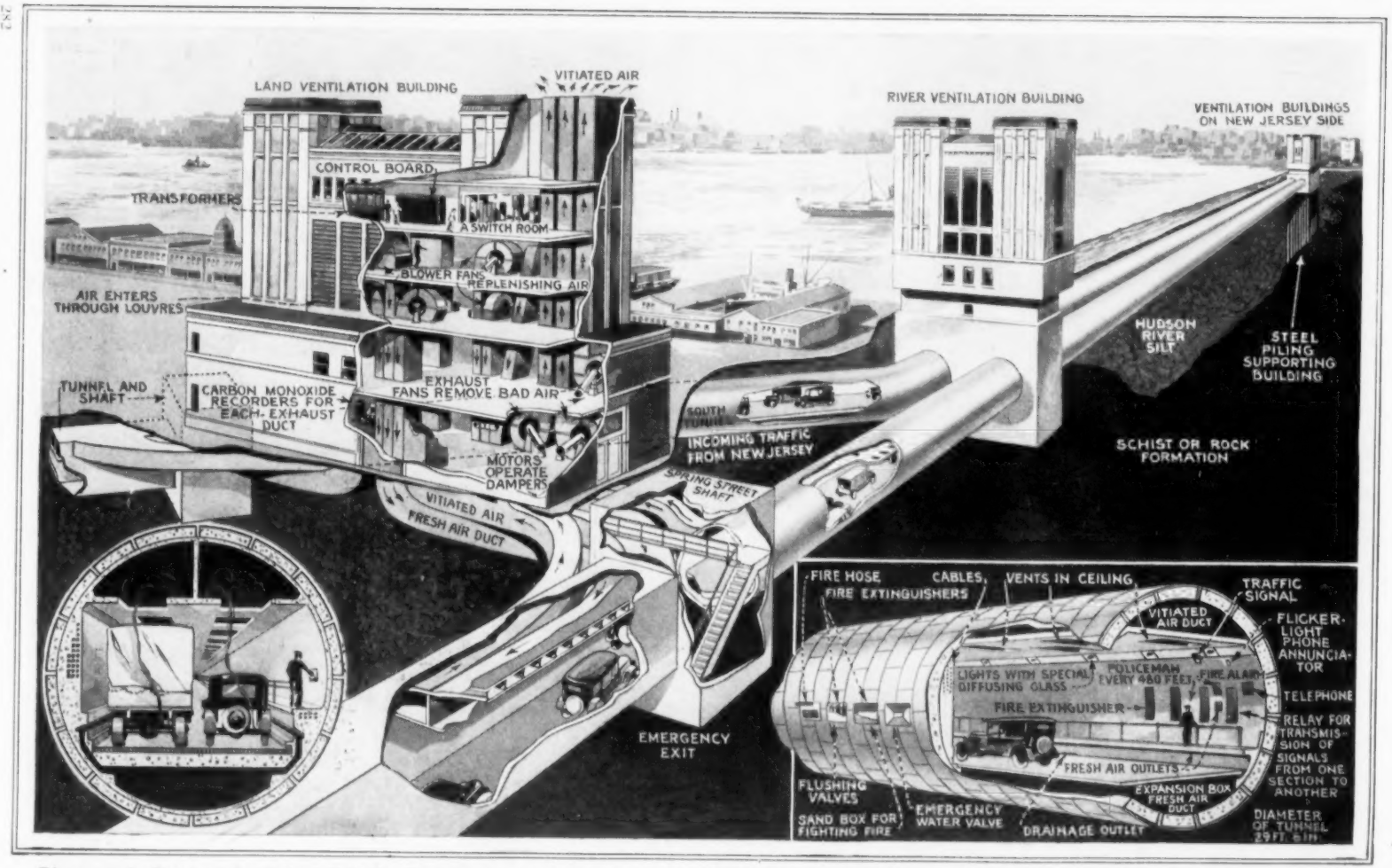
WRECK CAR HAS A PLATFORM TO CARRY AUTOS

An automobile wreck car of unusual type is used by the street railways in Cleveland to haul away cars which are damaged on its tracks. Because an automobile, after a brush with a street car, seldom has all four wheels intact, the car is of the type which picks the victim up bodily and loads it on a low-slung platform. An unusual feature, however, is two large chests for ropes, jacks, blocks and other tackle, built over the rear-wheel fenders. The chests are supported through attachment to the inverted U-shaped supports of the overhead crane used in loading.

Wrecking Truck with Supply Cabinets Built Out over the Fenders of the Car

WEIGHT OF WHALE'S BRAIN

According to preliminary tests conducted at the University of Southern California, the moist weight of the humpbacked whale's brain is about 4.4 pounds. This is interesting when compared with the weight of the average human brain and the relative bulk of a man and a whale. The range for the human brain is between forty-three and forty-eight ounces. The whale's brain is being kept for further studies.



Diagrammatic Sketch of the Holland Vehicular Tunnel under the Hudson River, Showing the Twin Traffic Tubes, the Ventilating Arrangements, and the Huge Ventilator Buildings, Two of Which Are Located on the New York and Two on the New Jersey Shore

Interior of One of the Twin Tubes under the Hudson, Showing the Ventilation Ducts in the Ceiling, and the Sidewalk at the Side for the Police Who Regulate the Traffic

Auto Tunnel Is World's Newest Marvel

Vehicle Tubes under the Hudson Are Monument to Man Who Gave Life to Build Them

WHEN New York's and New Jersey's governors passed through the twin tubes of the Holland vehicle tunnel under the Hudson river recently, and then declared them open for their maximum capacity of 15,000,000 automobiles and trucks a year, they set the seal of approval on one of the greatest engineering feats of all time. And at the same time they dedicated a $48,000,000 memorial to the engineer who conceived and created the tunnels, and gave his life to the work, with the result that he died before it was completed.

The twin-vehicle tubes are unlike anything created before, because they have been built to handle vast streams of automobiles discharging into the air carbon-monoxide gas, one of the most deadly poisons known. A ventilating system had to be incorporated that would draw out the poison from the air, otherwise motorists would have slumped down and died at the wheel before they could have traversed the 9,250 feet of tunnel.

To force ventilating air through the nearly two miles of tunnel requires a man-made hurricane raging at seventy-two miles an hour. To turn such a blast loose among the autoists would have hurled cars into each other and piled up more wreckage than a tornado. So the engineers tamed it by sending the seventy-two-mile wind through a separate tunnel, beneath the roadway.

At intervals branch ducts carry the air to expansion chambers beside the curb, where it is expanded and slowed down until it is admitted into the vehicle tubes as a gentle wind, to be sucked out again, with its load of smoke and carbon monoxide, through return tubes at the top. Four huge ventilating buildings, two at the water's edge on either side and the others back near the entrance to the long approach drives, provide the air stream. They are fitted with automatic instruments which constantly check the poison content of the air throughout the tunnel length. Should the machinery fail for any

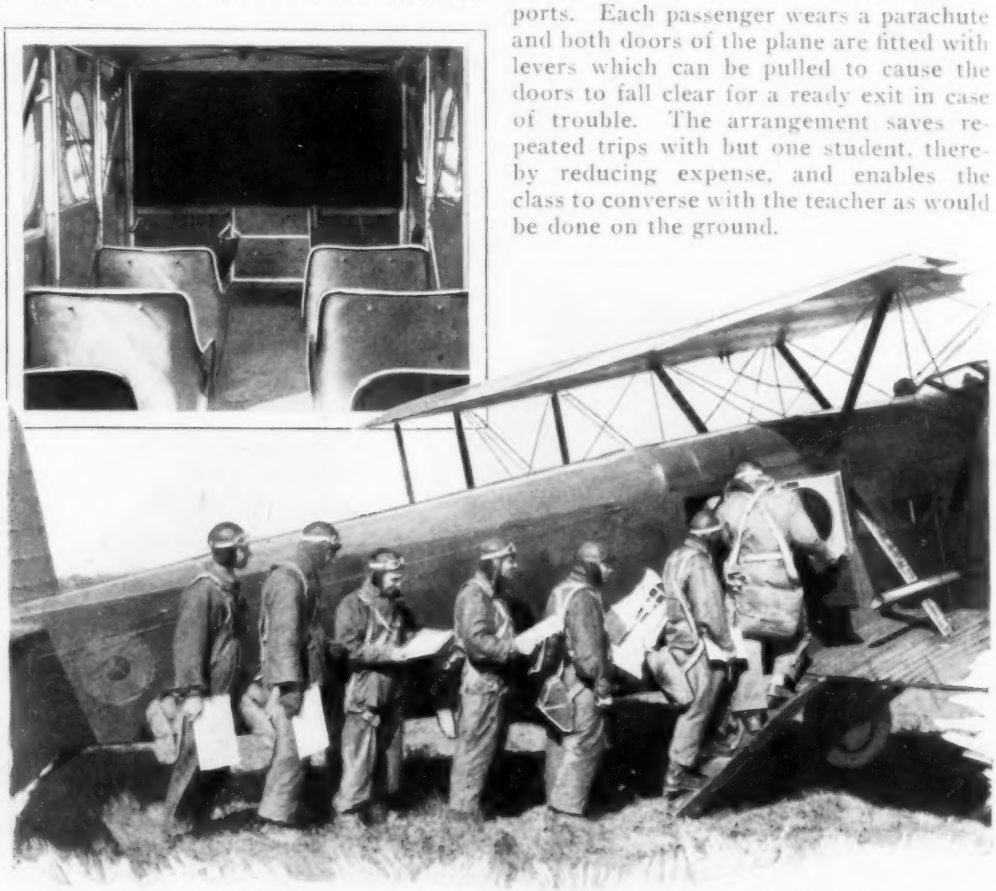
reason, the traffic lights throughout the tubes have been supplemented with extra warning signals which may be flashed on ordering drivers to stop their engines. A special force of 300 policemen has been trained for duty in the tubes.

Each of the tunnels, one for traffic from New York to New Jersey and the other for cars moving in the opposite direction, includes two traffic lanes, one for pleasure cars and the other for trucks. The speed limit will permit the former to traverse the tunnel in six minutes, as compared to much longer times for the river ferries, plus waits which may last an hour or more before a car can reach the ferry slip.

Clifford M. Holland, the tunnel designer, was only thirty-six years old, when, in 1919, he was selected to take charge of the work. The work on the tubes, with its worry and strain, and the bad effects of frequent trips to the high-pressure locks, where the diggers worked under compressed air, undermined his health, and he died in 1924. His chief associate, Milton H. Freeman, took over the task, and lived but six months. Only one of a half dozen engineers who were associated in the work at the start lived to see the tunnels finished.

GOING TO SCHOOL IN CLOUDS HELPS TRAIN AVIATORS

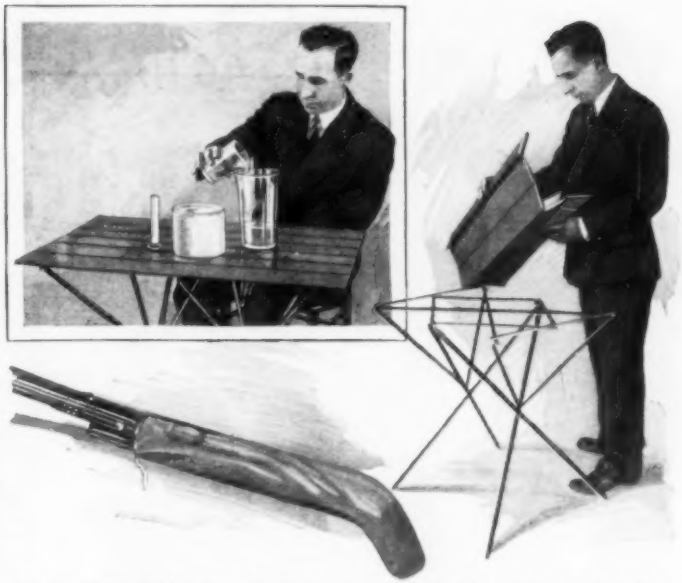
Candidates for army air officers' commissions go to school in the clouds at a midwestern flying field. A plane that holds six students, an instructor and pilot has been fitted with comfortable, padded chairs, a blackboard, and other equipment, and, while the ship sails along, the teacher gives lectures with the aid of the board and the class makes notes and reports. Each passenger wears a parachute and both doors of the plane are fitted with levers which can be pulled to cause the doors to fall clear for a ready exit in case of trouble. The arrangement saves repeated trips with but one student, thereby reducing expense, and enables the class to converse with the teacher as would be done on the ground.



View inside the Flying Schoolroom, and Students Going Aboard for a Lesson; Several Can Listen to the Teacher at Once, Saving the Expense of Numerous Separate Trips

BANK-VAULT DOOR OF PURE COPPER DEFIES TORCH

Tests with an oxyacetylene torch showed recently that two hours were required to penetrate a plate of pure copper, seven inches thick, intended for a bank vault. Engineers estimated that it would take a burglar about six hours to burn through one of twelve-inch thickness. One of the chief reasons for this is that copper, being an excellent conductor of heat, is more difficult to raise to a high temperature under a torch so that, while the flame may penetrate the first few inches of the metal in a short time, a much longer period is required for the rest, as the plate tends to draw the heat away and thus lower the efficiency of the torch considerably.



Folding Table Which Can Be Carried in Sack No Larger Than a Golf Bag, Yet Will Support a Heavy Load

FOLDING TABLE FITS INTO BAG FOR EASY CARRYING

A folding table, that goes, top and all, into a canvas sack about the size of a golf bag, has been produced by a Wisconsin manufacturer. A single motion opens the framework, as all the parts, with the exception of the two locking members beneath the top at either end, are permanently hinged. The folding top, covered with artificial leather, is equipped at the corners with coil springs that snap over the framework and hold it in place. The table weighs twelve pounds, stands twenty-seven inches high and the top measures twenty-two by thirty-four inches. It is strong enough to stand transportation and usage as a dinner table for camping.

LUGS FOR TRACTOR WHEELS HELP IT OVER MUD

The usefulness of the tractor, especially in mud and soft soils, has been increased by the application of sets of horseshoe-shaped lugs to the wheels to afford greater traction. They are especially serviceable in clearing land, passing through growths of underbrush and other difficult places where tractors ordinarily might become stalled. They are easily attached, and permit the use of the tractor on plowed and disked land.

Giving the Tractor Added Efficiency: Wheels Equipped with Special Lugs for Soft Soil

To Save Work

To Keep the Fingers Away from the Wringer, the Washing Machine at Left Is Fitted with an Automatic Feeding Attachment; Above, an All-Rubber Dish Scraper That Won't Break, and Saves the Plates

At Right, a Convenient and Easily Adjusted Window Shelf for the Plants

Combination Salt and Pepper Shaker with Button Control for Contents Is Practically Moisture-Proof

Metal Guard to Keep Stains from Walls When Painting or Washing Woodwork

Pea and Bean Huller, Right, Saves Time and Eliminates Staining the Fingers; It Is Quickly Clamped to Table or Cabinet

in Your Home

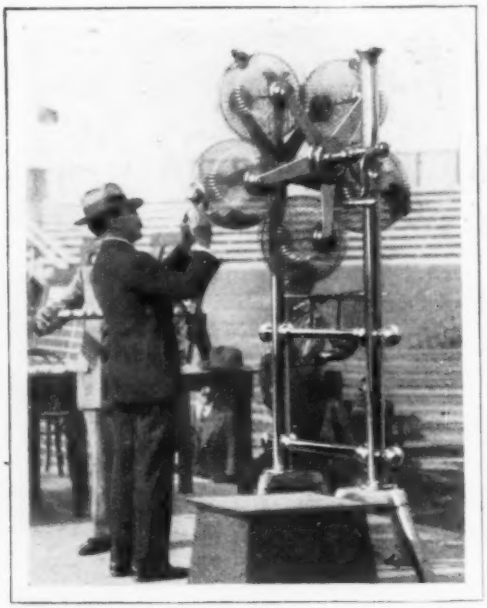
Here Is an Ironing Plug with Variable Heat Control on Side for Quick Regulation; Below, a Floating Holder for the Soap

Saving Space and Hooks, Triple Towel Holder Can Also Be Used for Hanging Garments

Right, Handy Broiler for Steaks or Fowls Is Used on Top of Gas or Oil Stove, and Broils Both Sides of the Meat at One Time

At Right, Washable and Ventilated Laundry Bag of Mesh

Double Aluminum Cooker Has a Non-Meltable Bottom Which Eliminates the Necessity for Water in Either Upper or Lower Compartment; Vents Give Even Distribution of Heat and Several Articles May Be Prepared in the Cooker at One Time



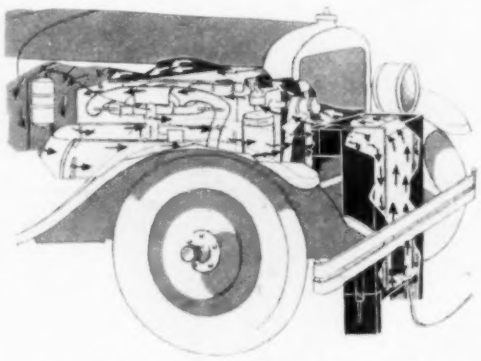
Shuffling the Tickets for the Road Lottery; the First Prize Was for $10,000

LOTTERY AIDS ROAD BUILDING IN LOWER CALIFORNIA

To raise funds for constructing better roads from Tia Juana into Lower California, Mexican officials resorted to a lottery. Lucky numbers were picked from tickets that had been sold, placed in an arrangement of whirling wire baskets and thoroughly shuffled. The first grand prize at one of the drawings was $10,000.

HEATER KEEPS MOTOR WARM IN COLD GARAGE

Operating on current from a lighting socket, a heating cabinet is said to be effective in keeping the automobile engine warm even if the garage is unheated and during the coldest weather. It is placed in front of the radiator and has chambers so arranged that, as the warm air enters, the cold air is driven out, causing a constant circulation to be maintained.



View Showing Heater Installed and Operation

ROLLER BEARINGS ON RAILWAYS HELP IMPROVE SERVICE

No more rest-disturbing jolts and jars for the railroad passenger! No more sudden starts and stops that spill his coffee in the diner and spoil the enjoyment of his meal. Lower operating costs, no more hot boxes, greater speed and generally improved performance for the railroads. These are some of the benefits claimed for roller bearings. More than 110 railroads are employing one type while upward of fifty roads are using another. Tests have shown that a heavy Pullman car, equipped with roller bearings, can be pushed by two men. Another demonstration proved that a twenty-one-car roller-bearing train could be started much more easily than one of twelve cars with the ordinary type of brass journals. Tremendous savings are being effected through the elimination of hot boxes and the reduction of the number of inspections necessary. One railroad estimates that a hot box on a passenger car in service costs on the average $30. The roller bearings need lubrication inspection only about once in every 25,000 miles. Lubricant in them has been found in good condition after running 30,000 miles. Several railroads are still gathering data concerning the results achieved by the bearings, but already interesting announcements have been made. For instance, the Chicago, Milwaukee and St. Paul railway found that during October, 1927, it cost but 9.8 cents per 1,000 car-miles to grease its "Pioneer Limited" after the adoption of roller bearings, while the cost of lubricating the train on plain bearings was between 22.5 and 26 cents per 1,000 car-miles. At a recent test, using a block and tackle and a dynamometer to measure the force applied, it was found that a roller-bearing car, although 755 pounds heavier, was started with but 267 pounds, while the plain-bearing car required 2,337 pounds to

start. On speed tests, the roller-bearing cars reached 10.54 miles per hour after twenty seconds, while the plain-bearing cars made but 8.75 miles per hour after the same length of time.

RADIO TELEPHONES ON LINER SERVE EVERY CABIN

Passengers on the "Cap Arcona," the new Hamburg-South American liner, may enjoy radio-telephone conversations with their friends while the ship is proceeding on its way, as there is a wireless telephone in each cabin. The installation is of sufficient power to maintain contact with radio stations on shore, for the boat is not far from land over the greater part of its route. Passengers may sit comfortably in their cabins while talking with persons at home, or they may call up anyone of their fellow voyagers.

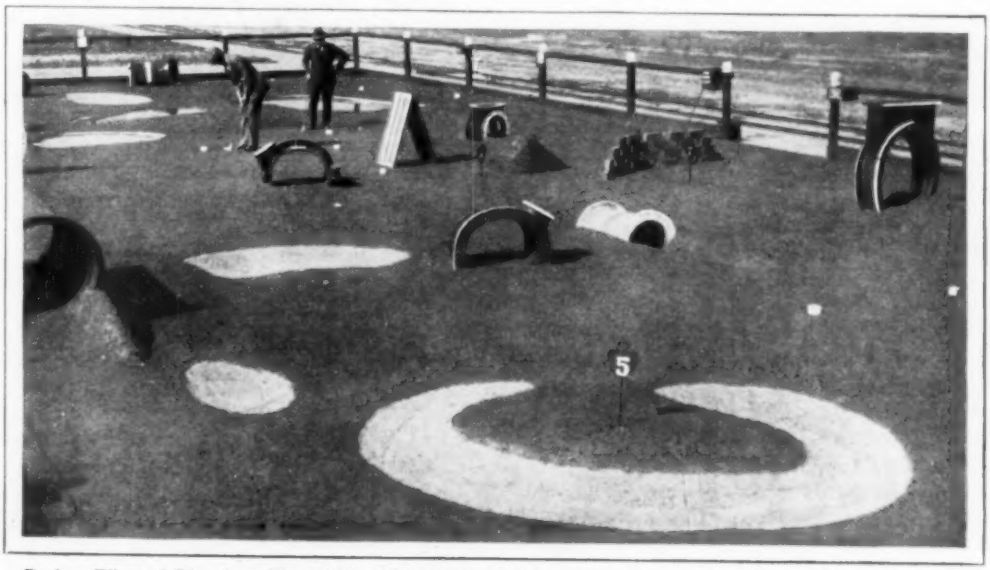
BROKEN TILE AS GOLF HAZARDS TEST PLAYERS' SKILL

Defective tiling, pipe and other articles usually consigned to the scrap heap, have been used on a small golf course in New York to afford the players unusual hazards. The course has nine holes and is arranged to give the greatest opportunity for skillful playing and unusual shots.

Capt. Holland with His Pet Ant Bear, One of a Tiny Species Found in Central America

ANT BEAR, SIZE OF A KITTEN, IS SHIP'S PET

Carrying a bear upon your shoulder might suggest a "strong man" act, but Capt. Charles J. Holland, of the Panama mail motorship "City of Panama," thinks nothing of this stunt, for his pet is one of the tiny species from Central America, an ant bear about the size of a kitten. It is tame and intelligent, its owner declares. One of the ship's passengers, on a recent voyage, brought back a bird with a beak like a pelican's and a crow's voice.



Broken Tile and Pipe form Hazards for This Small Golf Course on Private Grounds; the Shape of the Obstacles and Their Position Often Necessitate Especially Skillful Shots

Preparing Ice Cream at the Table; the Freezer Is Shown Open at the Left and in Operation at the Right

FIVE-MINUTE CREAM FREEZER USED ON TABLE

Freezing your ice cream at the table can be done in five minutes, it is asserted, with a German freezer recently introduced. It is attractively nickelplated and holds slightly more than twenty-six ounces. Ice and salt or nitrate of ammonia, washing soda and water may be used for freezing, the operation being similar to that required with the ordinary unit.

MUSKRAT FARMS IN SWAMPS YIELD BIG RETURNS

State reports from Maine show that the business of muskrat farming is becoming more important each year. In many localities, bogs and flats, otherwise useless, are being flooded to make ponds for raising the animals. This is done by building dams across streams that are not navigable, and, if the resulting lakes lie within the farmer's borders, the public cannot trespass. The activity is regarded as remunerative as fox farming.

SECRETS OF SOUND

Thunder generally cannot be heard at a distance of more than ten or twelve miles, but the sound of artillery is frequently audible more than 150 miles. To a high degree, the intensity of a sound depends upon the density of the air in which it is produced and not upon the density of the air in which it is heard. When many feet up, persons in a balloon can often hear sounds from below with remarkable clearness, but people on the ground cannot hear similar sounds from the balloon. During a thunderstorm, the air is generally in such a disturbed condition that the sound waves are likely to be dissipated. Gunfire is usually heard at great distances only when the air is extremely calm.

BRICK CLEANER AND SHAPER SAVES TIME AND WORK

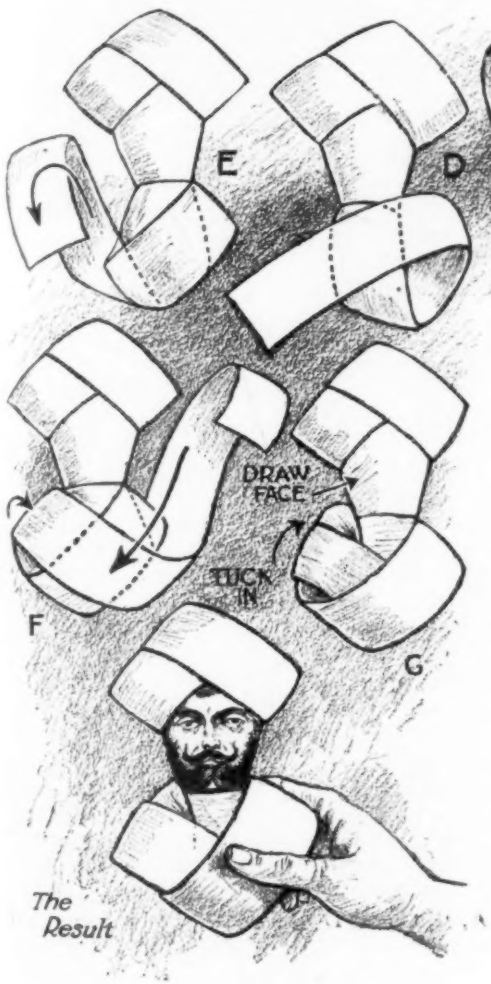
Three men can clean 3,000 nine-inch brick in a ten-hour day, according to claims for a rotor unit that removes the scale, clay and mortar and also shapes the brick. It consists of a rapidly revolving member that strikes 600,000 blows per minute, and the brick are handled in exactly the same manner as a piece of wood is planed or shaped on a wood joiner. The entire machine, including the motor, is mounted on a four-wheel truck so that it is readily portable.

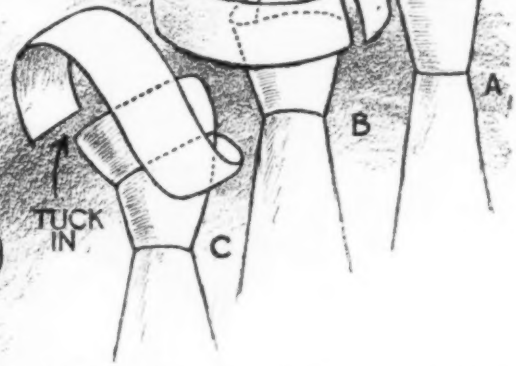
Portable Brick Cleaner and Shaper in Operation; a Revolving Unit Knocks Off Scale and Mortar

TRICKS and TWISTS with PAPER

by Sam Brown

CURIOSITY killed the cat—but not paper tricks. Indeed, it is the healthy "what is it" development of the average person that has elevated paper tricks to its present place in the aristocracy of magic.





No one, however indifferent he may be at the start, can long remain uninterested when the clever performer evolves, from a mere sheet of paper, some interesting or mirth-provoking item of amusement.

Take, for example, "The Making of Abd-El-Krim." In this effect, the performer takes a strip of paper, thirty inches long and one inch wide, makes an ordinary overhand knot about ten inches from one end, and then proceeds through the successive foldings illustrated at B, C, D, E, F and G, Fig. 1.

After Fig. G has been completed, it only remains for the performer to sketch in the "bearded ruffian's" features, and Mr. Krim is all set to receive the plaudits of the audience.

"The Making of Abd-El-Krim" is a trick that can be worked with little or no talking on the part of the performer, but in the majority of cases the effect in itself is only the bones of the trick, while the per-

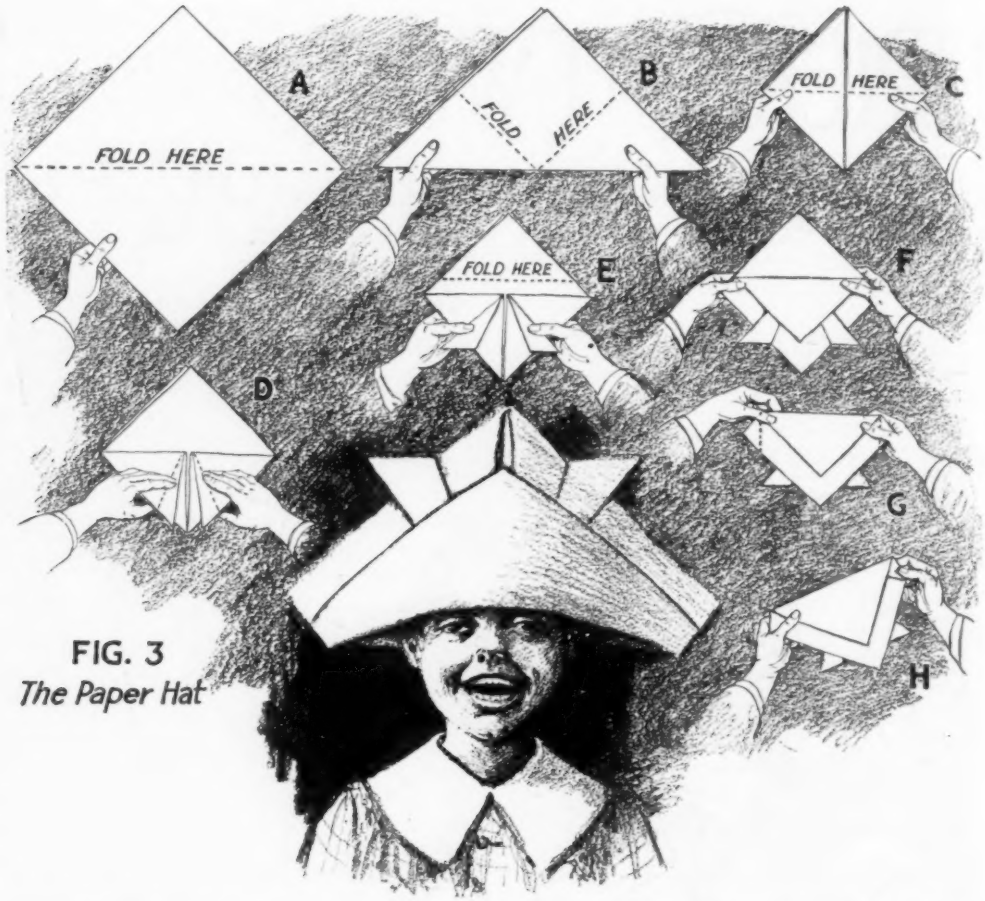


FIG. 3
The Paper Hat

former's "patter" supplies the entertaining value.

How many times has some youngster rushed up to you, all breathless, and demanded, "Make me a sojer's hat?" And could you do it? And ain't it the grand and glorious feeling when he burbles, "Say, this is a peach of a hat—this one's diff'rent!" Yes, sir!

The Chinese have given us the "diff'rent" hat. To make it, cut as large a square as possible from a sheet of newspaper. Fold this square from corner to corner to form A, Fig 3. Then fold A on the dotted lines as at B. Fold one side of B down on the dotted line to form C. Then fold the "wings" out as indicated by the dotted lines in C, forming D. Fold one part down on the dotted line to form E. Fold down the opposite side in a similar manner to form F. Fold the ends in, as indicated by the dotted lines in F, to produce G, and finally fold both sides of the hat down on the dotted line as shown at G, and the hat is complete.

A clever interlude, when exhibiting tricks with paper, is to juggle a sheet of newspaper on the tip of your nose. It may sound impossible, but if you take the diagonal corners of the sheet, one in each hand, as shown in Fig. 4, and stretch the paper tight, you will find this juggle a fairly simple matter.

Perhaps the one effect which has done more to popularize paper magic than anything else is the "Mariner's Wheel," and even today patterns based on this principle are pet effects among many magicians.

To make the wheel, take a sheet of paper—any size—and fold it as shown at A, B, C and D of Fig. 5. Then tear away the white portion, as shown at E. When the paper is unfolded—lo! the Mariner's Wheel.

Another clever little conceit with paper that goes over big, is that illustrated in Fig. 6. Take a six-inch square of paper, A, and fold the corners to the center, as shown at B. Then turn the paper over and fold each corner to the center again, as in C. Color the dark portions in diagram D with red crayon. Fold the top edge of your sheet down to the lower edge, producing E.

You will find that you have four small pockets on the outside of your folded sheet. Each of these pockets may be opened by inserting the finger at the point to bend the outer flap outward and the inner walls inward. Then squeeze the four together by inserting the thumb and first three fingers into the pockets, forming F.

By alternately opening the pockets, which is done by spreading the fingers and thumb in alternate pairs, you can make the pockets change from red to white and back again in a manner that is most mysterious.

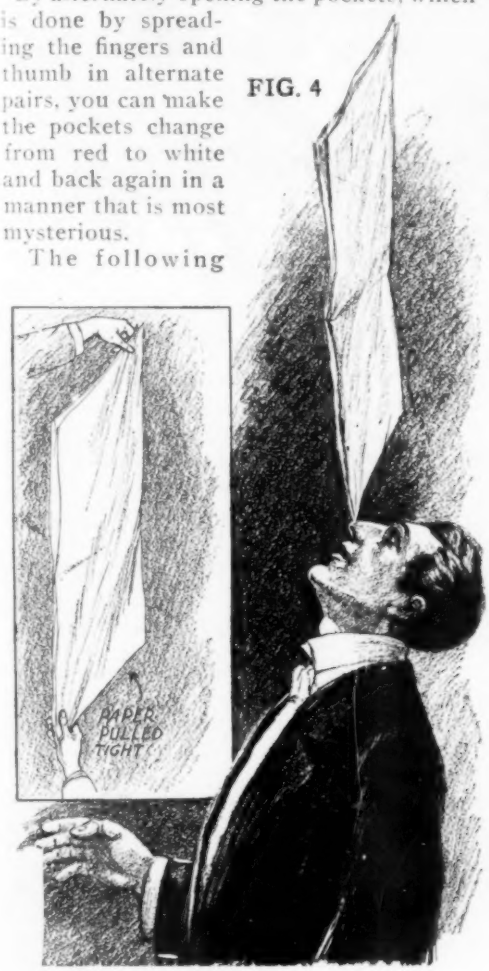


FIG. 4

FIG. 5
The Mariner's Wheel

The following trick has made quite a lot of money. Indeed, as a money maker it ranks with the age-old "Three-Shell Game" and "Three-card Monte."

But let me explain. The performer exhibits a folded sheet of paper. He opens this up and finds a second sheet, similarly folded. Opening this he reveals a third paper, and inside this a fourth. The performer requests a quarter from some unsuspecting member of his audience.

"Now," says the performer, addressing the donor of the quarter, "would you pay fifteen cents to see a good trick in magic?"

The spectator invariably nods his head. What else can he do?

The performer places the quarter in the inner paper and folds it up. The other papers are then folded, one at a time, until the package is complete. The performer blows gently on the paper. On opening the package, only a dime is found in the inner fold.

"Ah, quite right," murmurs the performer. "Here's your change."

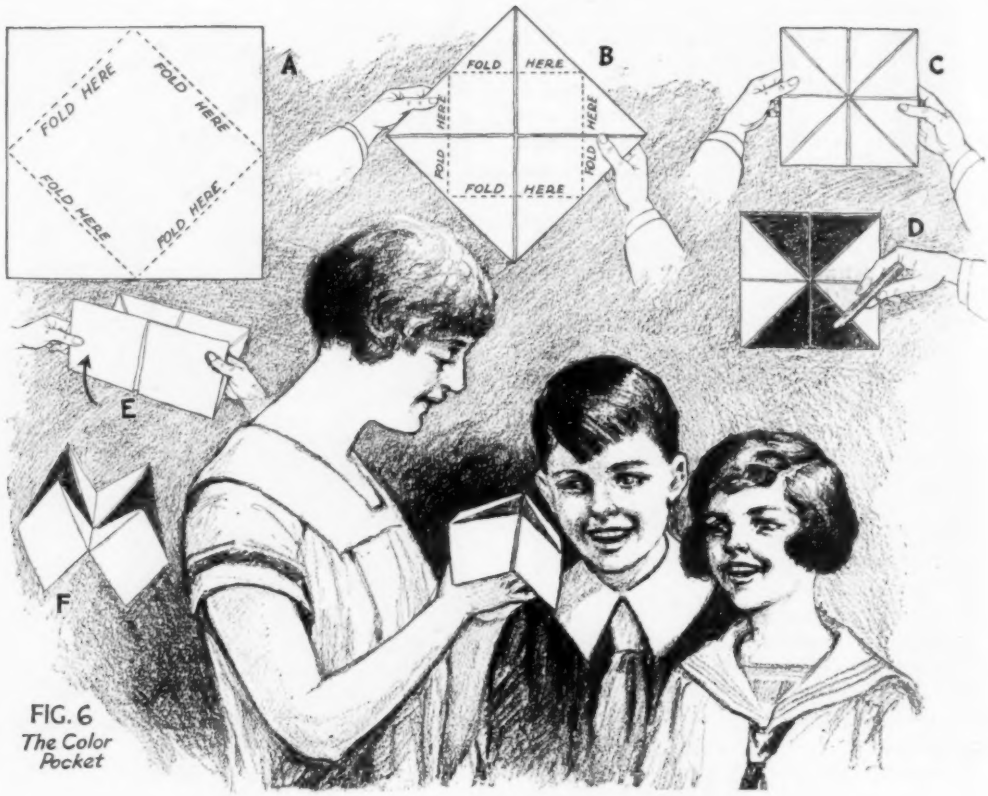
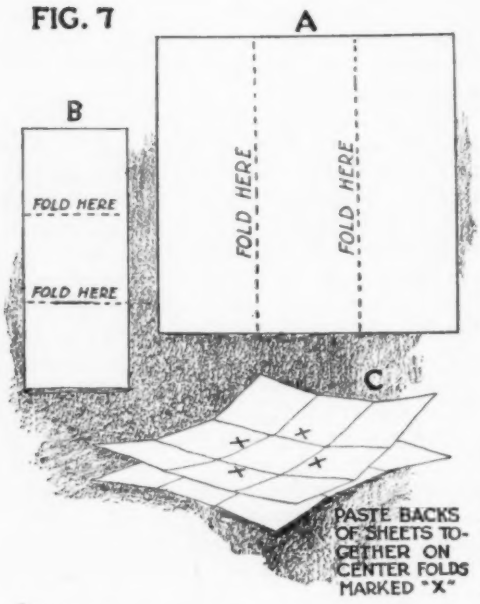


FIG. 6
The Color Pocket



This effect requires a little preparation. Take a nine-inch square of very thin paper, and fold it in thirds, as shown by the dotted lines at A, Fig. 7. Then fold it in thirds the other way, as shown at B. Make a second sheet exactly like this one, and then paste the two sheets back to back at their center portions, as shown at C. If the work is carefully done, and the creases pressed tight, the two sheets should exactly coincide.

Inside each of these sheets place a smaller fold. Inclose the whole thing in a ten-inch square sheet which is folded in the same manner.

To prepare for the trick, place a dime in the inner fold of one of the sides, and place the packet of paper in your pocket. When ready for the trick, take the packet out, and place it on the table with the dime side down. Unfold the papers to the final fold and then ask for the quarter. Fold the quarter up in the small fold.

In folding the sheet, the right side is folded first, then the left side, then the fold nearest, and finally the fold farthest. The second sheet is folded in a similar

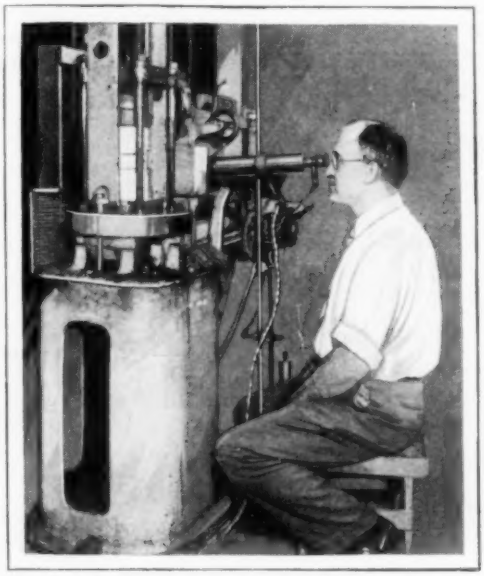
manner, but when it comes to the prepared sheet—there's the rub!

The right and left folds are made as before. Then the lower fold is folded up, but, instead of folding the top fold down, what you do is to fold the whole packet over on top of the top fold, thereby turning the quarter side down. The final sheet is folded in the ordinary way, covering the whole.

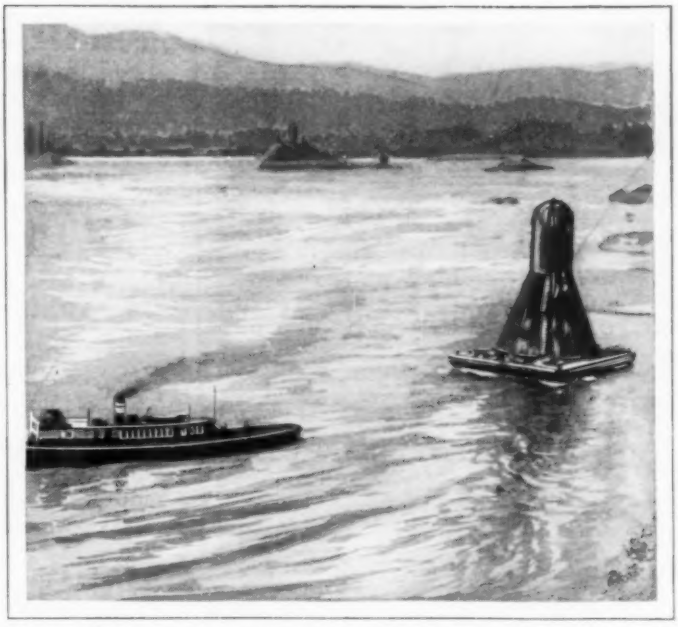
All that remains to do is the unfolding of the papers, the discovery of the dime, and the laconic, "Here's your change!"

PRESS OF FINGER BENDS BRICK

Bending a brick suggests the trick of a strong man, but almost anyone can do it, by simply pressing against the unit with his finger. This is shown by a remarkably sensitive instrument that the bureau of standards has devised for detecting slight strains in various materials used in industry, substances that appear to be perfectly rigid yet give under stress. The gauge indicates that pressing a brick with your finger bends it about one hundred-thousandth of an inch. This is determined by the amount of displacement of a bit of steel with a keen edge placed on the surface of the brick. The movement is measured by a special scale and a telescope. The gauge also reveals that a steel bar bends by its own weight if picked up by one end.



For Exacting Tests on Building and Other Materials; the Gauge That Shows a Brick Bends



Big Sawdust Burner Floating Down the Columbia River; It Weighed 60,000 Pounds, but Arrived without Mishap and Was Safely Set Up

SAWDUST BURNER TAKES A RIDE ON RIVER RAPIDS

The feat of transporting a large sawdust burner forty miles by water was accomplished recently on the Columbia river. It towered seventy-six feet above the stream, was fifty-two feet in diameter at the base and weighed 60,000 pounds. Engineers loaded it on two scows which were towed by boat. The trip was begun at the Cascade locks, so that, for some miles, the unwieldy load floated at high speed down the swift rapids, which are sometimes hazardous to navigation even with well-equipped boats. The burner was set up again without mishap.

To Attract the Eye of the Hungry Motorist; Plaster Hen and Chicks Advertising Inn Dinners

BIG PLASTER HEN SERVES AS AD FOR CHICKEN DINNERS

Tourists along an automobile road between Los Angeles and San Diego are attracted by a huge plaster hen and chicks on a box near the highway. The sign heralds the fact that chicken dinners are served at a restaurant near by.

QUIETLY RUNNING STREET CAR HAS FEATURES OF AUTO

Resembling, in many particulars, a closed automobile, a street car recently built for a mid-western city weighs considerably less than the usual type, is much quieter and is expected to effect savings in operating costs. Roller bearings, thin rubber layers between the wheel tires and center, and rubber cushions at the points of support of the springs are special features. As in an automobile, there are longitudinal springs, a pair on each side of the truck, and each of the four axles is equipped with differential gears, similar to those of an auto to permit the outside wheels to run faster than the inside in rounding curves, thereby giving more efficient and quieter operation. The sides and other parts of the car are constructed of duralumin. The unit weighs about 8,000 pounds less than the usual street car of its type.

GOLF NOW PLAYED AT NIGHT WITH LUMINOUS BALLS

Long, glowing streaks shining over a golf course in New York attracted the attention of evening strollers recently. The streaks were the paths of luminous balls which have been introduced so that the game can be played at night. The spheres were covered with a preparation of secret composition which held its light eight to ten minutes after the ball was exposed to air. Those that rolled into the grass were easily found.

SAWS RUN BY HAND OR MOTOR SIMPLIFY WOOD CUTTING

Portability and simplicity are combined in two saws German inventors have introduced to aid the woodsman and which are also adaptable to other purposes besides cutting trees. One is a wire-band unit that can be run by hand or by a small gasoline motor. The band revolves around a shaft which is operated by the engine or a hand crank and cuts logs of almost any size and to any degree of thinness. The other is a circular saw run by hand, intended for felling large trees. It is worked from a steel platform on wheels simply by moving a lever back and forth.

Demonstrating the Wire Band Saw and the Hand-Operated Saw for Felling Trees

Simple B-Eliminator for Direct Current

By HERMAN R. WALLIN

MANY homes and shops are located in districts supplied with direct current, and owners of radio receiving sets in such localities have heretofore been unable to use the standard B-eliminators designed for a.c. supply without going to the expense of installing costly converters.

The simple and compact device described in this article will enable the set owner to use the d.c. supply to eliminate B-batteries with little or no hum. The eliminator is made up of old parts and is quickly put together. The condensers used were taken from old Ford coils, obtainable from any Ford dealer or repair shop. If these are difficult to procure, use three 2-mfd. filter condensers of any good type. Six of the Ford condensers were used, wired in pairs to obtain sufficient capacity; purchased condensers of 2-mfd. capacity each would of course simplify matters but would cost considerably more. The entire eliminator, shown in Fig. 1, is only 4½ in. long by 2¾ in. high, and can almost be held in the palm of the hand. Owing to the compact construction, it may be tucked away in the cabinet of the receiver. After plugging into the 110-volt d.c. supply, it is merely necessary to adjust the detector voltage, which takes but a moment; no further adjustment is then necessary.

The choke coil is made from an old audio-transformer core. Two thin cardboard or fiber disks, 1¾ in. in diameter, retain the winding, which consists of a coil of No. 36 silk-enamel wire. The transformer core is separated and the disk slipped over one leg preparatory to winding. Leave a starting end, about 6 or 8 in. long, and continue the winding until it fills the spool to a diameter of 1½ in. The length of the coil is 1 in., and it is not necessary to wind it evenly, as the wire may be staggered or "random-wound," the main point being to fill the space allotted for it. After winding, the core is reassembled. The condensers are placed on top of each other, as shown in the sketch, and tied together with strong cotton thread; the entire unit may then be dipped in melted paraffin. This dipping is not absolutely necessary but is advised; if standard filter condensers are used, dipping is unnecessary. The condenser unit is mounted on a board, 4½ in. square, in the position shown in the illustration, and held in place by one or two strips of tin, ½ in. wide. The choke coil is now mounted on the base and held in position by four small metal brackets. The

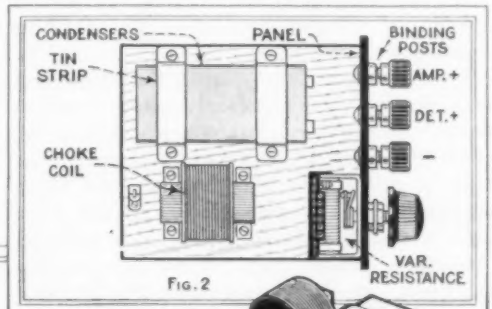


FIG. 2

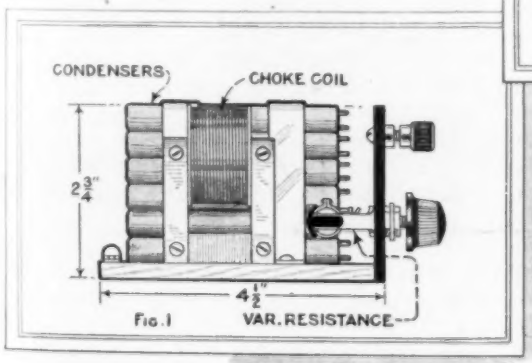
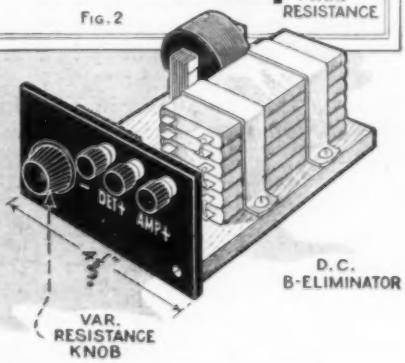
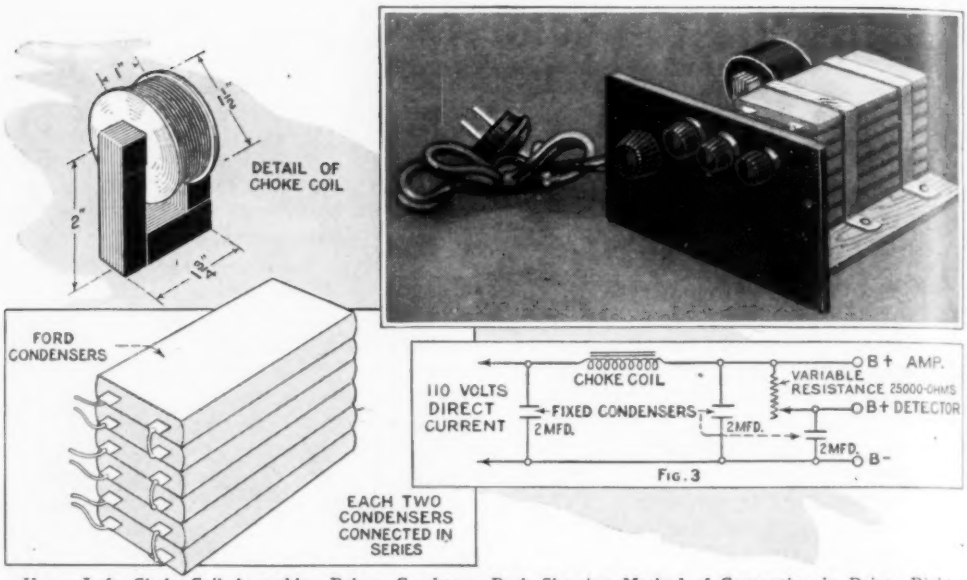


FIG. 1



Left, Side View of Assembly; Above, Instrument Layout; Below, Front View Showing Controls



Upper Left, Choke-Coil Assembly; Below, Condenser Pack Showing Method of Connecting in Pairs; Right, Schematic Diagram of Connections and Photo of Finished Unit

front panel in the original model consists of a piece of bakelite, 2¾ by 4½ in., although this and the baseboard may be any size the builder wishes. The three binding posts and the variable resistance are mounted on the bakelite panel, and the panel is then screwed to the baseboard. The variable resistance should be 25,000 ohms and is used to adjust the detector voltage.

The wiring is very simple, the start and finish turns of the choke coil being brought down on the base to two small Fahnestock clips, to make a neat and easy job. It is a good idea to place a fuse (any standard fuse block will do) in the 110-volt d.c. line, connected in one side of the input supply line. Two Fahnestock clips, one of which is shown at the rear of the incompleted assembly in Fig. 2, are the connections for the supply line. The wiring diagram is given in Fig. 3. One pair of condensers is connected across the input line; the choke coil is in series with one side of the line; another pair of condensers is wired across the line beyond the choke, and a third pair connected across the contact arm of the variable resistance and the negative B-post on the panel. The other side of the resistance is connected to the B-amplifier binding post. The B-positive detector binding post is then connected to the contact arm of the variable resistance, completing the unit.

When using an eliminator of this type, a small fixed condenser of .001 or .002 mfd. should be connected in series with the regular ground lead and ground binding post of the receiving set; in case the 110-volt d.c. line is grounded outside the house this condenser will prevent any damage to the receiver. The eliminator may be housed in a wooden or metal box, if desired, or may be used open, as shown in the photo. The lampcord is connected through the fuse to the Fahnestock clips at the rear of the assembly and terminates in a socket plug, the length of the cord, of

MATERIAL LIST

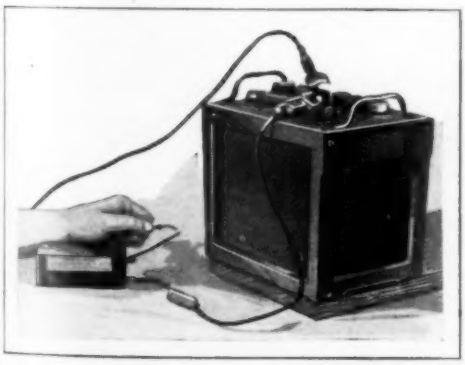
1 board, ½ by 4½ by 4½ in.
1 bakelite panel, 3-16 by 2¾ by 4½ in.
1 core from old a.f. transformer.
6 condensers, taken from old Ford coils, or 3 filter condensers, 2 mfd. each.
1 25,000-ohm Truvolt, Bradleyohm or Clarostat.
3 binding posts.
4 Fahnestock clips.
1 fuse block.
¼ lb. No. 36 silk-enamel wire.
Lampcord, brackets, tin strips and rubber-covered hookup wire.

course, depending on the requirements of the builder. The eliminator provides a maximum output of from 95 to 100 volts; if more voltage is required, it is necessary to connect regular B-battery blocks in series with it.

A blueprint showing the point-to-point simplified wiring diagram and layout has been prepared, and may be obtained from Popular Mechanics radio department, 200 E. Ontario st., for 25 cents, to cover cost and mailing. Specify blueprint No. 127.

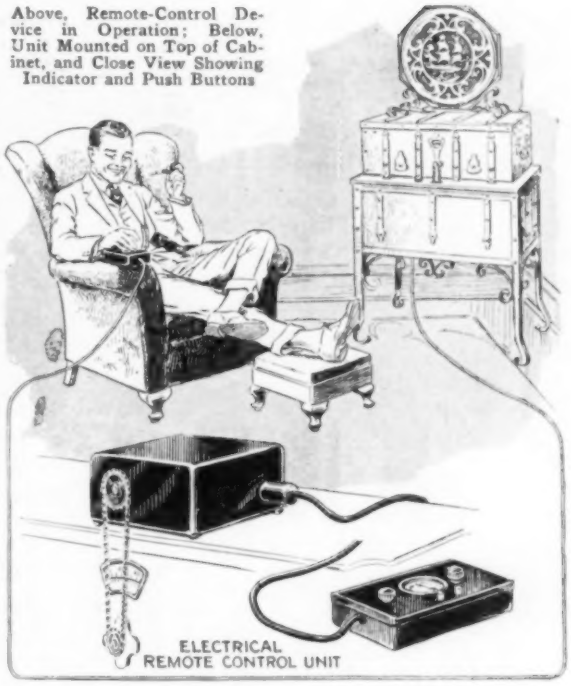
Salvaging a Shorted Condenser

With the large number of home-made B-eliminators employing high-capacity by-pass condensers, the tin-block type has come into general use. Some of these older types were not as rugged as they should have been, with the result that they were often shorted. In many cases such short circuits may be broken down by the application of high-amperage current from a storage battery. The short is caused by adjacent tinfoil sheets touching and allowing current to pass. As the high-amperage current from the storage battery is flashed across such a condenser, the contact is often burned out by the tinfoil melting at the point of contact. If the foil is melted far enough back, the condenser may again be put in service.—R. Wailes, Washington, D. C.



Applying Storage-Battery Output across Condenser That Has Become Short-Circuited

Above, Remote-Control Device in Operation; Below, Unit Mounted on Top of Cabinet, and Close View Showing Indicator and Push Buttons



Remote-Control Radio-Tuning Unit

The new remote-control device shown in the illustration enables the set owner to install his receiver where he chooses and operate it from his easy-chair, and invalids can control the set without help—another advantage. The device turns a receiver on or off, tunes from one station to another and regulates volume. Two models were shown at the New York radio show, one a mechanical unit which controls the set within the radius of a 6-ft. flexible rotating cable. The electrical unit permits the set to be installed anywhere—living room, attic or closet—and controls the set from any room in the house. If desired, every room in the house can be wired with outlets for plugging in both remote-control unit and loud speaker. The device is designed for use with any set of the single-dial type, the dial being removed and an adapter plate substituted, which requires no tools. It may be installed on top or at either end of the cabinet, or within a console. The control unit employs an indicator calibrated in the same manner as the dial in the set, the needle being deflected right or left by pressing

buttons. A small motor in the device at the set supplies the power for turning the condenser shaft, and relays operate the filament switching device.

Connecting the Light-Socket Aerial

The light-socket aerial shown in the diagram is one of the newer types. Screwed into any electric lamp socket, it takes the place of an unsightly and often inefficient

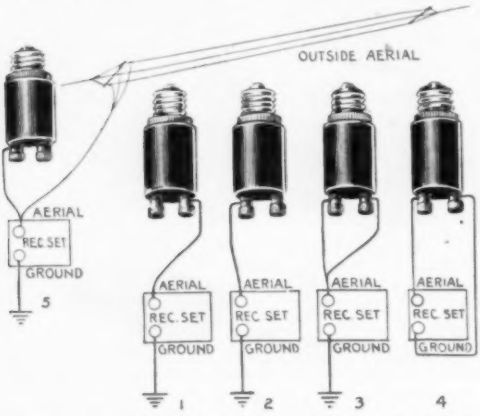


Diagram Showing Various Ways of Connecting Light-Socket Aerial for Best Results

outdoor aerial. It is also said to eliminate lightning hazards and make arresters and ground switches unnecessary. It operates efficiently on a.c. or d.c. lighting circuits, supplied by either the central station or from farm-lighting equipment. When once installed, the aerial needs no further attention, and no current is consumed. After connecting to light socket or base plug, the current is turned on. No precautions need be taken against either electric shock or short circuits as the device is fully insulated. It is said also to sharpen the tuning of the set, but as local conditions often affect reception, it may be necessary to try each of the five circuits given to find the one that gives maximum results. The connections should be tried in the order given in the diagram.

Curing Speaker Noises

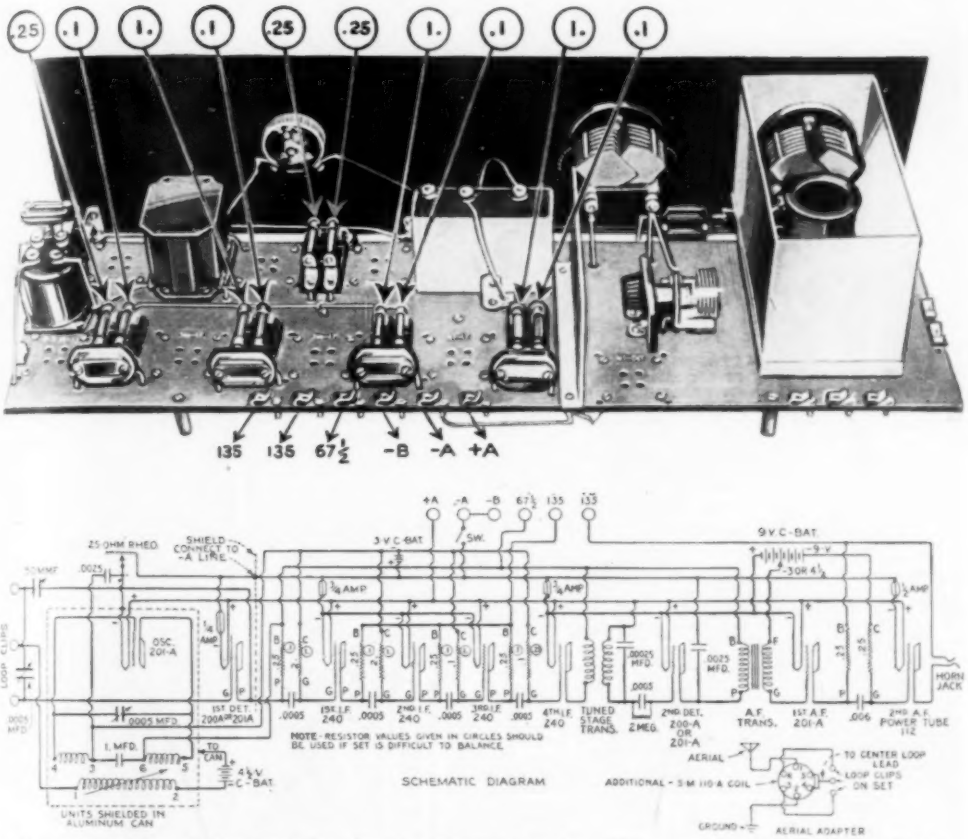
Speaker noises may be due to a number of conditions, which are often difficult to locate, but usually will be found in a tube. Detector tubes are the chief offenders. The cause of the microphonic noises lies in the fact that the elements are not securely anchored. Shipping will often jar one or more of them and permit them to vibrate. Operating loud speakers on, or near, the set will often cause this vibration. The remedy most easily applied is to mount the entire set on sponge-rubber pads, and keep the speaker some distance from it. Most of the set designers now employ spring-suspended sockets for the r.f. and detector sockets to eliminate this trouble. Fractured, or poorly soldered, connections will also cause these noises as well as materially interfere with reception. A loose or broken connection is easily remedied by the application of a hot iron, as there is usually enough solder at the point to make a good connection and a touch with the iron will put the set in good order.

Clock Starts and Stops Radio Set

Connected in the A-battery circuit of the receiver, a clock-operated switch can be set to shut off or turn on the current at predetermined hours. Of course, as the device only controls the A-battery current, if the set is equipped with a B-eliminator, it will be necessary to provide an automatic switch, operated by the A-battery current, in this circuit.

Cone Speaker Mounted in Tip Table

The combination tip table and speaker shown in the illustration is useful in that it is a convenient smokers' stand as well as an effective means of hiding a loud speaker. The cone is mounted just below the top and sound issues from holes in the sides. The table top acts as a sounding or baffle board, and the speaker is so mounted as to utilize the entire wooden casing.

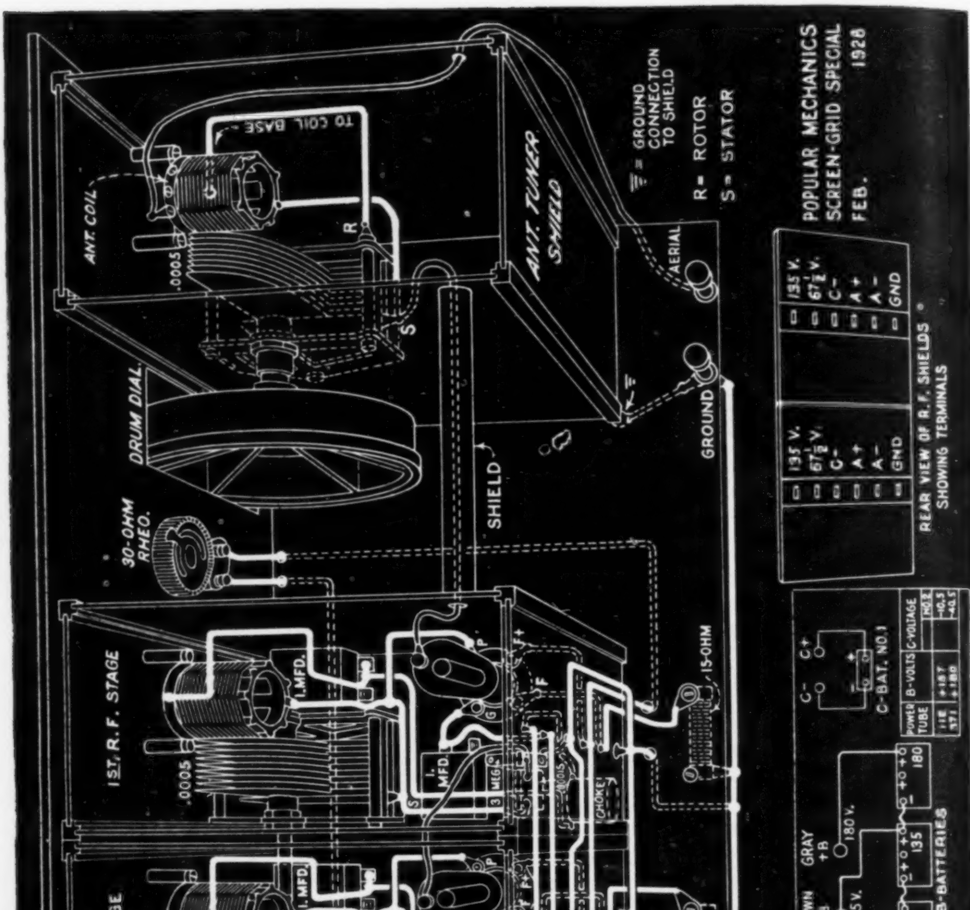


Above, Rear View of Completed Set, Showing Suggested Resistor Values to Simplify Balancing; Below, Schematic Diagram Showing the Same Resistor Values, Indicated in the Small Circles

Balancing the "Economy Nine" Superhet

The Popular Mechanics Economy Nine, described in the Nov., 1927, issue, and featured at the New York and Chicago radio shows, has proved to be one of the most efficient and interesting sets developed in the past year. A very close check on its performance in the hands of the average builder is kept for the purpose of insuring maximum results under all conditions. A number of readers report reception of west-coast stations from eastern states, in spite of unfavorable weather conditions, immediately after completing the set; others comment on the ease of building, sharp tuning and excellent tone. Balancing the set seems to be the only difficulty that any of our readers have encountered. A laboratory check on one or two of these cases revealed the fact that the resistors used were not actually of the values for which they were marked, and, of course, a variation in the value of any particular resistor threw the set out of balance. One or two other builders did not use the parts specified, and this also led to trouble, since any variation in this respect naturally would produce entirely different results.

The resistor combination shown in the accompanying illustration is less critical than the one previously specified and a random selection of various makes, marked for the values given above the photo, proved perfectly stable in all cases. If it is found necessary to change the resistors you are now using, be sure to disconnect the A and B-batteries before making the change, so as to protect the tubes from an accidental short circuit. Back copies of the November issue, also large blueprints of the wiring diagram and full-size drilling templates are available for our readers.



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POPULAR MECHANICS SCREEN-GRID SPECIAL

By Frank L. Brittin

ONE of the most interesting developments in radio receiving is the new screen-grid tube. This tube is intended primarily for r.f. amplification and requires neither neutralization nor stabilizing resistance. The voltage-amplification factor of the tube is said to be over 250, which makes possible an actual voltage amplification of from 20 to 40 per stage, depending on circuit losses. When compared with the usual 4 to 6 per stage of the general-purpose tube, this is a real advantage, as it makes possible the building up of very weak signals from distant stations to a point where detection and audio amplification are simple matters. Engineers have been striving for several years to develop greater amplification in the r.f. stages, and the superheterodyne circuit was one of the most successful methods of obtaining such amplification. The real solution, of course, lies in the better tube and circuit design, reducing losses to a minimum. It must be remembered that, although these new tubes give greater r.f. amplification per tube than former types, a certain number of tuned stages must be used under present-day broadcasting conditions to obtain the necessary selectivity.

The new tubes will not necessarily reduce the number of tubes required in a given circuit, and they cannot be utilized in present standard receivers. Special circuits and specially designed shielding are required to obtain maximum results. The new tube, known as the UX-222 or CX-322, has a filament, a plate and two grids, instead of the three elements employed in the standard tube. The base is of the four-prong type and the tube differs in external appearance from the ordinary tube only in the addition of a small metal cap (indicated in photo 1) at the top, for a fifth connection to the control grid. The filament voltage for the tube is 3.3, and

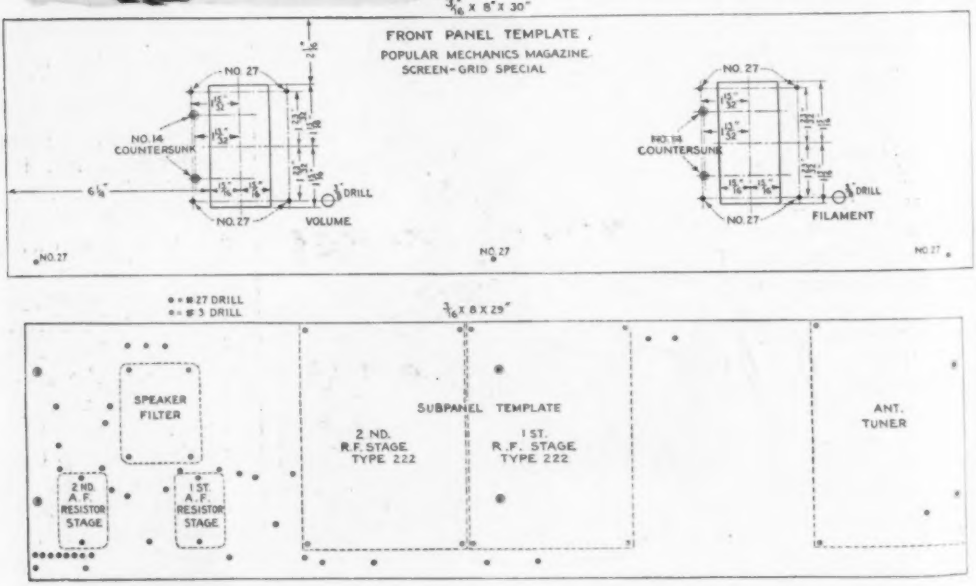
Position of Screen-Grid Tube in Shielded Radio-Frequency Stages

the filament-current consumption is .132 amp. Filament resistors make it usable with a 6-volt storage battery, and the recommended B-voltage is 135 volts.

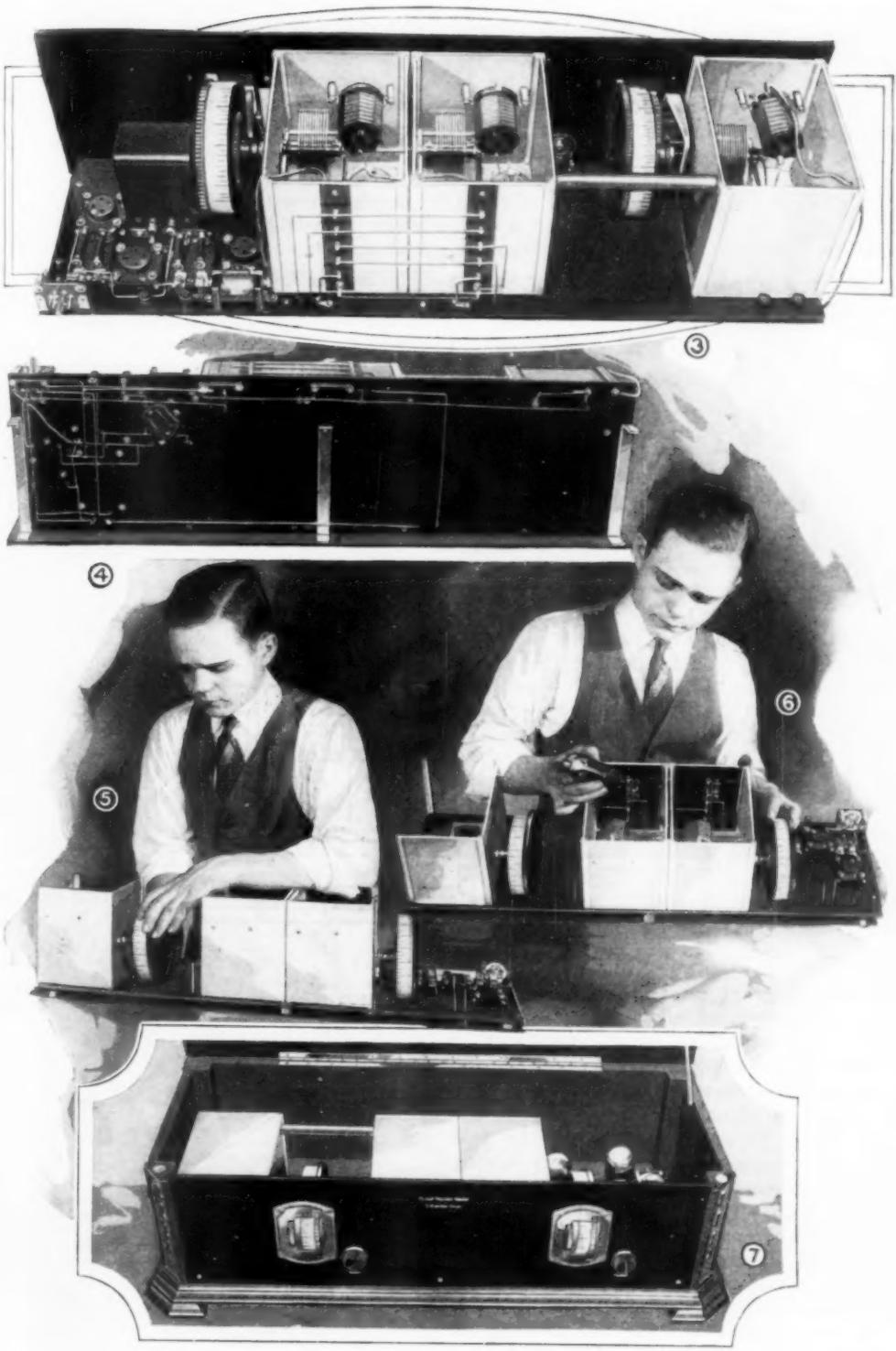
The full high-amplification possibilities of the tube will no doubt be obtained when it is applied to the superheterodyne circuit in the intermediate stages, but the results obtained with the receiver illustrated and described in this article were highly satisfactory. The first try-out was on silent night in Chicago and resulted in the logging of thirty-two distant stations in a little less than two hours. The volume on these distant stations was even greater than one would expect from locals in the city, on a standard multi-tube set. The a.f. stages of the set are resistance-coupled, of latest design, and the tone quality is excellent.

A complete set of full-size drilling templates and large blueprints of the wiring diagrams make construction very simple. The panel layout is shown on this page, and the assembly is started with the front panel, as shown in photo 2. The knob at the right controls the 6-ohm combination rheostat and filament switch, and the one at the left the 30-ohm rheostat used as a volume control. The escutcheons for the drum dials are mounted on the front panel by means of four small machine screws supplied with the dials.

Photos 5, 8, 9 and 10 show various steps in assembling the instruments; photo 5 how the drum dial of the aerial tuning stage is mounted on the shaft of the condenser, and 8, the position of the aerial tuning coil, which is mounted on the front panel of the tuner-stage shield. The three shielded stages are obtainable either in knocked-down form or completely assembled and wired. The r.f. stages are mounted near the center of the subpanel, as shown in photo 6. The interior construction of the aerial tuning stage is shown in photo 10, in which the rear and side panels of the shield have been re-



Drilling Templates, Showing Location of Various Instruments on Front and Subpanels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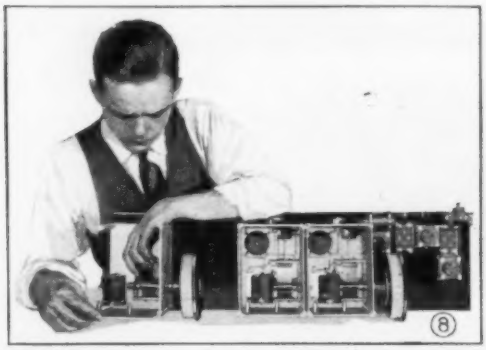
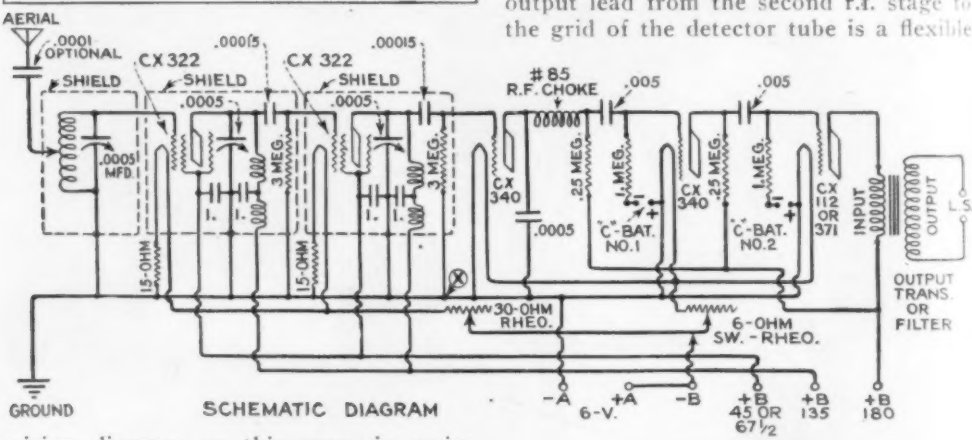
moved, to reveal the antenna coil and condenser. This coil, as indicated in the photo, is tapped and the taps brought out to terminals at the base for 5, 7 and 12 turns, enabling the builder to sharpen or broaden the tuning to suit local conditions. In crowded localities, where there are a number of broadcasting stations, it is well to use a minimum number of turns on the coil, and the .0001-mfd. fixed condenser, marked "optional" in the schematic





SCHEMATIC DIAGRAM

connected to the plate of the detector tube and the negative-A line. The aerial lead to the coil in the tuner stage is a flexible rubber-covered wire, soldered to the aerial post beneath the subpanel, and brought up through the side of the shield at top; this shield is connected at the base to the ground binding post. The copper or brass tube, between this shield and the first r.f. stage, shields the lead running from the stationary plates of the variable condenser to the control-grid connection at the top of the first CX-322 r.f. tube. Note the external connections at the rear of each of the r.f.-stage shields; these are marked for their respective positions, as shown below the simplified wiring diagram on page 302. A 9½-in. shaft, ¼ in. in diameter, connects the variable condensers in both of the r.f. stages. Note that each condenser is mounted on a support bracket at the rear, in each stage, and also bolted through the side of the shield, grounding all rotor plates. The output lead from the second r.f. stage to the grid of the detector tube is a flexible wiring diagram on this page, in series. For those located where sharp tuning is not imperative, the fixed condenser in series with the aerial may be omitted, using the seventh or twelfth turn of the coil.

Photo 9 shows the mounting of the drum-dial support brackets on the rear of the front panel preparatory to bolting the front panel to the subpanel assembly.

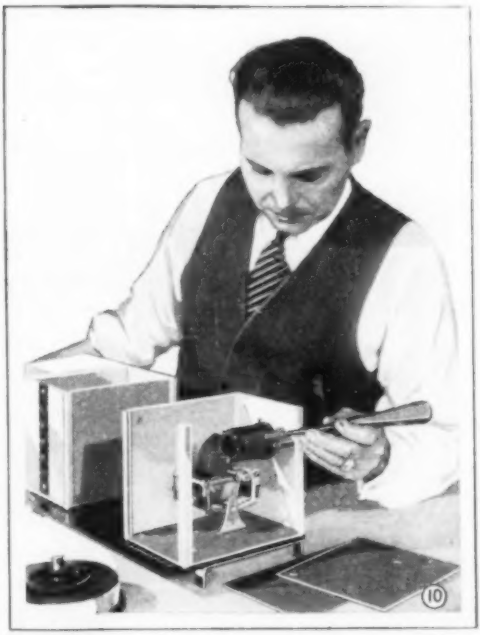
Complete all the wiring possible on the subpanel before placing the front panel in position. Subpanel brackets raise the subpanel, facilitating the wiring beneath it, and the only instruments mounted under the subpanel are the two 15-ohm resistors, and the .0005-mfd. fixed condenser

rubber-covered wire and should be shielded. This may be done by using special shielded wire, or by wrapping tinfoil around the lead between the stage shield and the detector grid. This conductor shield should also be grounded on the stage shield, but it must not touch the detector-grid post. The resistor units for the two a.f. stages are two Daven, type 43, couplers; these have the proper blocking condensers included in their assembly for the type-340 amplifier tubes used. The power tube and the output filter unit are placed directly in front of the resistor units, as in photo 3, showing the completed set.

All battery leads, as well as the speaker tip-jacks, are taken care of by the cable and receptacle plug specified. The mounting for the connector device is shown at the lower left-hand corner of photo 3. Check all of the wiring with both the simplified and schematic diagrams, and be sure that all connections are well soldered.

The point marked X in the schematic diagram on page 306 is connected to the negative-A line, but may be connected to the positive-A line as desired, for either a positive or negative bias on the grid of the detector tube. The C-battery No. 1 is of the usual tapped 4½-volt type and either 3 or 4½ volts may be used; C-battery No. 2 must be of the proper voltage required for the grid of the power tube used. Note the table below the wiring diagram. Note also that the positive terminal of C-battery No. 2 is connected directly to the negative-A at the battery.

A good ground connection, and a one-wire aerial, about 35 ft. long, should be used for maximum results; when the set is used in localities remote from broadcasting stations, a 100-ft. aerial will be better. Connect all batteries and try one tube successively in each socket with the rheostat-switch in the on-position; if the tube lights satisfactorily in each socket, insert all the tubes in their proper sockets, and the set is ready for use. No balancing is required; the volume is controlled by the 30-ohm rheostat, and both tuning dials will be found to tune about alike.



Assembling Aerial Tuner Stage; Pointing Out Tapped Turns for Optional Aerial Connections on the Coil

MATERIAL LIST

1 front panel, 3-16 by 8 by 30 in., available drilled and engraved.
1 subpanel, 3-16 by 8 by 29 in., available drilled.
2 Tyrman vernier single-control drum dials.
1 6-ohm rheostat with switch, Frost No. S-1906 or similar type.
1 30-ohm rheostat, Frost No. 1930 or similar type.
1 Camfield ant. stage complete, available knocked-down or assembled.
2 Camfield, type 222, amp. stages complete, available knocked down or assembled and wired.
3 sockets, standard X-type, Benjamin or similar type.
2 Daven resistor couplers, No. 43.
2 resistors, .1 meg., Daven or similar type.
2 resistors, .25 meg., Daven or similar type.
2 Yaxley, 15-ohm resistor units.
1 Samson, No. 85 or similar type, choke coil.
1 set, Karas subpanel brackets.
1 speaker-filter unit, General Radio 387-A or similar type.
1 cable and receptacle plug, with phone-tip jacks, Yaxley No. 669 or similar type.
4 engraved binding posts.
1 .0005-mfd. condenser, any good molded type.
18 soldering lugs, long round-hole type.
13 round-head, 6-32 brass machine screws, ½ in. long, nickelplated.
10 round-head, 6-32 brass machine screws, 1 in. long.
8 lengths No. 14 round tinned-copper busbar wire.
2½ ft. stranded rubber-covered hookup wire.

SUGGESTED EQUIPMENT

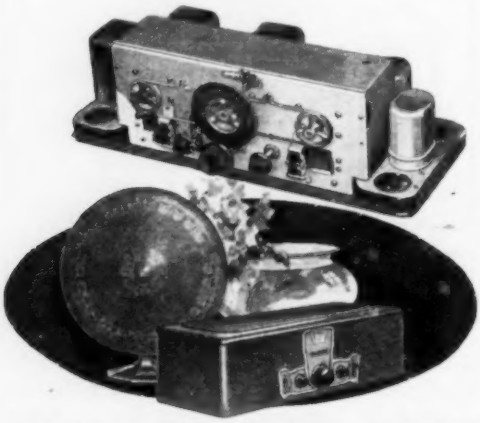
1 CX-112 or 371 tube.
2 CX-340 tubes.
2 CX-322 tubes.
4 45-volt heavy-duty B-batteries.
1 tapped-type, 4½-volt C-battery, Burgess 2370 or similar type.
1 tapped-type C-battery, voltage depending on type of power tube used.

There may be a slight variation in the aerial tuner dial, but this can be compensated for by shifting the position of the rotor plates on the shaft of the aerial tuning condenser.

A set of large blueprints of all wiring diagrams and full-size drilling templates have been prepared, and may be obtained from Popular Mechanics radio department, 200 E. Ontario st., Chicago, for 50 cents to cover cost and mailing. Specify blueprints No. 128.

Compact Set for Console Installation

This receiver combines several interesting features and was one of the attractive

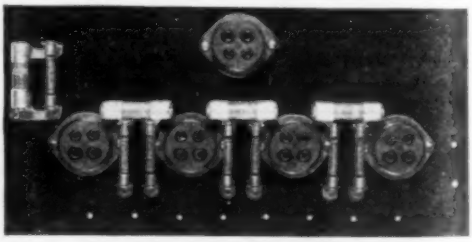


Above, Receiver without Cabinet; Below, Standard Assembly Showing the Comparatively Small Size

exhibits at the fall radio shows. It has been designed in two models, one for d.c. and the other for a.c. operation. The circuit is of the balanced type, with three stages of r.f. amplification, detector and two stages of a.f. amplification, a power tube being used in the last stage for maximum output without distortion. Both a.c. and d.c. models employ the same basic circuit, but differ, of course, in details. Tuning is accomplished by means of a single master station selector, with an illuminated dial. There are two auxiliary tuning controls, called "acuminators," for sharp tuning in or receiving distant stations, and, in addition, a volume control and switch on the control panel, cutting off the power supply when the set is not in use. Both types are built into identical metal cabinets, which have a crystalline finish. A feature of these cabinets is the ease with which they may be removed from the sets, it being necessary only to remove the "escutcheon," through which the controls project, to lift the cabinet from the chassis. This feature makes possible the adaptation of the set to a number of different types of consoles.

Complete Subpanel Unit for Five-Tube Set

A subpanel unit or "deck" with all necessary instruments for a complete five-tube receiver less the tuning elements, is now available for the set builder. All parts are mounted directly on the subpanel, the coupling condensers and resistors for the resistance amplifier being held in place by specially designed clips. The fixed condensers are of a new cartridge type, incased in glass tubes, and metal caps, similar to those on the resistors, fit into tight-locking clips. The by-pass condensers for the input of the audio-amplifier are of the same type. A double clip of new design provides a strong and neat mount for the grid condenser and gridleak. Holes are provided at the rear for ten binding posts, but the posts are not supplied because some constructors prefer to use a cable for battery connections. The addition of a front panel, coils and variable condensers makes a complete receiver, and construction details for a set of this type will appear in an early issue of this magazine.



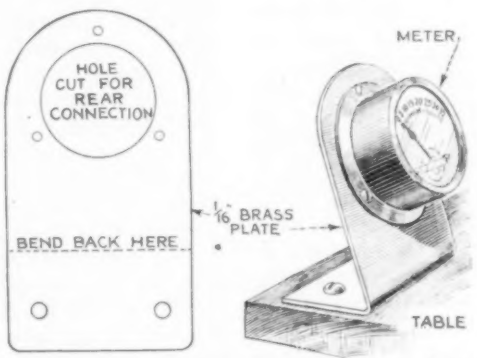
Top View of Subpanel Unit Showing Sockets, Resistors and Condensers

¶To prevent oscillation in r.f. stages designed for high amplification, choke coils are put in the plate circuit of each stage.

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.

Table Mounting for Panel Meters

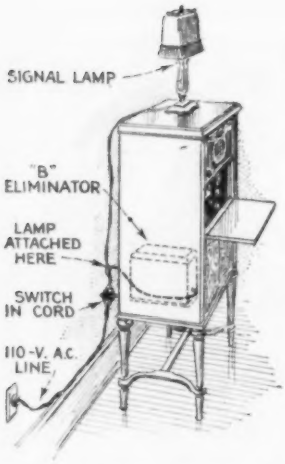
Very often panel-type meters are used in the laboratory, by experimenters, electricians and in every amateur transmitting station. Usually these are laid on the table, but owing to the rear-meter connections, will not lie flat unless holes are cut into the table. The type of table mounting shown in the sketch is very handy and neat and can be made quickly by anyone with ordinary tools. A sheet of metal, which may be iron, brass or aluminum, 1/16 in. thick and slightly wider than the meter, is cut in the form shown. About 1½ in. from the bottom of the meter and from the table, it is bent at right angles. If preferred, it can be bent over a little more, so that the face of the meter can be read from above or at an angle. A hole is drilled to allow the rear-meter connections to protrude through the rear of the mounting. Holes are also drilled for the three meter screws and two holes at the bottom. Through these the mounting is fastened to the table. The mounting can now be finished by painting it in black enamel to match the color of the meter, and the finished article will look like a factory job. If holes can be drilled in the table, the wires to the meter can be run under the table to the meter at the rear and so be out of sight.—H. R. Wallin, radio operator, S. S. "Cornelia," Brooklyn, N. Y.



Left, Template for Metal Support; Right, Meter Mounted Ready for Wiring

Signal Lamp for B-Eliminator

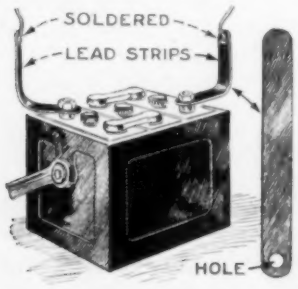
My experience, as well as that of my friends, shows that we are quite careless about leaving



the B-eliminator connected to the 110-volt line when the set is not in use. This not only consumes unnecessary current but materially shortens the life of the eliminator, especially at a no-load voltage. To overcome this carelessness, I now use a lamp as a signal when the eliminator is on. The supply line is tapped between the push-button switch in the cord and the power units in the set. The same method may be used with a red glass bull's-eye mounted on the front panel.—C. R. Yarger, chief engineer, Station KFNF, Shenandoah, Iowa.

Preventing Battery Corrosion

Corrosion at battery terminals should not be ignored and as soon as it is noticed immediate steps should be taken to prevent the leads from injury. Corrosion at these points manifests itself in poor reception, flickering filaments and uneven volume. A simple method of stopping or preventing it is shown in the sketch. A piece of sheet lead, 1/16 to 1/8 in. thick, is cut into strips, 3/4 in. wide and about 4 1/2 in. long. A hole is drilled at one end to fit the battery terminal, as shown at right, and the strips are bent and mounted on the terminals. Turn the nut down tight and cover each terminal with vaseline. The wires are then soldered to the top end of the lead strips, and these connections are also coated with vaseline. Connections made in this manner will last for the full life of the battery. Another point in preventing corrosion, or "sulphating," is to keep the battery fully charged, and watch that the water level does not fall below the tops of the plates.—Harry Saine, chief engineer, Station KQW, San Jose, Calif.



A Stable B-Eliminator Filter

With the wide-spreading use of B-eliminators, the homemade type has appeared in many varieties. Rectifying tubes are used to convert the 110-volt, 60-cycle supply to direct current. These tubes do a good job in this respect, but they do not smooth out the variations in the d.c. This action is accomplished by a filter system included between the rectifying tube and the receiving set. It is a relatively simple matter to construct a complete B-battery eliminator according to instructions supplied by many manufacturers of the parts, but many an experimenter has found that such an eliminator will not work on every type of receiver. The greatest trouble is experienced with resistance-coupled audio amplifiers. When placed in operation

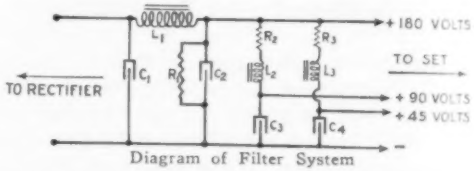


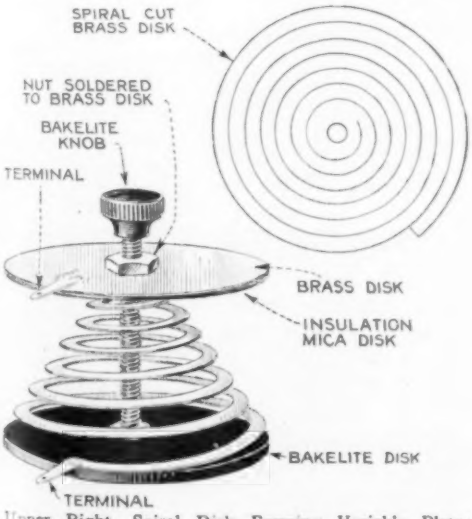
Diagram of Filter System

with a set of this type, a fluttering or popping sound is often the result, and this disturbance has been termed "motorboating." The cause is usually the common resistance shunt specified for the eliminator, from which taps are taken for the different voltages required for the receiving set. The currents drawn by the different tubes all pass through this common resistance, thereby setting up reactions of one circuit on another which result in instability. In the diagram is shown a filter which has proved absolutely stable where other types have failed. L_1 is a high-capacity choke coil of from 25 to 30 henrys; C_1 is a 4-mfd. condenser; C_2 an 8-mfd. condenser, and R_1 a protective resistance of from 50,000 to 100,000 ohms. The choke coils L_2 and L_3 are about 20 henrys, and may be the secondaries of old style a.f. transformers. R_2 and R_3 are series resistors

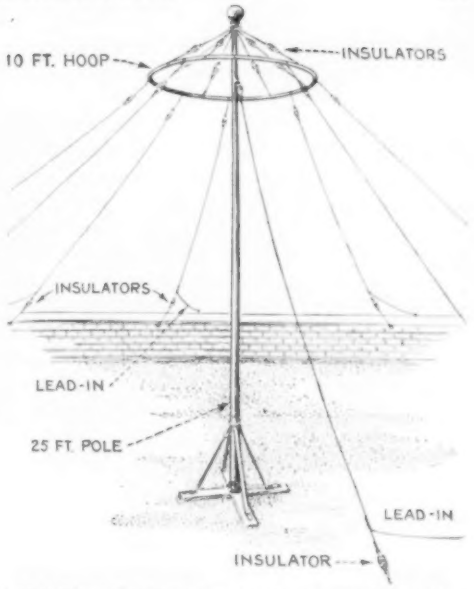
used to reduce the voltage to values suitable for the detector and r.f. amplifiers, their values varying with the number of tubes supplied, but usually being about 15,000 ohms for R_2, and 50,000 for R_3; C_3 and C_4 are 2-mfd. condensers. The various voltages available at the terminals may be regulated by varying R_1, R_2 and R_3. Variable resistances, such as clarostats or truvolts, may be used for this purpose.—W. J. Creamer, Jr., service engineer, Bangor, Me.

Simple Vernier Condenser

A simple vernier condenser may be made up from scraps, and will prove very effective when a small variable capacity is required. Two disks of thin spring brass, about 2 in. in diameter, a mica disk of the same size, a bakelite disk for the base, one long brass machine screw, a knob for the top and a few nuts and soldering lugs are the materials required. A center hole is drilled through all four disks. The diagram at upper right shows the method of cutting the spiral, whereupon a little stretching will result in a flat spring. The maximum capacity will be reached when the top plate is screwed down on the bottom plate. These condensers are often useful in series with standard variable condensers as verniers, for neutralizing r.f. stages, etc.—M. M. Paggi, chief engineer, Station KFWO, Catalina Island, Calif.



Upper Right, Spiral Disk Forming Variable Plate; Below, Assembled Unit Ready for Use



Aerial Mast Designed for Apartment Building, Showing Method of Distributing Aerials

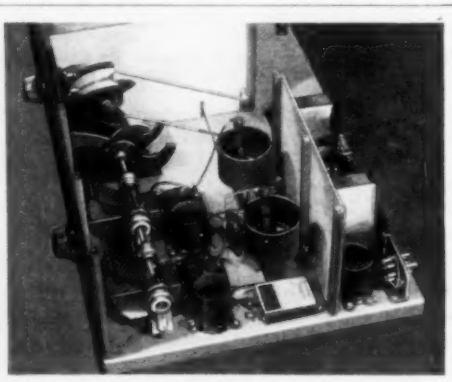
Support for Aerials on Apartment Building

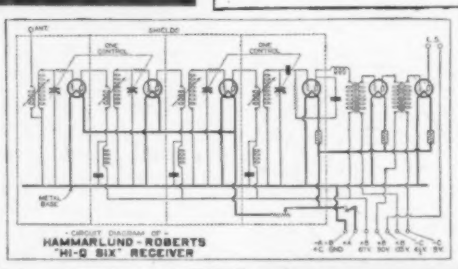
The arrangement of aerial masts on apartment buildings is often a serious problem to both owner and the tenants, because random crossing of wires prevents good reception, and the damage done to the roof by unskilled amateurs usually leads to trouble. A simple remedy is offered in the sketch. A 25-ft. pole is mounted on a base that rests flat on the roof, guy wires holding the mast upright, without the use of nails in the roof at the base. The top of the mast may be ornamented with a ball or weather vane if desired. A 10-ft. hoop is supported by insulated wires from the top, as shown. The various aerials are insulated from this hoop and taken to insulators fastened to the side wall of the building, immediately above the apartment to be supplied. The lead-in wire is then soldered to the aerial wire, and taken through stand-off insulators down to the apartment window.—J. E. Christensen, engineer, Riswell Radio Co., Chicago.

¶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.

Automatic Variable Coupling Features New "Hi-Q Six"

Automatic variable coupling and complete isolation of each of the four tuned stages, combined with symphonic audio amplification, make this new "Hi-Q Six" of special interest. Each stage operates independently without interaction between any of the stages, resulting in higher amplification per stage, greater selectivity, stability and absence of background noises. Designed to be built by the average set builder at a low cost, this new receiver is said to provide a higher degree of performance than has hitherto been possible except in non-commercial, laboratory instruments. The automatic variable coupling, a new idea in radio, is said to secure maximum and uniform amplification over the entire tuning range; exceptional sensitivity and selectivity with full volume without oscillation are obtained, and symphonic audio amplification, which, with a power tube, is said to faithfully reproduce both speech and music with the timbre and character of the unbroadcast original. Every modern construction feature, such as steel chassis, heavy aluminum shielding, battery cable and centrally located illuminated drum-dial control, is available for the builder.



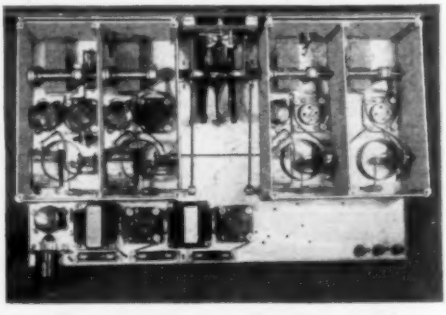


Above, R.F. Stage Shield Removed, Showing Coils and Condenser Assembly; Right, Schematic Circuit Diagram, and, at the Bottom, Top View of the Assembled Receiver

The set employs three stages of tuned r.f. amplification, a non-regenerative detector and two stages of transformer-coupled a.f. amplification, self-adjusting filament controls, and non-microphonic tube sockets. The photos show the simple construction details and require little comment; the shields are somewhat of a novelty, since most of the shield sections may be inserted after the wiring has been completed; they are slotted to take the wiring without injury to the insulation. The materials are all of standard make, obtainable from any dealer in radio supplies, complete construction details and wiring diagrams being supplied.

Eliminating B-Eliminator Hum

B-eliminators have reached a state of perfection where there is little or no hum when correctly installed and operated, but if a hum is present, a slight adjustment will often correct the trouble. Installed in console sets, the eliminator frequently offends in this manner, while, operated outside the console, it will be perfectly quiet. The reason is that the magnetic field around the power transformer in the eliminator will couple with the fields around the other units and give rise to a hum. Turning the eliminator at an angle in either direction will often remedy this trouble. Long leads to the eliminator should be bunched together and tied; the standard battery cables for connections between the eliminator and the set are advised.



Facts and Fads for Radio Fans

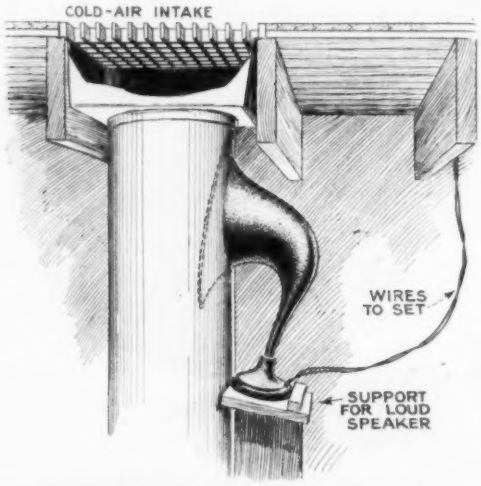
Above, Bureau of Standards' Measuring Apparatus for Checking Broadcasting Stations

Bernays Johnson, at the New York Radio Show, Lights a Lamp by Means of Energy Transmitted through the Head of a Young Woman Who Does Not Seem to Be Disturbed by the Experiment; Above, Right, Radio Receiver on One of a Number of Autos at Paris Contest; the Sets Were Tested with Cars Running

Left, Captain Autrey, of the U. S. Signal Corps, with One of the Latest Types of Radio-Receiving and Transmitting Sets Designed for Use in Trenches; These Two-Way Short-Wave Sets Are Portable and Mark an Advanced Step in Radio Communication as Applied to Field Use under War Conditions

Hiding the Loud Speaker

The practical method of hiding the loud speaker indicated in the illustration has several advantages other than that of placing the speaker out of sight. As it is



Loud Speaker in Position Showing Method of Mounting the Base

mounted in the cold-air intake pipe of the furnace, visitors are always at a loss to know whence the music is coming. From a practical standpoint, it saved throwing away an old horn of the gooseneck type which, although still good, was better out of sight. Keeping the speaker as far as possible from the set is another advantage, and, mounted as shown, it interferes in no way with the operation of the heating plant. A hole was cut in one side of the pipe, somewhat smaller than the bell of the loud speaker. This hole was cut as near the cold-air collar between the joists as possible. A piece of cheesecloth was tied over the bell of the speaker to exclude any sweepings that might fall down the cold-air pipe. The grill was removed from the floor, and the horn, with the unit detached, was let down inside of the pipe, the small end running through the hole cut in the pipe. The grill was then replaced and the unit put back on the horn. The stand, built directly under the speaker as a support, is set at an angle, as shown in the illustration, so as to direct the volume upward. If the horn fails to fill the hole in the pipe entirely, the space may be closed with strips of gummed paper. A cone may be used in practically the same manner, and will work equally well.—Arthur L. Kaser, Mishawaka, Ind.

Using A. F. Transformers for Impedance-Coupled Receivers

Impedance-coupled sets give better tone than many transformer-coupled sets, but many radio owners do not feel justified in throwing away their a. f. transformers to make the change. However, the transformers can be used as impedance coils if connected as shown in the illustration. Fig. 1 shows how the secondary is wound over the primary in the standard a.f. transformer. Using a length of busbar wire, the two coils are connected in series, making a choke of high value. How the transformer terminals are marked is also shown, as well as the variation from these markings necessary for use in the impedance-coupled circuit. If the transformer is a good one, more volume and perfect tone can be obtained by changing it into an autoformer, as in Fig. 2. In this case the secondary, having the largest number of turns, forms the plate impedance, and the primary, being connected through the coupling condenser to the grid of the next tube, adds its quota in the form of a voltage step-up. The cause of audio distortion is generally insufficient impedance in the primary at low frequencies. By the changes suggested, the plate or primary impedance is increased several times, which accounts for the success of resistance impedance-coupled amplification. The actual coupling is done by the condenser, which should be .5 mfd., or larger, in order to pass the lower frequencies without loss.

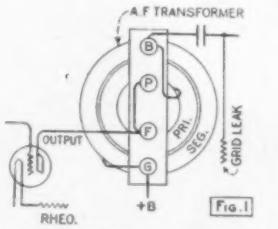


Fig. 1

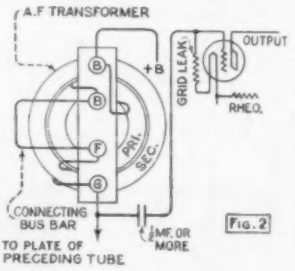
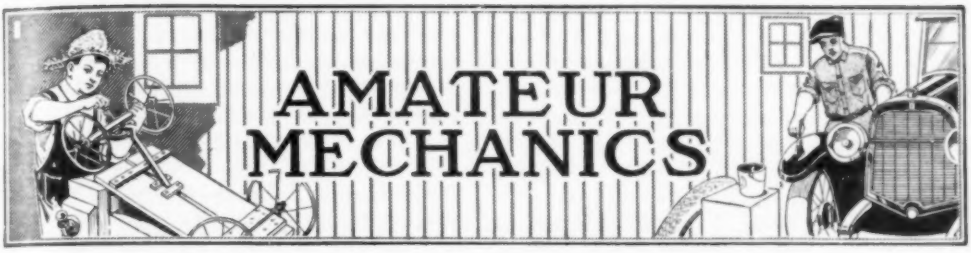


Fig. 2

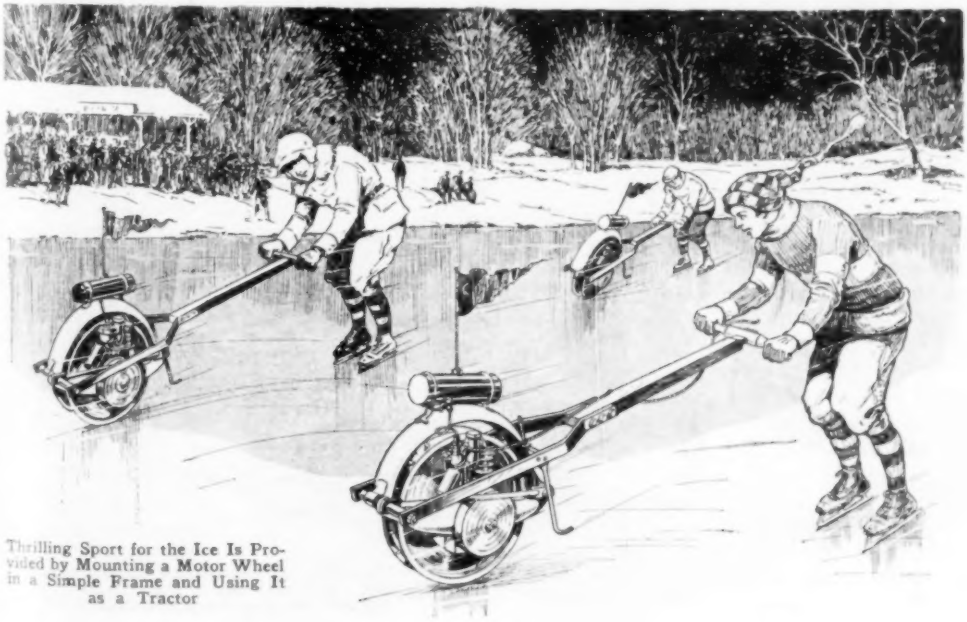


Fun on the Ice with a Motor Wheel

By LAWRENCE B. ROBBINS

EACH winter brings out some new sport. Now comes an ice tractor, a means of pulling oneself along a smooth stretch of ice with a motor wheel. Arranged as indicated in the various sketches, such a tractor is capable of pulling one person over the ice at a speed of 30 to 35 miles an hour. With several persons in a line, holding on to each others' belts, it will pull them along at reasonably good speed and give all the thrills of "snapping the whip," single-file skating and like stunts. No changes are necessary in "installing" the motor wheel for this tractor. Just remove it from the bicycle, substitute sharpened spikes for the tire, pivot the wheel in the frame, and off you can go.

Make the riding frame first. It consists of two pieces of stiff flat steel, 1½ in. wide by ⅜ in. thick, their length depending on the distance from the pivot hole for the wheel to a point about 3 in. behind the rear end of the mudguard. At that point bend the pieces in and then out again, parallel to the longer portions. When brought together, they form the sides of a fork. Drill three holes in the short ends to coincide with each other, and then bolt to the ends of a lawnmower handle that will serve as steering bar. The distance between the long portions of the irons should be sufficient to clear the sides of the motor wheel easily when it is placed between them.



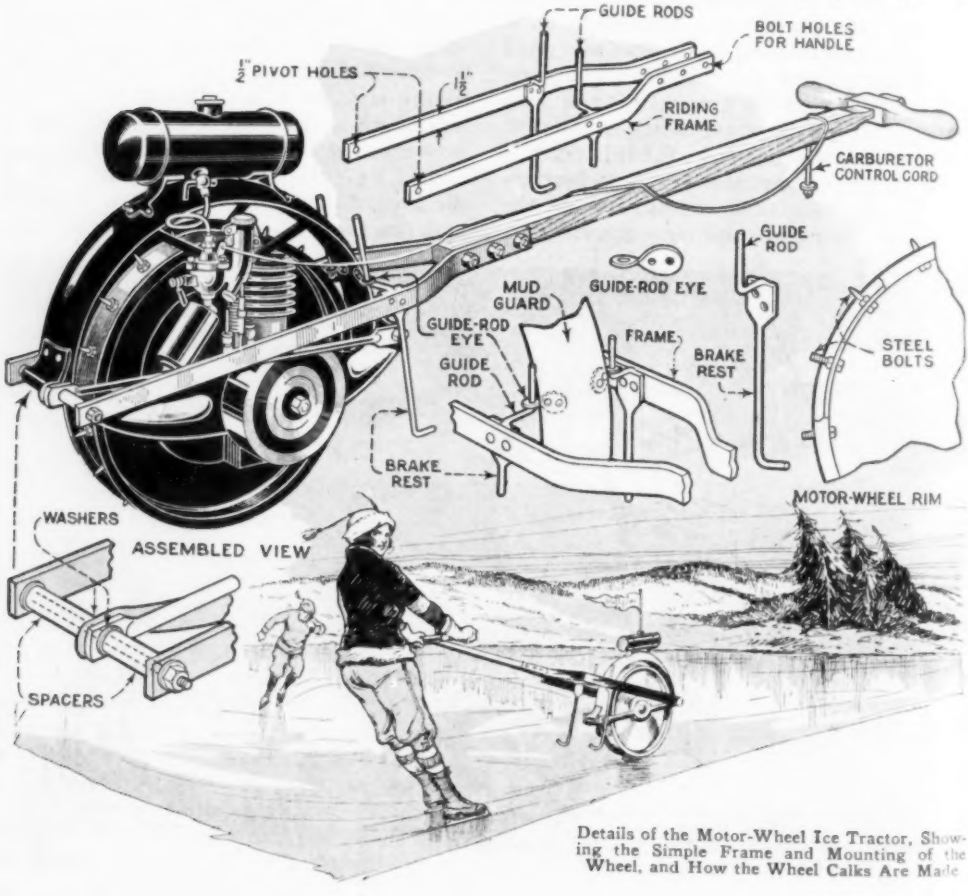
Thrilling Sport for the Ice Is Provided by Mounting a Motor Wheel in a Simple Frame and Using It as a Tractor

Pivot the wheel to the ends of the bars by drilling a ½-in. hole in each end and then running a ½-in. round-iron bar through these holes and the pivot hole in the front end of wheel frame. Two pieces of pipe should then be cut to fit loosely over the rod and act as spacers keeping the wheel properly centered between the sides of the frame. Their length and fit must be determined by experiment. Thread the ends of the rod and use washers at the ends of the pipes and under the nuts that secure the rod in place. When properly assembled, the outfit will appear as shown in the detail sketch.

Now make two guide eyes and rivet one to each side of the mudguard at the rear of the wheel. A ⅝-in. eye will do, and can be fashioned from flat steel, as suggested. Twist the metal, if necessary, so the flat of the eye is horizontal.

Two guide rods should then be fashioned from round iron, with a flat portion near the middle to rivet to the inside of the riding frame directly opposite the eyes. A close study of the drawing will show that these rods are bent in at right angles and then vertical and with a slight curve forward, so the eyes will slide over them if the handle is dropped down. This adjustment will necessarily have to be made to suit the occasion and by trial. The lower ends should be exactly the same length and the ends turned back at right angles, as shown. These are to act as rests for the wheel when not in use and as brakes when stopping. They should be 3 or 4 in. clear of the ice when the handle is held up by the user.

Remove the tire from the rim and put it away until summer. Then drill 16 to 18 small holes equidistantly around the center of the rim and fasten in them as many steel bolts with their ends projecting about



Details of the Motor-Wheel Ice Tractor, Showing the Simple Frame and Mounting of the Wheel, and How the Wheel Calks Are Made

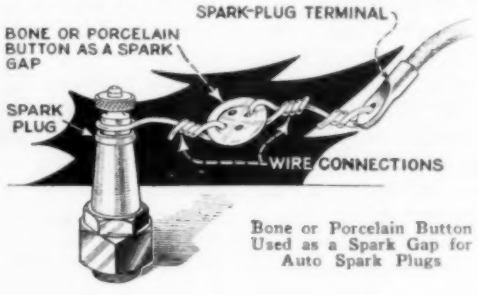
1 in. through the rim. Two nuts will hold each bolt securely. File each bolt to a short, sharp point, and you will have sufficient spikes to give good traction.

Lead the flexible carburetor control to the handle and lash it in place where it will be always under the operator's hand. An empty brass rifle shell can then be soldered to the gas-tank cap (not to the tank), if desired, to act as a socket for a small flag. Remove the cap from the tank, while soldering. Headlights can be added to the front of the frame and operated from three dry cells suitably placed, and a horn may also be attached.

The motor-wheel tractor normally should rest on the spiked wheel and the two legs provided for the purpose. When ready to use, grasp the handle in both hands and open the carburetor throttle. Then push the machine ahead as rapidly as possible by digging the spike points into the ice and running ahead. When the motor starts, the user can settle back on his skates and regulate the speed by the control. Turns can be made by slightly tipping the wheel in the direction one wishes to go but not far enough to prevent the spikes in the wheel from gripping the ice. When a stop is to be made, simply shut off the gas and lower the handle until the rests or brakes drag. This, with the compression of the dead motor, will bring the outfit to a stop very quickly.

Spark Gaps from Buttons

When making engine tests it is desirable to have some visible check on the operation of the ignition system. A simple means of forming spark gaps at the plug is ordinary bone or porcelain buttons, with the spark-plug wires attached to them. The wires are slipped through the eyes of the button, forming a gap through which the circuit will pass. When testing engines, it will be obvious that the absence of a spark at the gap accounts for missing, while, with the spark perfect and the missing still evident, the carburetion is at fault.



Bone or Porcelain Button Used as a Spark Gap for Auto Spark Plugs

Spring Hooks for Ironing Board

Holding the cloth tight on an ironing board can be done by means of the spring

Simple Spring Hooks Which Keep Cloth on Ironing Board Securely

hooks shown in the accompanying illustration. Each of these consists of a coil spring, equipped at both ends with a hook made of stiff wire. Points are filed on the ends of these hooks, which should be done before they are attached to the spring, and bent at the ends as indicated. The straight lengths of wire, with sharpened ends, are slipped through the ends of the spring, and bent around, forming a loop which holds them to the spring securely. A pair of pliers is used to bend the points into hooks and the device is then ready, the manner of its application in use being obvious from the illustration.—H. H. Siegele, Emporia, Kans.

¶Vaseline or cold cream, rubbed well into the hands before doing grimy work stops the dirt before it reaches the skin, so that you can wash them clean easily.

Quick and Smokeless Method of Lighting an Oil-Burning Furnace with a Bunsen Burner

Lighting Gravity-Type Oil Burner Quickly and without Smoke

An oil burner of the gravity type is usually lighted in the following way: Open the valve and allow the oil partly to fill the burner bowl, then shut off the valve and throw into the oil pool a piece of crumpled-up newspaper which is lighted and serves as a wick. While the oil is being burned, the furnace door must be left partly open to provide sufficient air. By the time that the oil has been consumed, the air-intake chamber is sufficiently heated to start the burner generating gas and the door may be closed. But the difficulty is that it takes several minutes to consume the oil in the bowl, during which time the attendant must stand on watch to guard against excess smoke getting out in the room. A quicker and cleaner method is by the use of a Bunsen burner. A 4-ft. length of ordinary ⅜-in. gas pipe is connected at one end to a flexible hose and at the other to an elbow carrying a Bunsen burner, as shown in the photo. There are two ways of using this torch. The quickest one is to leave the oil valve closed and heat the oil-intake pipe between the needle valve and the burner by passing the Bunsen burner under it. In about a minute, this will heat the oil to such a temperature that it is converted into gas as soon as the valve is opened, and the burner can then be ignited by the Bunsen torch, holding the latter above the burner. The other way, which requires a little more time but is effective, is as follows: Lay the torch on the top of the burner so that the flame plays on the air-intake chamber. You may go away and leave it going as long as you like, without any danger of smoke. When you come back, simply turn on the oil valve, whereupon the oil will be ignited and will start generating at once. Then the torch is removed, the doors can be closed, and the job is done.

Substitute for Crutch

When a crutch is not available, an ordinary kitchen chair can be used, as shown in the accompanying illustration. Place the knee of the afflicted leg upon the seat, on which a cushion is provided. Step forward with the other leg and then lift the chair forward with the hands, keeping the knee in contact with the seat of the chair. While I was laid up with a broken foot, I used this method of getting about, finding it more comfortable than a crutch, as the foot was supported in a horizontal position, which eliminates the throbbing pains experienced when the leg is swinging in a vertical position.—Lindley Pyle, St. Louis, Missouri.

BUILD THIS MODEL of FLYING CLOUD

BY JAMES TATE

Photo © Edw. Levick

THE next thing that should be done now is to paint the hull. The upper part, down to the water line, is black, and below the water line the object is to simulate the appearance of old, water-stained copper. First turn the model upside down on blocks, Fig. 48, on a level surface, and make a simple scribing block from a scriber or sharpened piece of wire, a couple of staples and a block of wood, as shown. Bend the wire so that it touches the hull at a point 7/8 in. down from the deck line, at station No. 11; see that the hull is level in a fore-and-aft direction, then run the scribing block round the hull, pressing the water line into the soft pine with the scriber. Now paint down from the rail to the water line with several coats of black japan color, allowing each coat to dry thoroughly. The color below the line should be a sort of a yellowish salmon pink, and may be obtained by mixing some red, cream and light brown. A little taste is necessary here. Get an old piece of weathered copper, and try to imitate its color. Don't, on any account, use a metallic copper paint. Space will not permit a complete and thorough explanation of the method of making each individual piece of the deck furniture, but the reader should have no trouble in doing this work from the drawings and text herein.

The method of making the rudder is illustrated in Fig. 47. The rudder itself is of the same thickness as the sternpost, and the forward edge, next to the sternpost, is beveled 30° on each side. Make hooks and eyes (pintles and gudgeons)

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 this series of articles, the first of which appeared in the Dec., 1927, issue.

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.

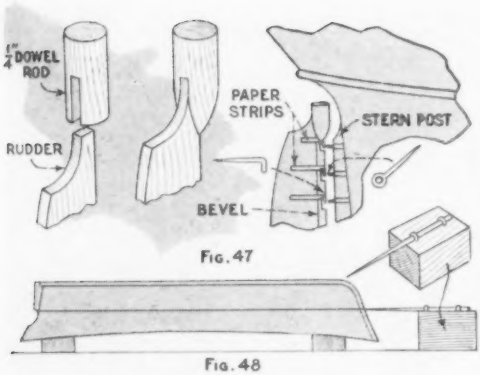


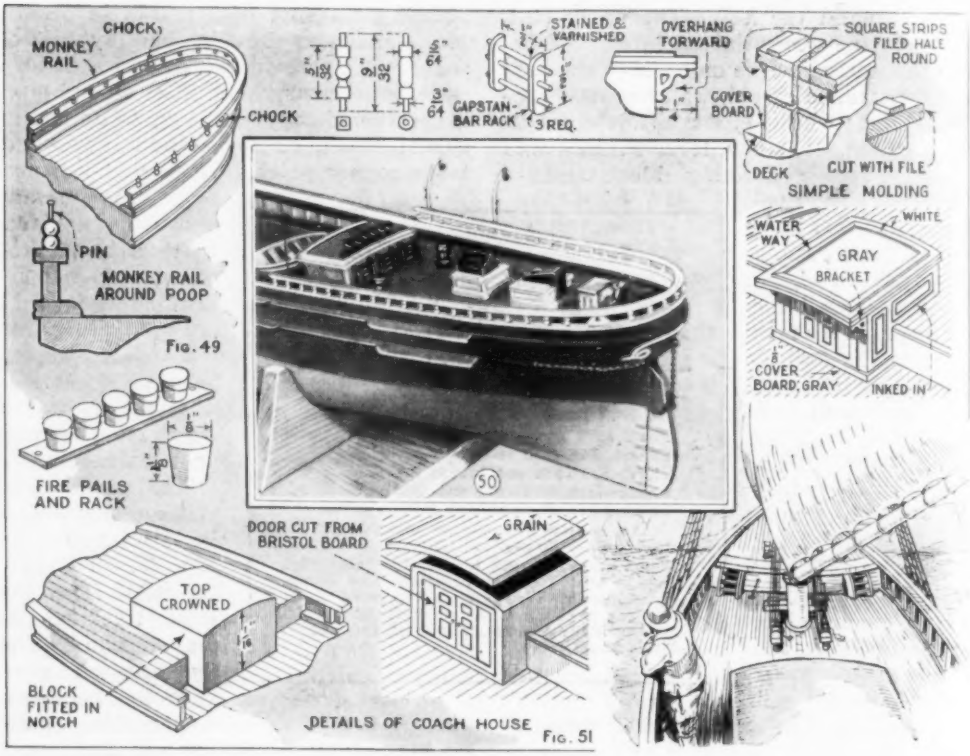
Fig. 47

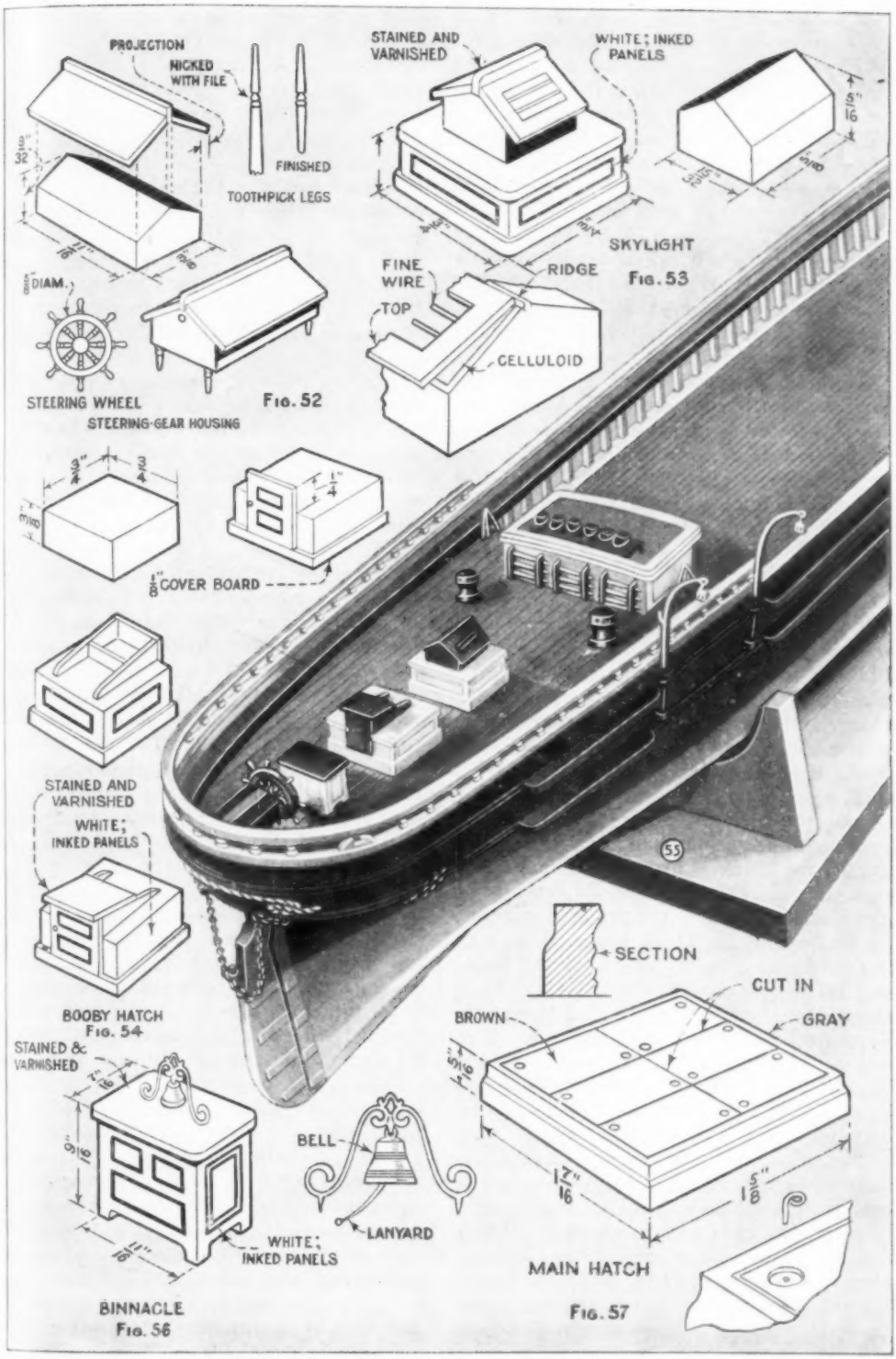
Fig. 48

from the smallest pins, and fit as shown, ½ in. apart, filing notches in the beveled edge of the rudder at each hook, so that the vertical part of the latter will be in line with the rudder edge. The rudder stock is made of a piece of ¼-in. dowel, slotted and glued over the rudder and carved to shape. The stock is glued into a shallow hole drilled up into the stern overhang. Cut a little rabbet into the bottom of both rudder and keel and glue in a slip of wood to hold the bottom of the rudder, then glue on 1/16-in. strips of paper to represent the straps of the pintles and gudgeons, and paint the rudder like the hull of the model.

The next job, Fig. 49, is the monkey rail around the poop. This is as wide and as thick as the top rail, and is best made in a similar manner, from a square, bent piece of wood. Rattan can be used if it can be obtained easily. The stanchions can either be turned from round or square brass wire to the dimensions given, or else built up from beads and pins, as shown. If the latter system is used, get some 1/16-in. pearl beads from the 10-cent store; these are rounder and more nearly uniform in size than glass beads. Don't use larger beads than this, or you will spoil the appearance of the rail. The entire rail is painted white. Leave space, between the stanchions on the quarters, for the little chocks shown.

Now fit a block, 1 1/16 in. high, into the notch in the quarterdeck, for the "coach house," Fig. 51. Crown the top like the deck. Fit a 3/32-in. roof board, allowing it to overhang ¼ in. forward and a full 1/16

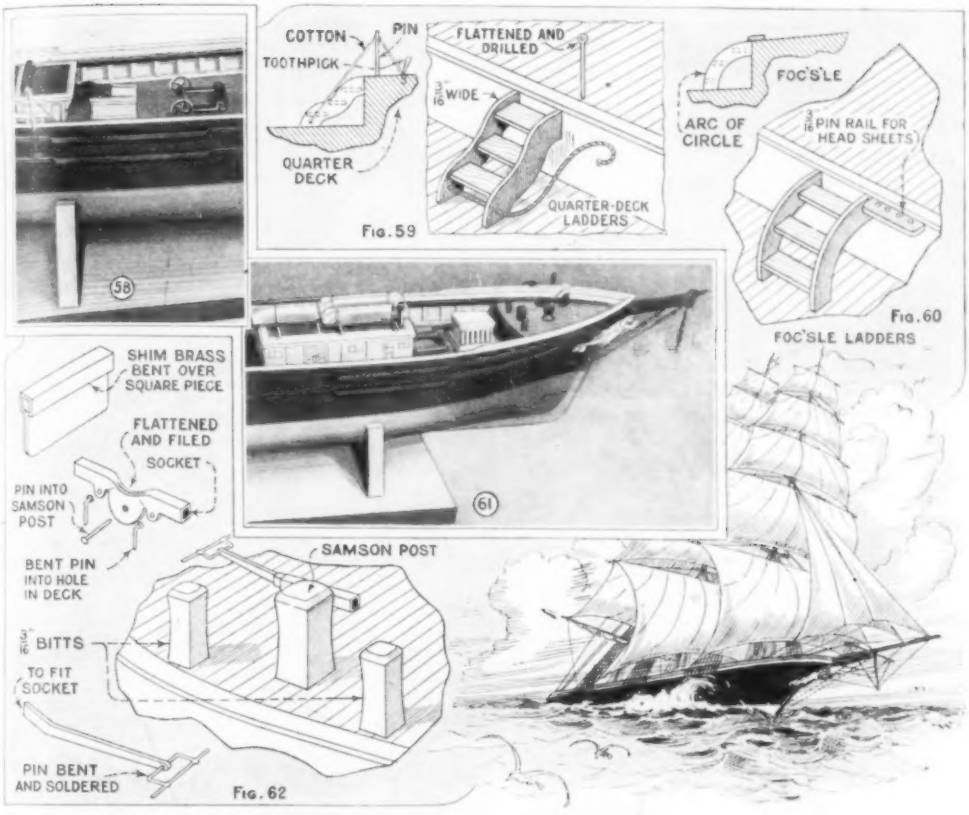



PROJECTION
NICKED WITH FILE
FINISHED
TOOTHPICK LEGS
STEERING WHEEL
STEERING-GEAR HOUSING
FIG. 52
STAINED AND VARNISHED
WHITE; INKED PANELS
SKYLIGHT
FIG. 53
FINE WIRE
TOP
RIDGE
CELLULOID
COVER BOARD
STAINED AND VARNISHED
WHITE; INKED PANELS
BOOBY HATCH
FIG. 54
STAINED & VARNISHED
BELL
LANYARD
WHITE; INKED PANELS
BINNACLE
FIG. 56
SECTION
CUT IN
BROWN
GRAY
MAIN HATCH
FIG. 57

in. on the other sides. Mold the edges of the roof with a small file, in the same manner as the hull molding, glue 1/16-in. square strips in the corners where the roof meets the block, and file these half-round. This makes a neat, attractive molding around the top of the house, and adds immensely to its appearance. Fit the brackets forward. One-eighth inch inside the edges of the roof, glue down 1/32 by 1/8-in. strips for the waterways, mitering the corners. Fit "cover boards" of the same material where the house meets the main deck. Cut the sliding doors and their frames from bristol board and glue them on. Paint the whole house white, except the cover boards and the roof inside the waterways, which are the same gray as the main rail. Use japan color for the first white coats, and finish with eggshell-gloss enamel. Using a fine lettering pen and waterproof India ink, draw in the panels on the side of the house and the doors. The heads of little pins, cut off and pressed in, form the doorknobs. Make and fit three capstan-bar racks to the after side of the house (see Fig. 50). Stain light oak and varnish. Make a fire-pail rack from a thin slip of wood and the pails from dowel stock, paint black, and glue in place on the after side of the house top. The bails of the pails are made of white thread, glued on.

The same methods are used in building up all the other deck erections. When making the steering-gear housing, for example, the block is first cut to shape and size, then the ridgepole and the top boards are glued on, the latter projecting about 1/32 in. beyond the block edges. The legs are made from toothpicks, with the beading cut on them with a small file. They should be of such a length that the steering wheel will just clear the deck. The wheel is better purchased than made, although one can be made from the drawing, Fig 52, if a small lathe is available. The housing is stained light oak and varnished. The skylight, Figs. 53 and 55, is built up in two separate blocks, the lower one white, with inked panels, and the skylight proper light oak, varnished. When the block has been made for the skylight, paint the slanting upper surfaces black, glue on slips of celluloid to represent the glass, then cut the openings in the tops and glue in two short lengths of fine wire across the underside of each opening, as indicated, gluing them down over the celluloid. The method of making the booby hatch is quite clear from the drawings. The block is white, with inked panels, and the door, sliding top and slides stained and varnished. Make two of these hatches, one on the quarterdeck; the other one, shown in Fig. 58, stands just forward of the coach house, on the main deck, the door facing aft. The binnacle, Fig. 56, is simple, and the bell and its standard can easily be soldered up on the soldering block described hereafter. The main hatch also needs little description, except that the looped and bent pins, shown in the lower view, Fig. 57, represent the eyebolts used for hoisting the hatch sections, and they are sunk into shallow, flat-bottomed holes in the corners. Paint the hatch coaming (sides) gray, and the tops of the sections brown.

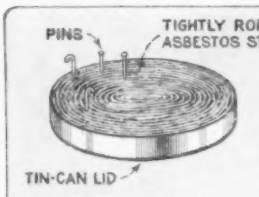
Little need be said about the quarterdeck and foc's'le ladders, except to use the thinnest wood possible, and to make them only 1/2 in. wide. The stanchions for the quarterdeck-ladder handrails are made of pins with the ends flattened and drilled; the handrail is a length of white thread, about No. 30 cotton, passed through holes drilled in the foot of the ladders, then through the holes in the stanchions, and the ends stuck in small holes in the deck, where they are fastened by driving in the glued end of a toothpick. This is cut off carefully when the glue has set. Foc's'le ladders have no handrails. At the after edge of the foc's'le deck are two 3/16 by 1/2-in. bitts, and a 1/4 by 9/16-in. samson post. These are shown in Fig. 62, and have a round peg end like the timber heads, glued into holes in the deck. The forward side of the samson post carries the pump brake for the windlass under the foc's'le. The pivot part of this is bent, soldered and filed from a piece of shim brass, and the pump-brake handles are made from 1/16-in. brass, with soldered-pin handles. Paint all black. The windlass underneath was turned by pumping up and down on these handles, rods running through the deck from the pivot piece operating on the windlass ratchets. The rods, on the model, are represented by pins, bent at the top into holes in the pivot, and passing down through small holes in

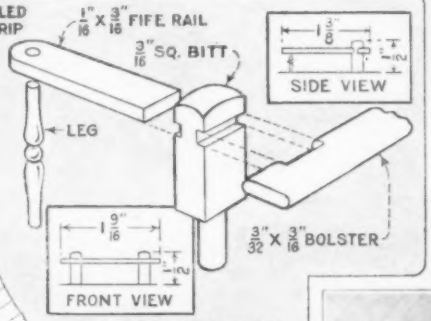


the deck. Between the foc's'le ladders and the rail, on each side, glue on small pieces of 3/16-in. wood (Fig. 60) to carry belaying pins for the head sheets. These will be explained later.

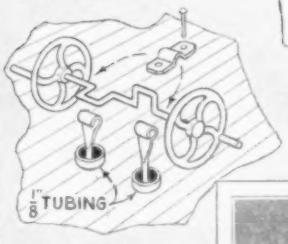
Around the fore and mainmasts are what is known as bitts and fife rails, Fig. 63. The drawing gives full dimensions for these. They are painted gray. The after end of the main fife rail carries a pump (Figs. 64 and 66), and the making of this is a nice little job. Get a tin-can lid, 4 or 5 in. in diameter, cut a strip of asbestos paper to the same width as the lid depth, then roll the strip up tightly and force it into the lid. This forms a soldering block, and small pieces can be held in position for soldering on it by means of straight and bent pins pressed down into the asbestos. To make the pump flywheels, form two rings of No. 20 copper wire around a 9/16-in. dowel, then cut four pieces of No. 24 wire and bend them S-shaped, to fit inside the rings and form the spokes of the wheels. Pin them down on the block and solder, attaching at the same time two short pieces of wire to the rims to form the wheel handles. Bend the crankshaft from a length of No. 20 wire, and carefully solder the hubs of the wheels to each end. Cut off the heads of two stout pins, flatten the ends for about 1/8 in. and bend them around the cranks to form the pump connecting rods. Drill two holes in the deck on the same centers as the cranks, and drive in two short pieces of 1/8-in. brass tubing, letting them project 1/16 in. above deck. Place the pump cranks in position on the fife rails and fasten them with two little bearings made of shim brass. Paint the rods, crankshaft, wheel rims and handles green and the spokes red, and varnish.

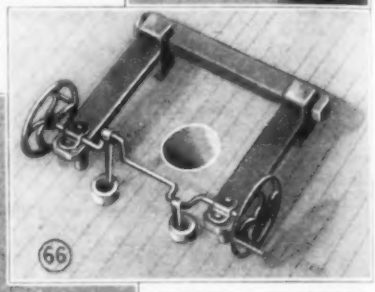
The deckhouse, Fig. 69, is made in exactly the same manner as the coach house, but the block is 5 by 2 1/4 by 1 3/16 in. in size. The galley funnel goes on the starboard (right) side, forward, and the spare spars on the port, lashed down to the boat skids. The boats are carved from white-pine

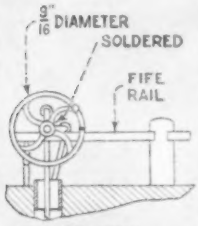




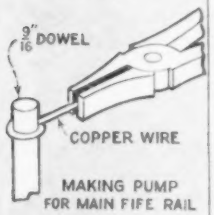
BITTS AND FIFE RAILS
Fig. 63



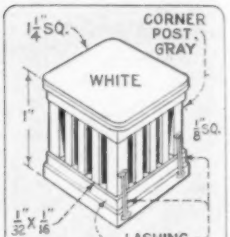


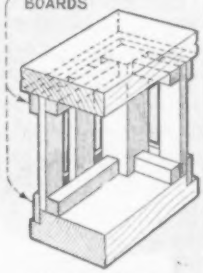


SIDE VIEW

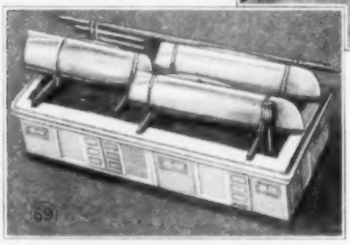


MAKING PUMP FOR MAIN FIFE RAIL
Fig. 64





FORE HATCH AND COOP
Fig. 67



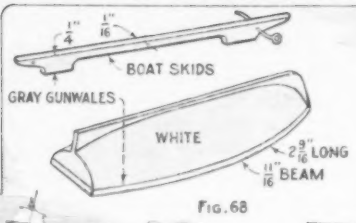
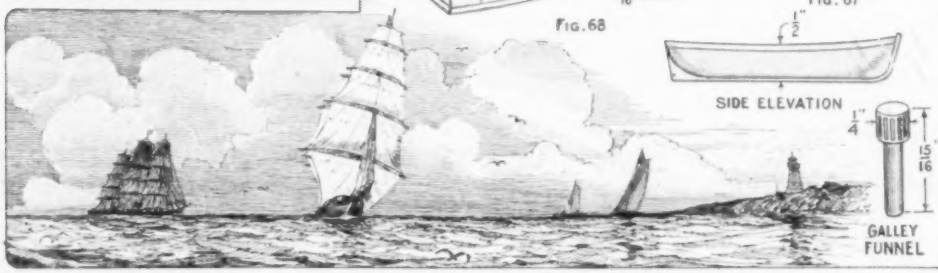
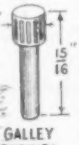


Fig. 68

SIDE ELEVATION



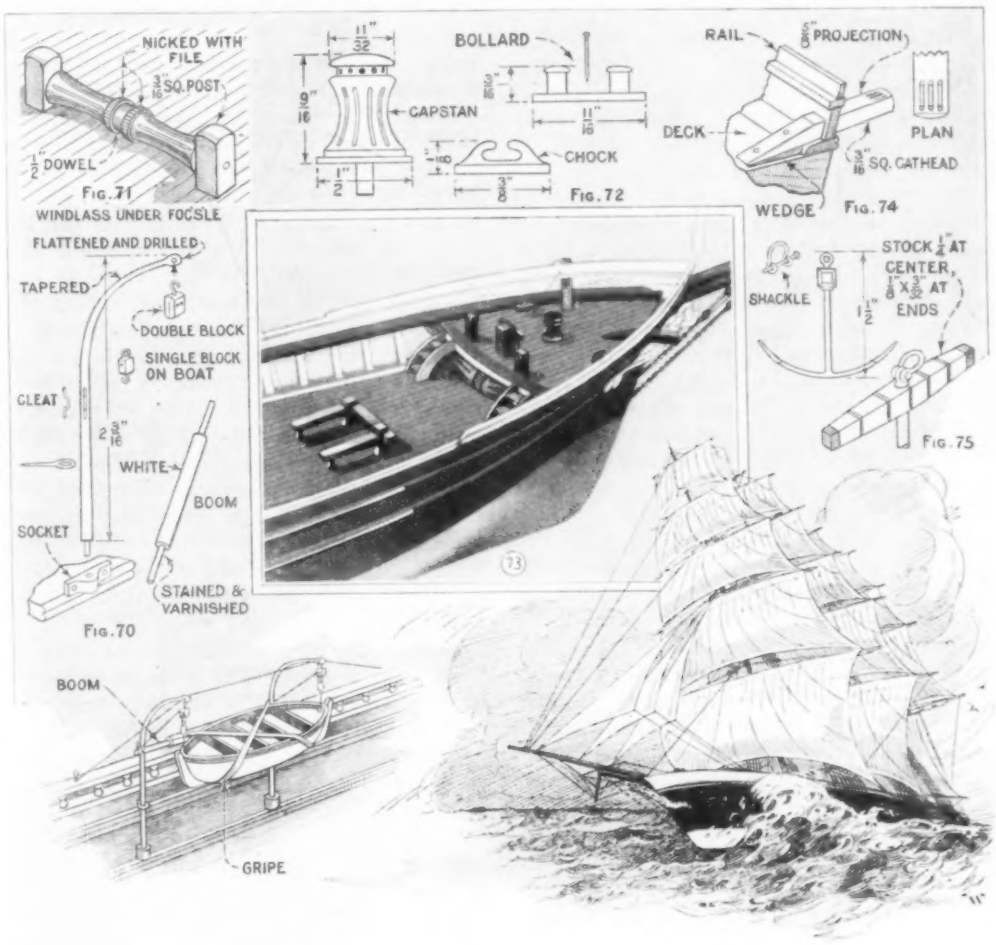


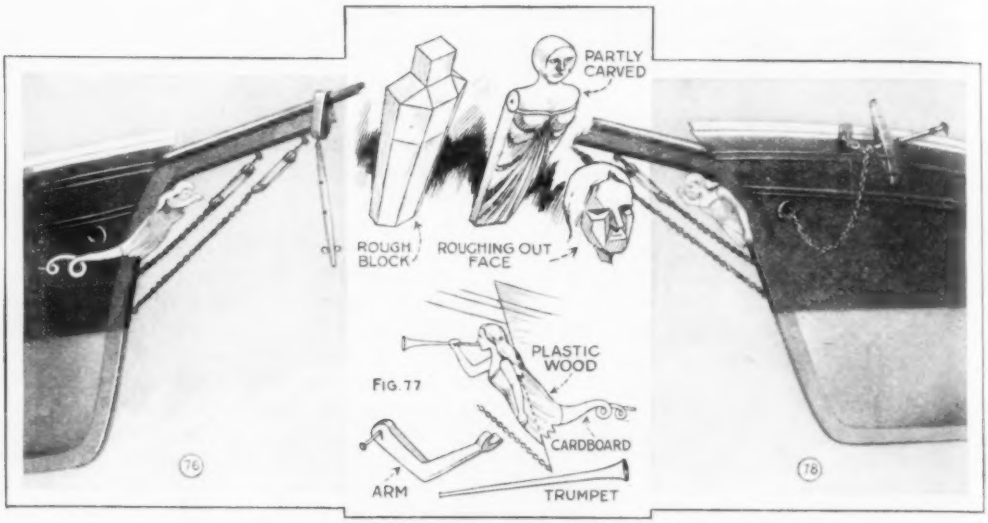
GALLEY FUNNEL

blocks, painted white with gray gunwales, and are lashed to eyepins made of fine wire, on the skids. Sliding doors are cut from bristol board and panels inked in. The fore hatch has a chicken coop lashed on top of it, as shown in Fig 67; for the model, the whole structure is a unit, and the lashings are merely for show. The hatch is 1¼ in. square and ¼ in. high; other dimensions are given in the drawing. Paint all white except the corner posts, which are gray.

The windlass, Fig. 71, is turned from a ½-in. dowel, and is 2½ in. long over all. Its position is shown in Fig. 73. The capstans, of which there are four, can be turned from dowel stock, as shown in Fig. 72, or purchased. This applies also to chocks and bollards.

The davits on the starboard quarter, shown in Figs. 55 and 70, are made from 3/32-in. brass wire. They taper from the bottom to top, and are flattened and drilled at the top for a double block. The bottom pin ends fit into small wooden sockets, pinned to the hull just above the lower molding, and they are further supported by eyepins driven into the rail at the upper molding. A small wire cleat for belaying (making fast) the falls of the boat tackles is soldered to each. Paint black below the rail and white above. The quarter boat is double-ended, 2½ in. long and ⅞-in. beam, carved from white pine, inside and out, and fitted with bristol-board thwarts (seats). Paint white with gray gunwales; brown thwarts and inside. Make the boom shown from 3/16-in. dowel, and lash across the davits. The gripes are made by doubling adhesive tape over





a small thread, then trimming 1/16 in. wide, and are used to hold the boat firmly against the boom. The single block at each end of the boat hooks into an eyepin.

The catheads, Fig. 74, are stout square timbers projecting from the bows, and are used to hoist the anchor up to the rail. On the model, they are fitted through the rail, as shown, at right angles to the hull, and project 5/8 in. outside and 3/4 in. inside the rail. Paint the inside part gray and the outside black. The outer end has six small holes drilled through it, to represent the sheaves. The anchor is shown in detail in Fig. 75. This can be purchased, or made in any way that the builder desires. The wooden stock is usually fitted by gluing two strips together with the anchor shank between, the stock being carved to shape when the glue has set. Paint the anchor flat black, stain the stock, paint on the black bands and varnish the stock. The anchor shackle is bent from copper or brass wire and the anchor is fitted with a double block. The lead of the tackle runs from an eye on the anchor block through the forward hole in the cathead, down through one hole in the block, up through the next hole in the cathead, down through the block again, through the next hole in the cathead, then through a hole in the rail, and is belayed around a bollard on the deck aft of the cathead. (See Fig. 73.)

The carving and fitting of the figurehead is a delicate job, although not such a hard one with a little patience. The writer is a very poor wood carver, but he managed to make a fairly decent-looking figurehead in about an hour by the method shown. Cut the block, which should be of hardwood, to the shape shown in Fig. 77, 1 3/8 by 1/2 by 1/2 in., then proceed to carve the face roughly by means of angular cuts somewhat as shown in the detail; the features can be rounded and fixed up afterward, the main thing at first being to get in the bold outlines of the face and body. Fit the carved block to the stem, then cut the arm that holds the trumpet (the right) roughly to shape, trying it often to the body to see that it is going to hold the trumpet in the correct position, which should be parallel to the bowsprit. When correct, round off the curves of the arm and body and pin and glue all in place. Add the hair to the figure with plastic wood or gesso, as desired, and make the trailing tail of bristol board, gesso or plastic wood. The figure is white, and the trumpet, made from a toothpick, is gold. The trumpet is better left until the model is finished, however, or it may be knocked off.

The hawsepipes, through which the anchor chains pass, are made of 1/4-in. copper tube, with the end cut on a bevel to suit the holes drilled for them in the hull. The outer beveled ends have washers soldered on, filed to elliptical shape and rounded. The rims of the pipes are black and the inside red. The anchor chain is fourteen

links to the inch, fastened inside the hawseholes by means of a pin driven into the hull, and shackled at the other end to the anchor. (See Fig. 78.) The rudder chains, shown in Figs. 50 and 55, are of the same size. They are fastened to an eyepin at the water line on the rudder, then led up, on each side, to an eyepin at the lower molding, leaving a little slack, then forward to another eyepin, 2 in. forward of the first, where they are made fast.

A word as to the painting of the deck fittings: The deck houses where white is used, look best when finished in egg-shell-gloss enamel, and metal parts, like the pump, when painted and varnished, but the anchor, bitts, fife rails, tops of houses and the like, finished in gray or black, look best left flat. Paint all chains black; chain of this size comes in brass, and of course it was iron on the original ship, so don't let the brass show.

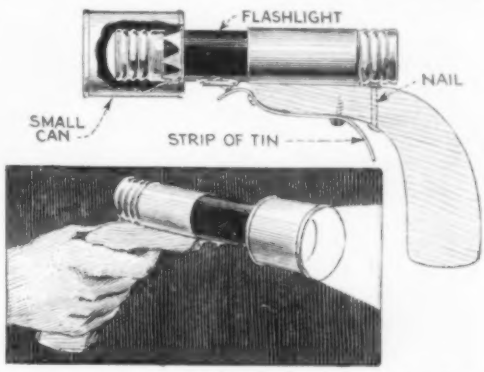
There is difference of opinion as to the best method of finishing the hull paint. It can be varnished and rubbed down, if desired, but the author does not like this; it makes the model look too much like a toy yacht, and not what it should look like, a picture, in wood and metal, of a real ship. The japan paint, when rubbed with a soft rag with or without just the slightest trace of polishing wax, takes on a soft, dull glow that is very pleasing, and that looks a great deal more like a real ship's paint than the varnish finish. If the wax is employed, only the very slightest trace must be used, and the first rubbing must be done very lightly, or the wax will lift the paint right off.

Those who do not wish to carve the figurehead can purchase it cast in metal. The location of the deck fittings is shown on one of the blueprints of this model, obtainable from the Amateur Mechanics department at 50 cents for the set of three.

(To Be Continued)

Flashlight for Signaling

Secret signaling at night can be accomplished by means of a flashlight gun of the kind shown in the illustration. All that is needed is a piece of soft wood, some tin cans, some wire, nails and a flashlight. Cut a small hole in the center of the bottom of a tin can and make radial cuts from this hole toward the side. Turn the pieces inward so that the head of a flashlight can be pushed through the opening, the cut sections "pinching" the flashlight to keep



Using an Ordinary Flashlight to Make a Signaling Gun; It Is Operated by a Trigger

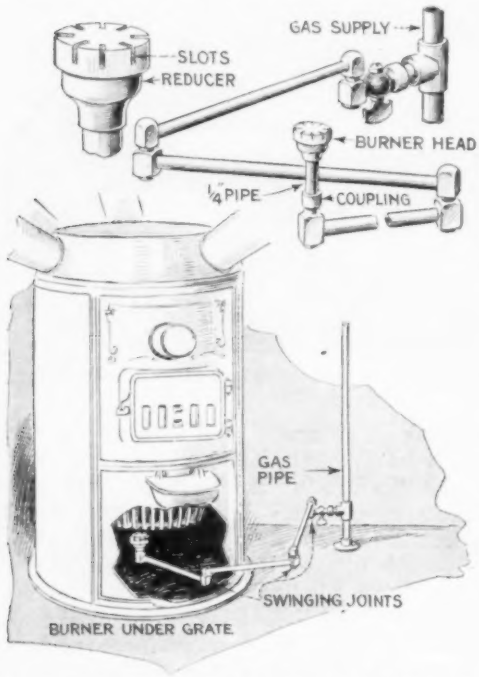
the can on securely. Cut another piece of tin from a can and bend it to form a tube, which fits around the flashlight, and nail it to a wooden handle shaped like a pistol grip. Arrange a strip of tin tacked to the underside of the grip to serve as a trigger. This should touch the push button on the flashlight. A hole is drilled for a nail, which is driven up through the handle to bear against the back ferrule of the flashlight, and so that the trigger strip can be pressed up against the nail head. The gun is pointed in the direction of the person who is to receive the signal and the flashes are made by pressing the trigger.

Coil Spring on Ford Brake Lever

On Ford brake levers the spring often becomes defective and troublesome. A good method of overcoming such trouble is to use a screen-door coil spring, which is attached to the brake lever, as indicated in the accompanying photo. The spring is slid over the rod attached to the ratchet pawl, and is fastened at both the top and the bottom.—A. K. Hinkley, Rowley, Massachusetts.

Lighting the Furnace by Gas

One of the simplest methods of starting a furnace fire, by other means than



Lighting the Furnace Fire by Means of an Extension Gas Burner

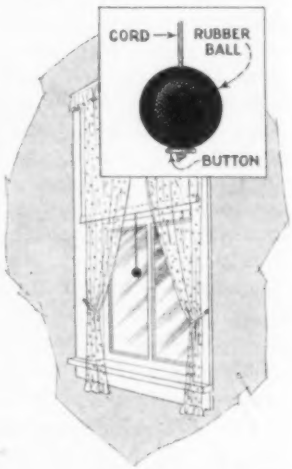
that of newspapers and kindling wood, is the use of a gas flame. Where gas is in the house it can be used as illustrated. Pipe the gas line down to within about 3 ft. of the ash-pit door at one side. Fit the end of the pipe with a swinging joint. Attach a 2-ft. length of gas pipe to this joint and also provide it with a swinging joint. A third and fourth section, the last fitted with a gas burner, is attached to the second length. The burner can be made after the pattern shown and consists of a short piece of ¼-in. gas pipe with a coupling on the bottom end to fit the burner threads in the end of the bracket. To the top end of the pipe fit a reducer coupling with a top diameter of ¾ in. and to that fit a pipe cap with about a dozen slots sawed through its edge. To use the burner, open the lower draft door and swing the burner inside the ash pit under the grate bars. Turn on the gas and light it in the usual manner. The flame will quickly ignite large kindling, or will even ignite the coal itself if left burning long enough. After the fire has been started, swing the bracket out.

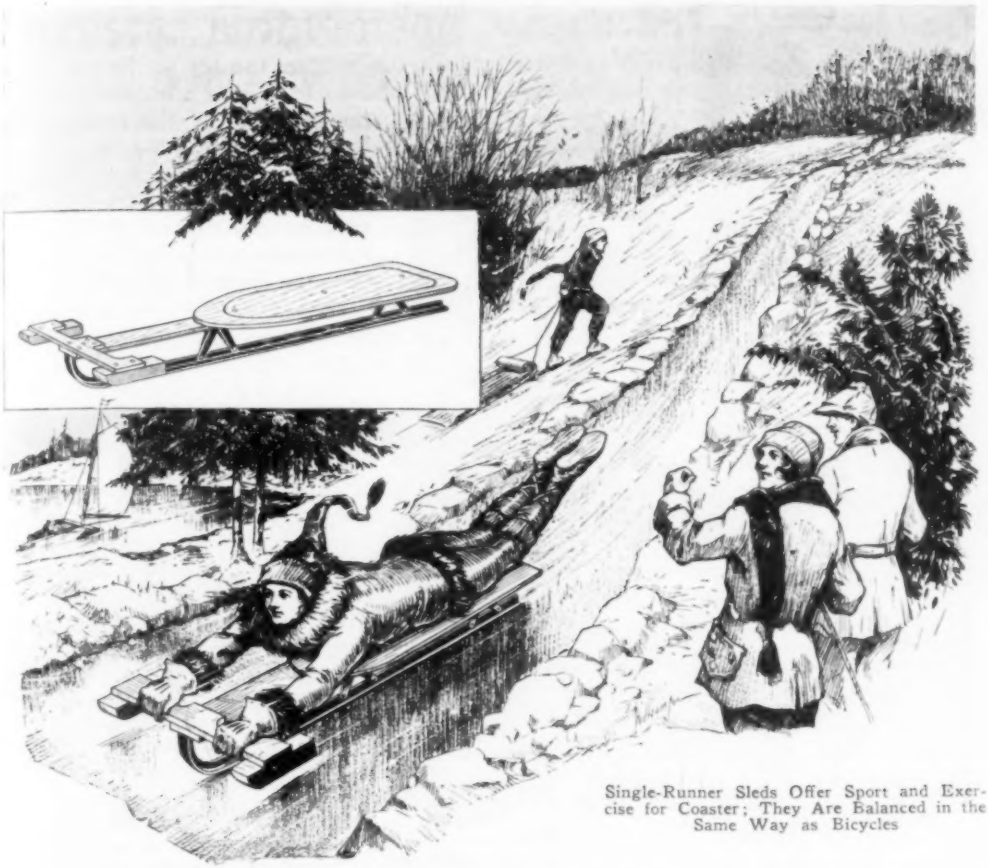
Rumble in a Closed Car

"What makes the rumble in a closed car?" is a question many car owners have tried to answer. One owner tightened down the body brackets, used rubber under some of the body supports and even screwed down floorboards with heavy wood screws in an effort to rid a car of the pronounced noise. Finally he cushioned the floor mats with a double thickness of felt, as used under rugs, with most gratifying results. The rumble was absent from the car for the first time since it left the factory. Felt as used for floor rugs is quite inexpensive, is easily cut to the required size and can readily be inserted under the floor mats. A double thickness has, in addition, good insulating qualities and adds to the life of the mats.—G. A. Luers, Washington, D. C.

Protectors for Window Shades

Nearly everyone has had the experience of window shades flying out of their hands and wrapping around the roller. This in time will cause the shade to tear. An easy method of overcoming this annoyance is to get a small soft rubber ball of the solid kind and attach it to the shade, as shown in the drawing. Take a large darning needle and thread it with good strong cord. A two-hole button is tied at the end of the cord and the cord is then pulled through the ball. The cord is tied to the lower part of the shade in the usual way. —William C. Thomas, Chicago, Ill.





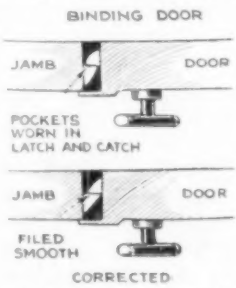
Single-Runner Sleds Offer Sport and Exercise for Coaster; They Are Balanced in the Same Way as Bicycles

Single-Runner Sleds

Balancing like a bicycle on account of its speed, a single-runner sled affords both amusement and exercise. The runner should be of the flexible type and can be taken from any discarded sled so equipped. It is fastened to a length of 1-in. wood, 3 in. wide and the same length as the runner, by means of brackets and bolts, or rivets. A crosspiece or handlebar, made of the same material, is securely nailed to the front end, and blocks of wood, rounded at the front ends, are nailed to the bar as indicated. The body board is then nailed on. It is about 2 ft. long, 1 ft. wide and is made of 1-in. stock. It is nailed in such a position that the rider's arms will extend straight in front of him to the handlebar. When starting, the sled is balanced by the user's toes, but once under way, it will be found possible, after practice, to balance the runner almost entirely by slight movements of the body and legs. This balancing is a bit difficult but not more so than mastering the riding of a bicycle.—L. J. Lesh, Miller, Ind.

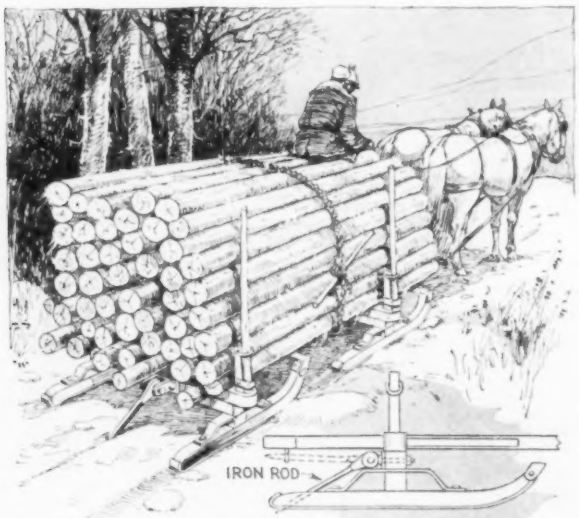
Correcting a Binding Door Latch

Auto doors sometimes stick on account of the latch and catch being worn to the shape shown in the upper detail. This can readily be remedied by filing off both, leaving a straight surface, slightly beveled. The spring behind the latch pushes it into place snugly, preventing rattling, and the slight bevel will allow easy turning of the door handle.—Richard C. Tarr, Gloucester, Mass.



Brake for Sleighs

A heavily loaded sleigh climbing a steep hill is a dangerous thing to ride on, especially if the road surface is slippery, or if the horses are tempted to pause for a breath. Many a teamster has had a spill or a serious accident, which could have been avoided if there had been some means of braking the sleigh. The drawing shows an effective brake. It consists of heavy iron rod fastened to the center of the rear bob by means of a bolt through one end, to allow a free up-and-down movement. The other end is sharpened. When the sleigh is drawn up a hill, the bar drags over the snow, and when the sleigh stops, a backward movement of an inch or two causes the point of the rod to dig into the road. A hook may be provided to hold the rod up when not needed.—H. Webster, Winnipeg, Can.



Simple, Effective Brake That Will Prevent Heavily Loaded Sleighs from Slipping down Steep, Slippery Inclines

Repairing Hood Roll Edges

Late-model Ford cars have hoods with hollow, rolled edges on which the hood fasteners catch. The fasteners wear partly through the roll edge and are difficult to release when the hood is to be opened. A good method of preventing this trouble is to cut lengths of heavy wire, about 6 in. long, and drive these lengths into the roller edge from the ends. This fills the worn spots, forcing the hood fasteners to rest on the top of the roll. The 1927 model Fords have a leather pad over the rear end of the hood at the lower edges, and a long piece of wire the whole length of the hood must be driven in from the front end, instead of two short pieces from both ends.—E. T. Gunderson, Jr., Humboldt, Iowa.

How to Clean Silver

There is probably just as much silverware sold today, which contains a great deal of filigree work, as there ever was, and some of it is very difficult to clean. However, this can be done in the following way: Make a paste from cream of tartar and water and rub it into the filigree work of the silver. Then wrap it up in a soft cloth and lay away for a day or two, after which it should be well washed with warm water. The appearance of the piece will be like new. —L. H. Georger, Buffalo, N. Y.

Simple Page Marker

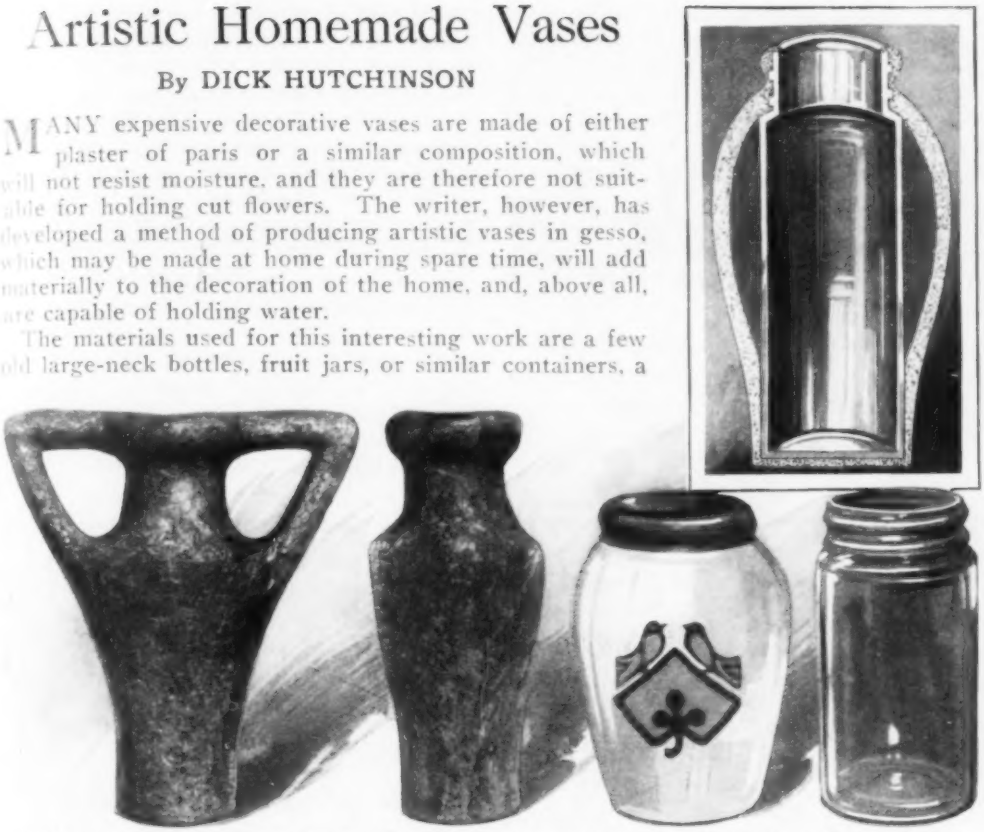
Turning down the corner of a leaf to mark the place in a magazine has the disadvantage that it is often difficult to find later and if several are turned down, one or more are likely to be overlooked. A better method is to make a semicircular tear in the sheet and then fold the torn section down so that the flap forms a tab projecting beyond the edge of the page, as shown in the illustration. By making these tears at various heights up and down the page, a large number of such markings can be made and each will be readily visible.

Artistic Homemade Vases

By DICK HUTCHINSON

MANY expensive decorative vases are made of either plaster of paris or a similar composition, which will not resist moisture, and they are therefore not suitable for holding cut flowers. The writer, however, has developed a method of producing artistic vases in gesso, which may be made at home during spare time, will add materially to the decoration of the home, and, above all, are capable of holding water.

The materials used for this interesting work are a few old large-neck bottles, fruit jars, or similar containers, a



Artistic Vases for Cut Flowers Can Be Made by Using Gesso, with a Fruit Jar, Bottle or Other Container as a Base; Upper Right, Sectional View of Vase

small can of liquid glue, a quantity of whiting, a small bottle of linseed oil and an old knife. Get an old air-tight tin can and pour into it a small quantity of the glue. Stir enough of the whiting into this to make a stiff paste, then add a few drops of linseed oil. If this mixture is too thin after stirring it thoroughly, add a little more of the whiting. Keep the mixture covered when not in use as it dries very rapidly. Now select a large-neck bottle to be used as a foundation upon which to build up the mixture. Cut a number of narrow strips of fairly heavy paper, and wind these around the body of the bottle, near the top, as shown in the sectional view above. Use plain glue to hold the paper in place. A little work, of course, is necessary to build up a sufficient shoulder of paper.

Now begin at the top of the bottle and apply with the knife enough of the composition to form a collar, bringing the material over the top and to the inside edge of the neck opening. Work on down over the paper shoulder, applying the mixture until the desired shape has been obtained. Select a stick or large cork that will fit into the neck of the bottle rather tightly, and invert the bottle, then work on down and over the bottom with the mixture. If a smooth finish is desired, wet the knife occasionally by dipping it in water and work over the entire surface until it is perfectly smooth.

If the vase is to have a handle or handles, as in the left-hand example, bend short pieces of wire to the required shape, tie these in place on the bottle with a length of cord, apply a small quantity of the mixture at both ends of each wire and let it set until dry, then cover with the composition until the handles are of the required size and shape.

There are a great many methods of finishing vases. They may be given a coat-

ing of brush lacquer of any color most suited to the particular style of vase selected and a medallion painted on, or a coat of gold bronze may be applied over the surface and some old rose, burnt umber or green oil paint then rubbed on with a piece of cloth. This will produce a very pleasing effect, which will fit in well with any plan of decorating. With a little originality and practice, one will be able to work up a variety of very beautiful pieces.

Floating Siphon Insures Clean Gasoline

Many tourists, particularly those of the motor-camper class, use a rubber-tube si-

Cork on End of Siphon Prevents Getting Sediment and Water Out of Auto Gas Tank

phon to fill the tanks of their camp stoves or gasoline lanterns. Clean gasoline is essential to the proper operation of any gasoline-heating unit. Dirty gasoline containing water is often caused by the end of the siphon tube extending down to the very bottom of the gas tank of the car, which permits it to suck up some of the sediment and water accumulated there. This trouble is avoided by attaching a large cork, which can just be slipped through the filler hole of the tank, to the siphon tube, about an inch or so from the end. The tourist is then always assured of getting clean gasoline.

Eliminating the Ash Sifter

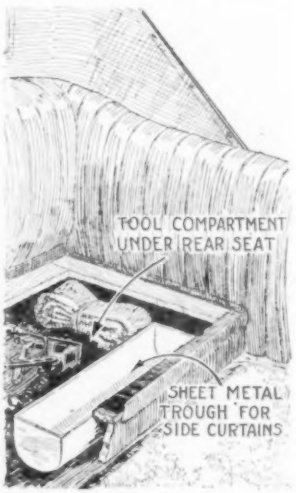
Screening and sifting coal ashes from the furnace, while essential from the standpoint of economy, is a most disagreeable chore. This messy task is eliminated in a most effective manner, however, by the employment of a short-handled garden rake. When the ashes have been shaken down into the ashpit, the door should be left closed long enough for the dust to settle. The rake should then be used to push them toward the back of the pit. With a little care, the partly burned coals can be raked from the pile to the front of the pit and shoveled into the fire box again. Besides eliminating the use of a sifter, this practice prevents dust and dirt, especially if the fire-box door is left open and the check draft closed during the raking, as the draft carries away practically all dust that rises from the pit door.

Gravy Spots on Linen

Gravy spots can be removed from linen table cloths in the following way: Set a saucer under the spot and pour some peroxide over the spot immediately. Then soak it with a little ammonia. The ammonia is not always necessary, but in some cases it is essential in removing all traces of the marking.

Metal Trough Holds Auto Curtains

While many forms of holders for side curtains of the car are available, the majority of these are arranged in the top, or at the junction of the top with the rear curtain. A practical and serviceable departure from these forms is used by a Washington motorist, and is shown in the attached illustration. A small metal trough is carried in the tool compartment under the rear seat. This is made from sheet iron and is securely screwed to the forward ledge of the



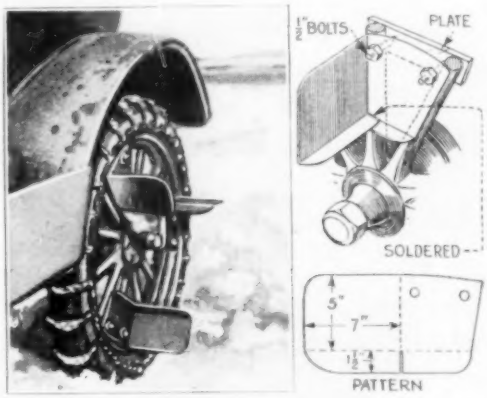
box, where it is easily accessible. The holder is made of a size to accommodate the rolled bundle of side curtains, but a few inches longer than the roll, to permit inserting the fingers. A cardboard lining should be used in the holder to avoid cutting or scratching the curtains.

Better Switch Plates

Wall-switch plates have been made from several substances. The trouble with most of these is that they soon become discolored and scratched, which naturally detracts from their appearance. Better ones can be made in the following way: Take some ¼-in. plate glass and cut some pieces to the same size as a regular switch plate, bevel the edges and cut the necessary holes for both screws and switch. Any glazier's shop can do this work quickly and at a small cost. They are then silvered as any mirror would be. These plates can be more easily seen than other kinds when the room is darkened because they reflect the least amount of light. They do not have to be replaced on account of becoming scratched or tarnished, and thus they last indefinitely. The material need be mere scrap glass.

Snowshoes for the Auto

In parts of the country where there is considerable snow during the winter months, it is often difficult for autos to get through. Chains do not give enough traction in loose snow. As a remedy we made sheet-metal snowshoes, which were securely bolted to the rear wheels of the car as shown in the photo. The shoes prevent the wheels from burying themselves in deep snow and provide sufficient traction. With them, we have driven through snow where other cars were unable to go.—A. C. Brundage, Rochester, Minn.



Sheet-Metal Snowshoes on Rear Wheels Help Auto Travel in Deep Snow

Novel Hat Pegs Consisting of Painted Dutch Dolls with Wooden Shoes

Dolls Make Attractive Hat Pegs

Vividly colored wooden dolls with shoes projecting sufficiently to allow their use as hat pegs, are the latest novelty in London. Any home mechanic can readily make them by cutting the figures out of ½-in. wood with a fretsaw. The extending shoes are securely attached to the feet with long wood screws, holes being drilled through the feet and lengthwise through the shoes to prevent splitting them. If a number of dolls are to be used side by side, as shown in the drawing, get a piece of ½-in. wood, about 10 in. wide and any desired length, draw the dolls on this piece and then cut out just the lower section of each doll. In the figures shown the shoes are attached directly to the underside of the part representing the dress, the screws being drawn up through the shoes and into the dress section.—H. T. Wilkins, London, Eng.

Small rubber rollers can be made by drawing strips through a hole in a hot metal plate.

Quick and Easy Method, Used by Wisconsin Farmer, of Twisting Four Wires into a Strong Cable

Twisting Small Wire Cables

One chief difficulty in twisting wires to make three or four-stranded cables for fence-post braces is to make allowance for the shortening of the twisted strands. A Wisconsin farmer used a simple and novel method of overcoming this difficulty. A hole about 1 in. in diameter is drilled through the upper end of a post which is set firmly in the ground. Four strands of wire are attached to the rear of a farm-wagon reach by means of a bolt, and the opposite ends of the strands passed through the hole in the post. These ends are bent to double back upon themselves an inch or so and then inserted into the jaws of a carpenters' brace where they may be gripped firmly. By operating the brace the four strands are twisted quickly and evenly, and the wagon is drawn slowly backward to allow for the shortening of the cable. A number of cables may thus be made in a short time as it is a simple matter to release a cable and substitute another set of strands.

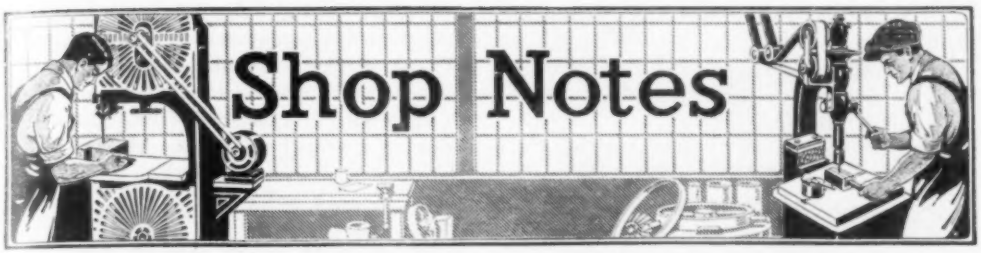
Novel Way to Oil Clock

When the works of a clock are not easily accessible for oiling, the following method is always successful. Fill an atomizer with the type of oil desired and direct the spray into the region to be oiled. A very little oil will suffice. This method is particularly successful with alarm clocks. It is not necessary to remove the back of the clock; simply insert the tip of the atomizer in the slot occupied by the regulating device and the works, including the mainspring, will be well lubricated by three or four compressions of the bulb. By using an atomizer with a tip adjustable at different angles, the spray may be driven vertically upward into the works of the heavier type of clocks that are not so easily moved.—L. Pyle, St. Louis, Mo.

Magnifying Glass Aids to Thread Needles

Much unnecessary eye strain can be avoided by women who sew if the method shown in the drawing is used. A magnifying glass having a handle is needed, the size depending on the sewing stand on which it is to be used. A hole, the same size as the handle, is drilled into the bottom of the stand. The handle is then inserted in the hole as indicated. It is an easy matter to thread needles by placing the thread and needle behind the glass. Both will be magnified to such an extent that eye strain will be eliminated. —Wm. C. Thomas, Chicago, Ill.

Magnifying Glass Mounted on Sewing Machine Relieves Eye Strain When Threading Needles



How to Burn Coke in Stove or Furnace

By J. S. HAGANS

MANY householders have been attracted to the use of coke for heating at one time or another, because of its merits of cleanliness, minimum ash, smokelessness and other considerations, only to abandon the fuel in disgust because the results were not what they had expected. In practically every such case, the trouble was not due to the fuel, but to unfamiliarity with the proper method of handling it, and to improper management of the furnace or stove in which it was used.

In the first place, there are several sizes of coke, just as there are of coal, and, for greatest economy and service, the size must be suited to the kind of heating apparatus it is to be used in; the ordinary sizes are: mixed egg and stove, for furnaces, steam and hot-water boilers with very large fireboxes; stove (range) size, for furnaces, steam and water boilers, such as form the heating equipment in the aver-

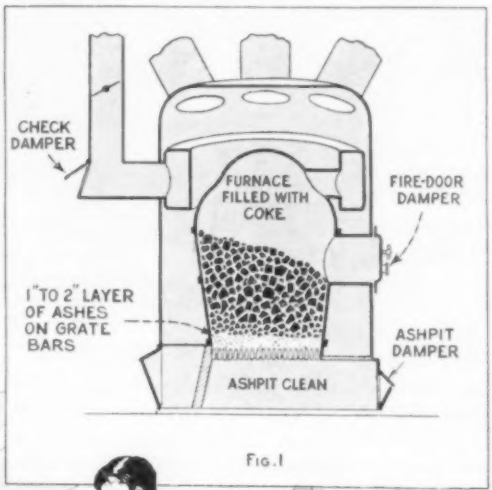
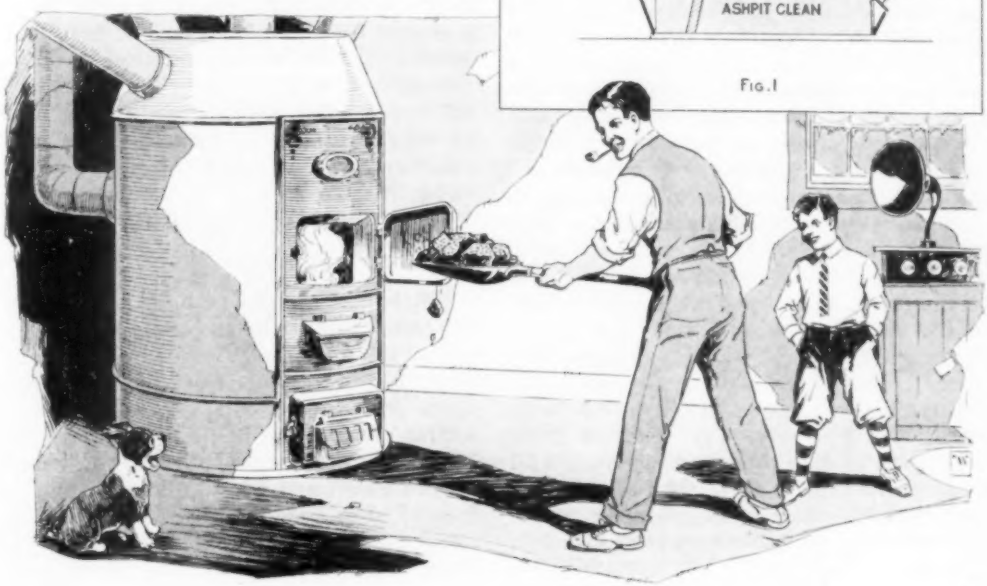


FIG. 1



age six to ten-room house; No. 1 nut, for small furnaces, boilers and open grates; No. 2 nut, for stoves and ranges, base burners, hot-water heaters and magazine-feed boilers and furnaces.

For use in furnaces, steam and hot-water boilers, after the fire is kindled fill the firepot with coke and close the fire-door and smoke-pipe dampers. Open the check damper (Fig. 1) and regulate the draft with the ashpit damper. It may be necessary, in some cases, to keep the smokepipe (twist) damper slightly open, but this is easily determined by experiment. When preparing the fire for the night, stir with the poker and open the drafts until the fire is burning brightly. Fill with coke and close the twist or smoke-pipe damper; open the fire-door and check dampers and, if necessary, open the ashpit damper slightly. Usually this damper can be kept closed.

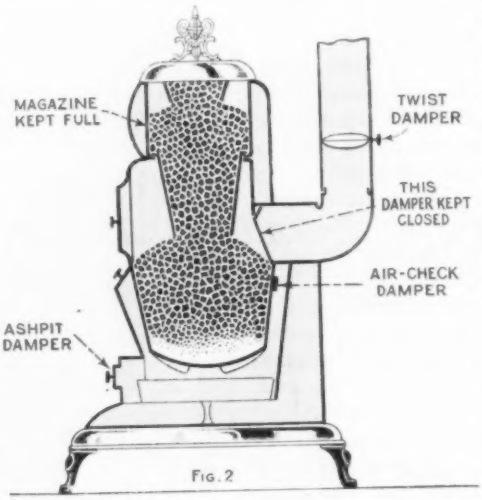


FIG. 2

In the morning the fire should be shaken only until the first red sparks appear in the ashpit. If the fire is low, don't shake it; stir it up from the top with the poker, throw on a few shovelfuls of coke and turn on the draft. When the fire is going well, fill the firepot with coke and regulate the drafts as before, or according to weather conditions. Should the fire occasionally go out, it is not necessary to dump it; dig a hole in the front of the coke and rekindle.

It is usually desirable to protect the bars of the furnace grate from the intense heat of the fire by allowing a layer of ashes to accumulate on the bars. In mild weather the thickness of this layer can be increased. Always keep the firepot full, since a thick fire, burning slowly, will generate more heat than a thin fire burning fast, and don't shake the fire more than once a day, preferably in the morning, except in severe weather, or when heat is required in a hurry.

When burning coke in a base burner or magazine-type of stove (Fig. 2), kindle in the usual way, then fill the magazine with coke. When well started, close the twist damper and regulate with the check, fire-door and ashpit dampers. A little experience will demonstrate that less draft is required with coke than with most other fuels. At night, open the fire door and poke so as to cover the fire with fresh coke from the magazine. Fill the magazine and regulate the drafts, and there will be a good fire in the morning. In the morning, shake gently until the first red sparks appear in the ashpit, after opening the drafts. When the fire has started nicely, close the smokepipe damper as before, and regulate with check, ashpit and fire-door dampers. If the fire does not burn evenly or freely, poke it.

To get good results with coke it is only necessary to experiment a little with the stove or furnace, basing the experiments on the foregoing hints. This is true not only with coke, but with every other fuel used for house heating; the heat units are there, and it is only a matter of determining how to get most of them into useful heat at the lowest cost, and to keep as many as possible from going up the chimney without performing their share in heating the house.

Snow Packs for Honey Bees

Putting bees in a snow pack out of doors has been found to be an ideal way to bring them safely through northern winters. Cases large enough to hold two hives, with space of 4 to 6 in. to spare, were built of boards and set out in the woods. In the late fall, hives were put in these and packed all around with dead leaves, with a foot or more of dead leaves on top. The cases were set facing east, to protect them from northwest winds. The leaves were

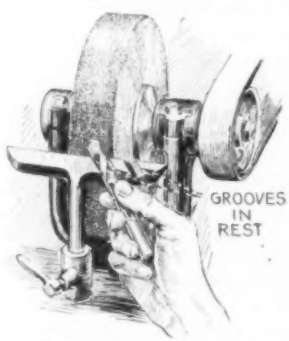
sufficient to keep the bees warm until snow came; then piles of snow on top and all around the cases served as a warm pack for the bees. Wintered in this way, they were found to come out in the spring in fine, hardy shape.

Drilling Holes in Lead

Every machinist knows what a difficult task it is to drill lead accurately. Large jobs cause considerable trouble, due to heated drills, which tend to stick, large burrs which form about the edges of the holes, and crawling chips, which tend to enlarge holes. The usual water lubricants, drilling compounds, kerosene, etc., are useless in such cases, but the use of good lard oil appears to be the solution for the problem. Use plenty of the oil and lift the drill out often during the drilling in order to clear the chips. A drill speed of between 800 and 1,000 r.p.m. has been found to give the best results.

Rest for Grinding Drills

I have had occasion to have a number of drills sharpened in small shops, and was surprised to note that in no case was the grinder operator supplied with any rest for holding the drill while doing the job. This method of sharpening a drill does not give an even bevel to the point and therefore the cutting is not performed by the entire surface of the point as it should be. In some instances there is but one edge cutting, the second having been ground down more than the first. I suggested the use of an ordinary rest having two V-grooves filed in the top at the proper angle to the surface of the emery wheel. A drill is placed in one of the grooves, and it can then be turned around while grinding, with assurance of having the correct cutting angle on the end.—Harry E. Gifford, Medford, Mass.



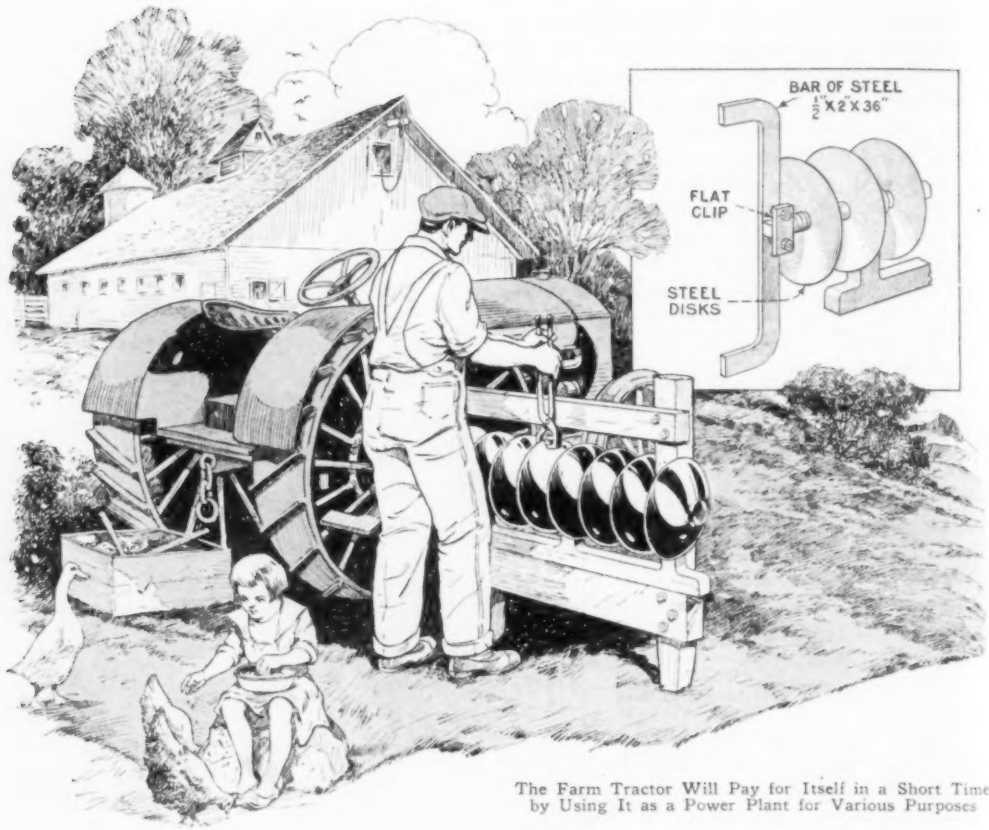
Auto-Wheel Spoke and Piece of Steel Plate Make Tool for Removing Mortar from Bricks

Chopping Mortar from Old Bricks

There are hundreds of brick buildings being torn down every year and contractors often try to salvage as much of the old bricks as possible. The photo shows a workman who made a brick hatchet out of a short auto-wheel spoke and a piece of ⅛ by 8-in. steel plate. The handle is split on the end for the blade and two screws hold the latter securely. This is a handy tool for chopping the mortar from the bricks and prying them apart. —Carlton Groat, The Dalles, Oreg.

How to Keep a Drawing Clean

Moving a T-square up and down on a drawing board over a sheet of paper tends to smudge the drawing. To prevent this from occurring, tie a length of string on each end of the board from top to bottom and the T-square will ride on them without touching the drawing.



The Farm Tractor Will Pay for Itself in a Short Time by Using It as a Power Plant for Various Purposes

Tractor Used to Sharpen Harrow Disks

Two years ago I purchased a harrow-disk sharpener. It was one of those arrangements in which you turn the harrow on its back, clamp a crank to one end of the shaft that holds the disks together, and, while one person turns the crank, another holds the sharpener against the disks. However, the job was not entirely satisfactory because of the lack of steady power delivered by the crank operator. Believing that a tractor could be used for this purpose, I made a device that coupled the harrow shaft to the tractor wheel directly, the coupling device consisting of a 3-ft. steel bar, 2 in. wide and ½ in. thick, bent as indicated in the detail and having a link attached at the center with two bolts for clamping it securely to the end of the disk shaft. Set the disk assembly on a heavy stand.—Geo. G. McVicker, North Bend, Nebr.

When Your Last Saw Blade Breaks

Did you ever have the only hacksaw blade break when working on a job away from the shop and where another blade was not available? Even if broken near the center, a blade can still be used. Dismantle the frame, and insert the broken end of the blade in the loose frame eye, wedging it with a bit of wood, as

Method of Using a Broken Hacksaw Blade

shown in the photo on the opposite page. If the blade is not used too strenuously small cuts can be made with it.

Repair on Gasoline-Tank Clamp

The bar that holds down the square gasoline tank on the older-model Ford coupes is held at the outer end by a wood screw, driven into the turtle-back frame. This screw often works loose and drops out, allowing the tank to vibrate on its supports. As the screw extends nearly through the wood frame, a longer wood screw cannot be used. A good repair can be made by using a small bolt through the turtle-back frame with the head on the outside. As the hole is directly above the tank, it is not easily drilled from the inside, though it can be done with a ratchet brace. A sharp-pointed punch can be driven through from the inside until a small dent is made in the metal on the outside of the turtle back. A hole for the through bolt is then drilled from the outside. A carriage bolt is good for this use and makes a neat finish on the outside. A bolt taken from a front-spring rebound clip is the right size.

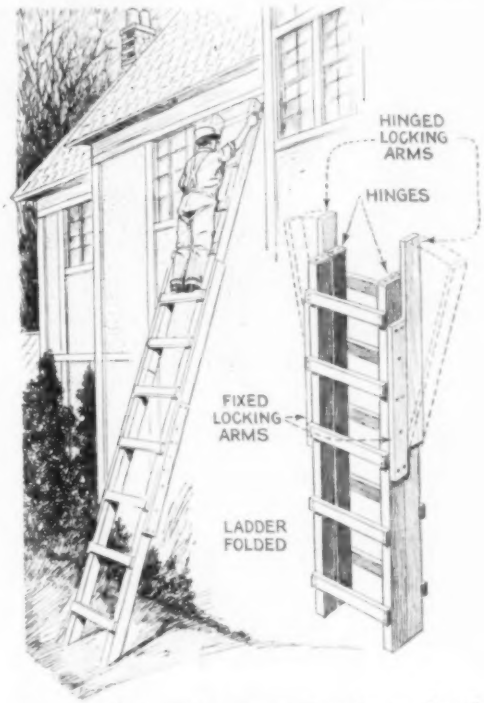
Keeping the Marking Brush Clean

The handle of a long marking brush is a hard thing to keep clean and free from paint in the average paint pot. Take a short piece of heavy hose, about 1½ in. to 2 in. long, and cut a deep angular groove in the top of it, as shown, to hold the handle of the brush. Split the lower end of the hose to fit snugly over the rim or edge of the pot. The brush handle is thus held away from the edge and will not get dirty or caked, nor roll around when the pot is moved.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

A section of an old inner tube, with one end cemented shut, makes a handy water pail for the motorist.

A Safe Folding Ladder

It is not uncommon for building workers to nail together rough, temporary ladders



Folding Ladder Which Locks Securely to Provide Safety for the Worker

to suit their own requirements. For example, there are many occasions during building construction where a ladder is needed in some particular part but it is impossible to reach it because of narrow passages and sharp turns. In cases like this a folding ladder can be made up out of materials found about the job. Instead of nailing the steps to two long uprights as usual, make the ladder in two halves and join them together with two stout hinges. Thus the ladder can be folded double, making it easy to pass it through places where a solid ladder would not go. However, such a ladder might be dangerous in use and therefore locking arms are provided to make it safe. These consist of two wood strips nailed to each side and two wood arms hinged to each side. When the arms are dropped, the ladder is locked and they must be lifted again before the ladder can be folded.—Harry Moore, Montreal, Can.

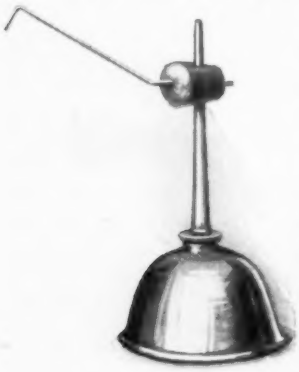
Convenient Truck Which May Be Made Stationary by Lowering the Legs

Truck Aids Moving Heavy Iron Machinery

The truck shown in the photo is constructed so that, by the use of a lever on the end, the guide wheel may be raised or lowered. When lowered, the truck rests on the two iron legs and becomes stationary. It is used for moving heavy iron machinery, but would also make a good portable bench.

Practical Improvised Surface Gauge

Many leveling or setting-up jobs encountered away from the shop can be done with an improvised surface gauge of the kind shown in the photo. The needle is simply a piece of wire forced through a heavy cork, which in turn is pushed down over the oil-can spout. The needle is easily moved up or down, yet it is firmly held by the cork. Of course, the tool cannot be relied upon for extreme accuracy, but it gives quicker and better results than the practice of attempting close work with a rule.

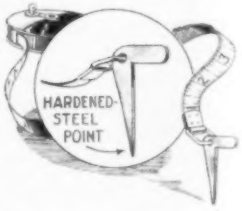


Sewers Plugged with Old Auto Inner Tubes

Old auto inner tubes are being used by plumbers and city sewer repairmen for plugging up sewer pipes while making repairs on them. Many tubes are ordinarily thrown away, due to a bad blow-out, although the rest of the tube is in good condition. The good section of the tube is cut off and the ends vulcanized to make it air-tight. If the valve is on the discarded section it should be removed and attached to the vulcanized section. Balloon tubes are the best kind to use. While the workmen are engaged in repairing a break in the sewer, the inner tube is inserted in the end of the pipe and is pumped up with air, forming a "plug," which effectively holds back water and sewage while the repair is being made. This method has been successfully used on pipes up to 30 in. in diameter. Small inner tubes can be used for smaller pipes.

Pin Attached to a Measuring Tape

When one is obliged to use a 50 or 100-ft. measuring tape alone, it is more or less of an awkward job. A nail and a rock are about the only means of holding the ring at the end of the tape in position for running the tape, and even these anchors are not always secure. A real-estate man used the pin shown in the accompanying drawing. A piece of flat steel was ground down to the form of a letter "L," with the longer portion 1½ in. long. This was sharpened to a point and hardened. A hole was drilled in the elbow and the short end rounded. The ring at the end of the rope was opened, slipped through the hole in the pin and closed, after which the butting ends were soldered together. With the aid of this pin, the tape can be held at any point on a tree, building or wood surface.—L. B. Robbins, Harwich, Mass.

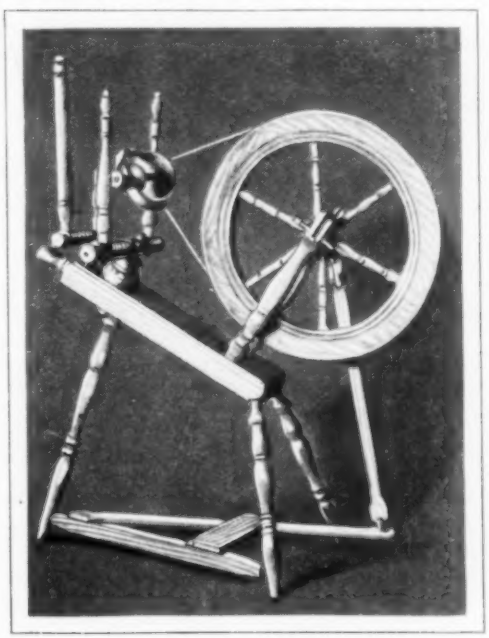


YOU CAN MAKE THIS COLONIAL SPINNING WHEEL

BY E·M·LOVE

SAVE in remote country districts, spinning has passed from the realm of household arts, outdistanced by machines that multiply hand labor a thousand fold. Yet an air of romance still clings to distaff and spindle, and the spinning wheel, celebrated in song and legend, takes its place in the modern home as a quaint reminder of an ancient craft and an example of early American furniture. Few people are fortunate enough to own a colonial wheel, but any handy man can make an excellent copy by following this article.

Most common hardwoods are suitable for material. Maple is perhaps the most desirable for the turned work, and oak or ash for the base, treadle and pitman. Glue up the wheel rim as a square frame from stock 1½ by 4¼ in. in the rough, the four pieces being 16 in. long. The ends are cut to an angle of 45°, as in Fig. 1.



Smooth one side and one edge of each piece for working faces, and gauge the ends with two lines, one ⅜ in. from the face; the other ⅞ in., for the sides of the tenons and mortises. Shoulder lines, 9½ in. apart, are scored with a knife square across the faces of the tenoned pieces, while pencil lines across the others limit the depth of the mortises. Rip the ends with the saw, splitting the line and cutting in the waste wood. Crosscut the shoulders, and chisel the mortise bottoms from both edges. Try for fit, apply glue liberally to all joining surfaces, and clamp up. Small clamps across the thickness of the joints will prevent wedging open. Set aside to dry until the turned work is done.

Rip 1½-in. strips from 1½-in. stock for larger spindles, and punch the centers of the ends with a nail. The photo below Fig. 1 shows a crude lathe driven by a washing-machine motor. The headstock is a piece of 2 by 4-in. wood, notched at one end to fit over the edge of another length of 2-in. material, to which it is nailed. A 16-in. spike, driven through the center 4 in. above the bed, forms a turning

center. The tailstock is like it, but left loose. The tool rest is a board of suitable width clamped in the vise. The spindle, drilled to fit the centers, and roughly rounded on one end to serve as a pulley, determines the distance between head and tailstocks. These, when clamped to the tool rest, form a rigid assembly.

Bore a piece of hardwood to fit the motor shaft or collar, turning it to a groove diameter of 2½ in. Over this drive pulley, pass a round leather belt, or, lacking this, a piece of carpenters' chalk line woven into a chain stitch and knotted together for a splice.

If a motor is not available, tie a 2-ft. length of inner tube to the ceiling for a return spring, with the belt tied to the lower end. Loop the belt around the spindle, attaching it to a 1 by 4-in. treadle, 3 ft. long and hinged to the floor at one end by two spikes driven through ¼-in. holes. With a little practice, very good turning can be done on this primitive lathe.

The average amateur has no turning tools, so shift must be made with common chisels. Sharpen a gouge to a razor edge. Fix the rest a little above center. Lay the gouge on it, holding it level with the left hand close to the rest and steadying the handle with the right. Point the blade and incline its diameter somewhat in the direction of motion, taking a cut from one end to the other of the stick. A little practice will show how heavy a cut can be made without slipping the belt. Rough the spindle to the largest diameter.

Figures 3 and 5 illustrate the legs. Cut the stock 1½ in. longer than the finished length, to allow for the pulley. Lubricate the centers with hard oil. When roughed to roundness, lay a rule on the rest, marking the divisions with a pencil while the piece turns. Work out the slender parts with the gouge to the finished diameter. If the tool is held well on edge in making the large coves, a shearing cut is obtained. Scrape the cylindrical portions with a ¼-in. chisel, holding it on edge to cut the shoulders and finishing with the blade held flat. For the beads, use the corner of the gouge, tipping the tool on edge as it nears the root depth. Cut the ⅛-in. coves with the tip of a rat-tail file. When the whole leg is shaped, smooth well with sandpaper. Lastly, cut to length.

Turn the two wheel supports, Fig. 2, in the same way. Rip the upper end of each through the diameter to a depth of 2⅛ in. Parallel to this, 3/16 in. from it on either side, make two other cuts. Bore the bottom with a ⅜-in. bit, as in another photo. File the slots smooth.

Figure 4 details the spindle crossarm, which fits over the tapered nut above the turned base, carrying the two spindle supports. The smallest coves are lines made with a three-cornered file. Centering 1⅛ in. from the left shoulder, bore a ¼-in. hole, ⅛ in. deep. Bore through the diameter with a ½-in. bit, and with a ¼-in. chisel and round file taper the small hole to meet the large upper one. Another hole, centering 8½ in. from it, is bored and tapered parallel to it. A third hole, tapering from ⅝ in. above to ¾ in. below, centers 2½ in. from the first, inclining at the rate of 3⅜ in. horizontally with a vertical rise of 6 in. Clamp the piece in a vise with the end holes properly inclined, as determined by a straight stick thrust through and compared with a square held upright on the bench. The bit can then be held vertical in the usual manner.

Figure 6 shows a mortise, ¼ by 1 in., in each spindle support, receiving a sole-leather spindle bearing. One leather is pierced with a ⅜-in. hole, while the other, carrying the tapered end of the spindle, is 3/16 in. Glue these in. Turn the tapers to such a diameter that the lower ends, solidly seated, project ¼ in. below the crossarm. Fig. 7 illustrates the distaff support. Four and one-eighth inches from the lower end, a ½-in. hole, 1 in. deep, carries the distaff crossarm, also detailed in Fig. 7. A ½-in. hole, 1 in. deep, centered on the cylindrical part of the crossarm, receives the distaff.

For tightening the belt, a screw, shown in Fig. 8, must be made. If an old wood clamp is available, the screw and nut may be turned from it; but if not, turn the screw from 1½-in. stock, with the threaded part ¾ in. in diameter. The end bearing is ½ in. through. The ¼-in. groove engages a wooden key in the base, to prevent withdrawal when the belt is slackened.

To get the pitch of the thread, build a miter box, ¾ in. wide, 1 in. deep and 4 in. long. With a backsaw, inclining 1/16 in.

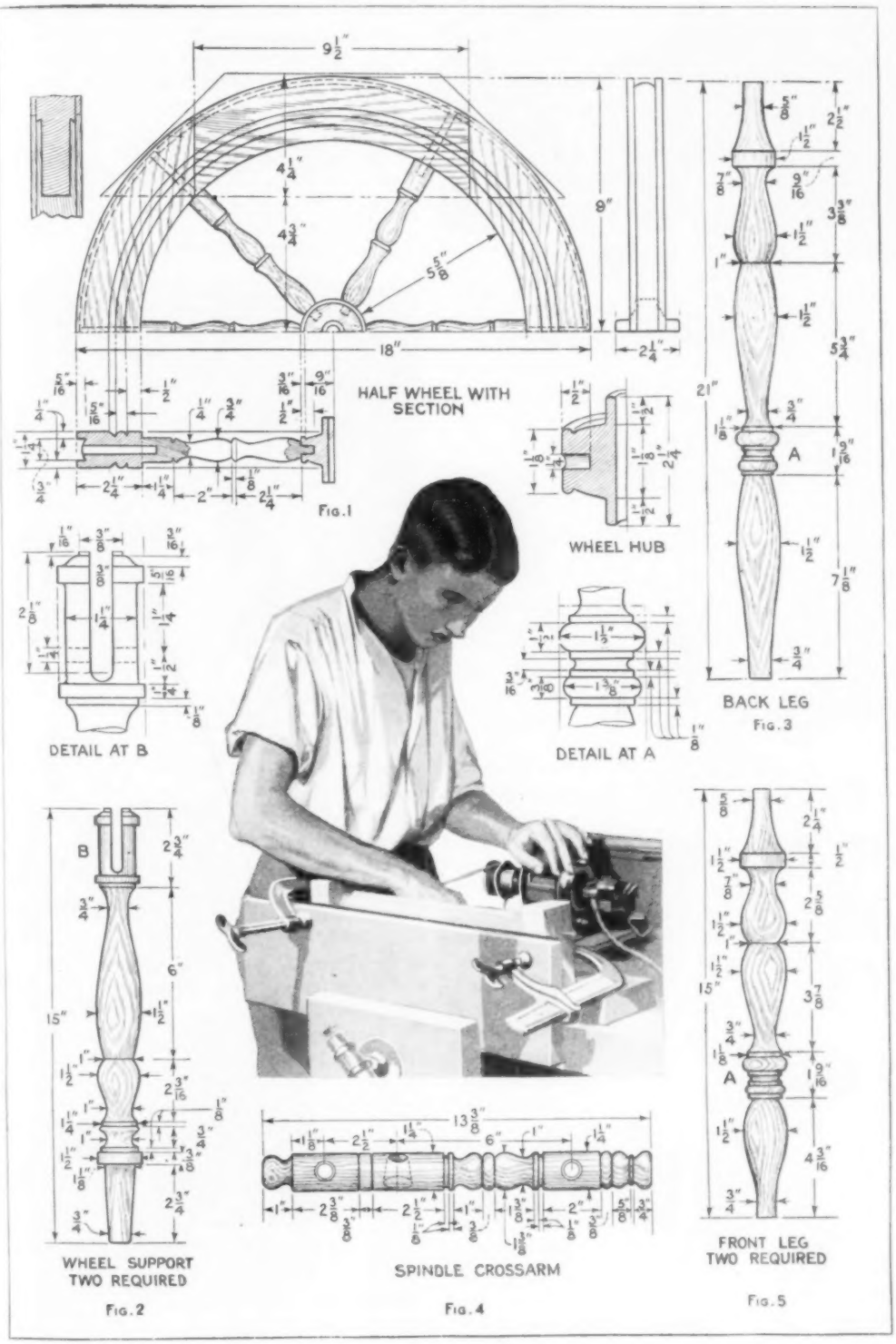


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

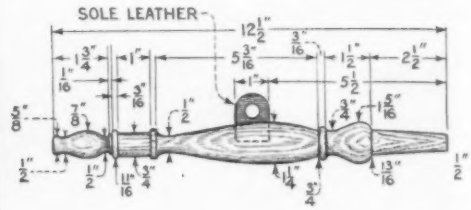
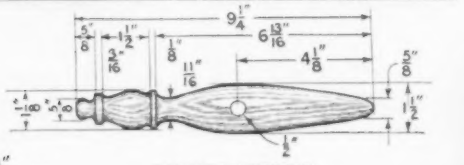
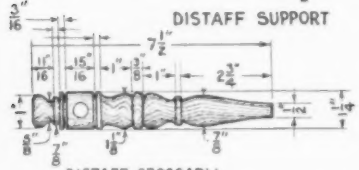


Fig. 6





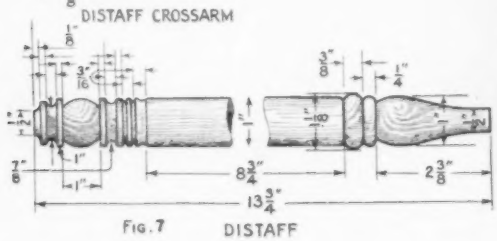
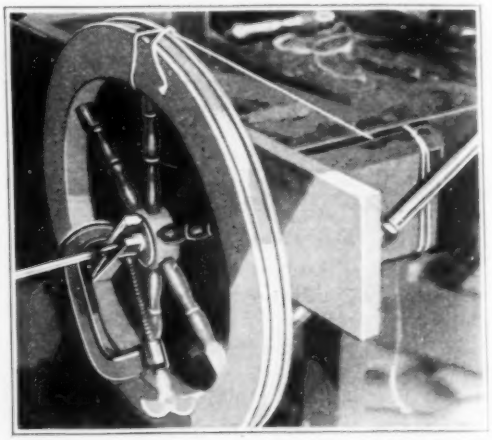


Fig. 7



Upper Left, Spacing Spoke Holes in the Hub; Lower Right, Truing Up the Wheel

from the square in the ¾-in. width, make a cut, ⅜ in. deep, across the middle. Insert the end of the screw blank and cut a groove about 1/16 in. deep, turning slowly and moving the saw in two or three short strokes. Next, draw a pencil line midway between the grooves and whittle the thread roughly to shape. Smooth the groove with a saw file, and trim the threads evenly to final depth with the knife. Finish smoothing with the file. A surprisingly accurate thread can be made in this way.

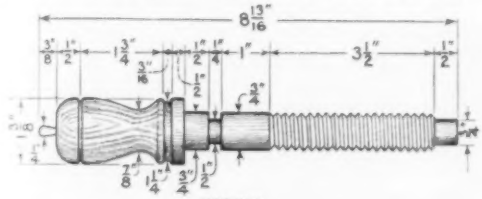
The nut, Fig. 8, having a square portion, 2⅝ in. long, to slide in the base guide, is turned off on the corners to a diameter of 1¾ in. Bore a through hole 1⅛ in. in diameter, centering 1¼ in. from the taper shoulder. Cast the threaded nut in plastic wood, as indicated in one of the photos. Bore a 1¼-in. hole through a 2 by 4-in. piece, 1 in. from the end, and rip out the end. In the bottom, lay a thick bed of plastic wood. Press the oiled screw into it, mold the top and force the piece sawn out of the block against it. Cut the wooden mold to liberate the bushing, leaving it on the screw until well hardened. Afterward trim the bushing to fit the tapered nut and glue it in place.

The turned spindle base, Fig. 9, is best made from 4 by 4-in. solid stock, but if this is not available, glue two pieces of 2-in. stock together with the grain running at right angles, bore the hole and taper it, and drive it over the nut taper for an arbor. Turn to dimensions. It is recessed in the bottom ½ in. deep. The bobbin, dimensioned in the same drawing, is pierced with a ¼-in. hole, so as to turn freely on the spindle.

The spindle can be made from a 3/16-in. curtain rod, obtainable at most 10 and 15-cent stores. Split the end for ¾ in., bending the halves outward and back parallel, to give an inside width of ⅜ in. Cut the rod to 8¾ in., and file a taper, 1⅝ in. long, on the solid end, reducing it to ⅛ in. Thread the rod for ¼ in. just above the taper where a nut sunk in the flier pulley engages. The eye bearing is a ferrule cut

from the base of an oilcan spout and filled with plastic wood. When dry, fit the eye ends solidly and bore out the center. The flier and pulley are also detailed in Fig. 9.

The flier is sawed from ¾-in. stock. Through a ¾-in. button, ⅜ in. long, and the slightly less than 3/16-in. hole in the flier, the spindle is forced until the eye sinks into the button enough to grip it strongly. Screw nine small iron hooks into each flier arm, and, lastly, screw on the flier pulley. (In use, the flax or wool is fed through the eye bearing and looped over the hooks, with the end tied to the bobbin. The flier, rotating, twists the yarn, while the bobbin, having a smaller pulley and revolving faster, winds it up.)



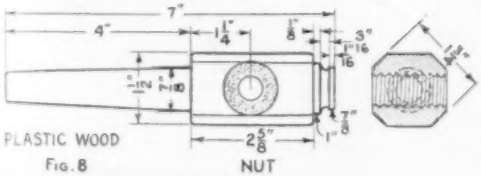
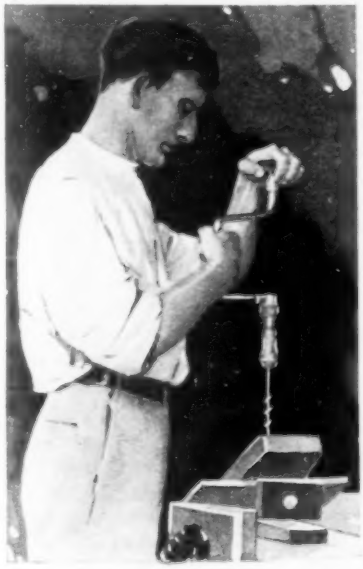


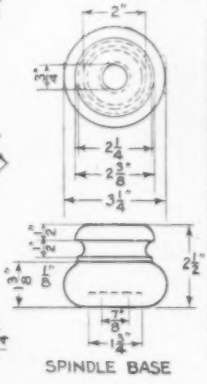
Fig. 8

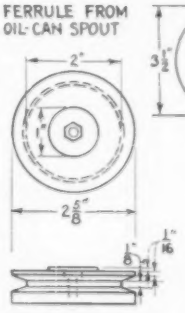


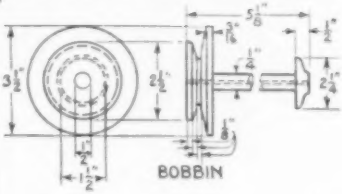
Two small pins, shown in Fig. 11, are turned to hold the wheel axle in the slots. The axle is a 5½-in. piece of ⅜-in. round iron. For the crank, bend a 5/16-in. bolt to an arc of about 1⅛ in., hammering it to a thickness of 3/16 in. Near one end, drill a 3/16-in. hole, to be filed square. Centering 2 in. from this, drill the crank-pin hole. File a square end on the axle for riveting to the crank. Use a piece of hinge pin for the crank pin, supplying washers, as in Fig. 13.

Scribe the inner and outer diameters of the wheel with a pivoted stick, as in the photo, and cut the outside with a keyhole saw. Smooth with a spokeshave. Nail, across the two faces, pieces of 1 by 4-in. stock with the nails in the waste wood. Locate the wheel center by scribing intersecting arcs from various points on the inner rim line. (See photo.) Bore holes

Upper Right, Paring Molding on Base to Make Bead; Lower Left, Boring Distaff Hole







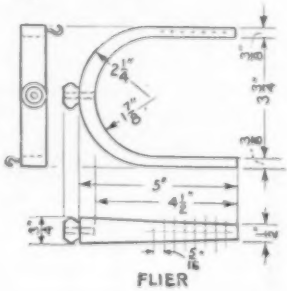


Fig. 9

in these temporary "spokes" to fit a piece of broomstick snugly; the spokes are nailed to the broomstick and a stout wooden crank is attached, after mounting in 2 by 4-in. bearings held in the vise. Stand on the floor a board long enough to serve as a tool rest, bracing it to the bearings. On each side of the wheel, with the least possible clearance, nail a guide piece, preventing side wobble with relation to the tool rest. If another person turns the crank, the belt groove detailed in Fig. 1 can easily be turned.

MATERIAL LIST

1 piece, 1½ by 5 in. by 5 ft., maple.
1 piece, 1½ by 8 in. by 4½ ft., maple.
1 piece, 1 by 6 by 12 in., maple.
1 piece, 4 by 4 by 12 in., maple.
1 piece, 2 by 10 in. by 2 ft., oak.
1 hinge pin from loose-pin butt, 2½ by 2½ in.
1½ doz. small steel hooks.
1 leather shoelace.

Turn the spokes and hub, bore ¼-in. holes, ½ in. deep, in the large ends of the turned spokes, and locate the holes in the hub by stepping around the circumference with a pair of dividers spanning the radius of the hub, as in the photo to the left of Fig. 6. When the inside of the rim is cut and smoothed, bore ¼-in. dowel holes through it at the proper points for the spokes. All being ready, glue up, inserting the spokes in the hub and inside the rim, driving the dowels from the outside.

The photo below Fig. 6 shows a method of holding the wheel true until dry. Insert a ⅜-in. rod into the hub and clamp it level in the vise. Tack a board across the bench end, shimming it square with the rod, and place the wheel. If the spokes are tightly fitted, the hub will bulge outward. Force it into position and hold with sticks clamped to the axle. Rotate it until the part of the rim inclined outward is at the top, where it can be tied with a string, its position being proved by a square held along the shaft.

Figure 12 dimensions the oak base. Cut the stock 18 in. long, and work from a center line. To make the molding, rabbet the top edge ⅛ by ⅜ in. Round the corners to a radius of ½ in. Plane off the bead corner and work it round. Bore 1½-in. holes for the ends of the guide, and saw out the material between. The screw bearing is ¾ in. in diameter, 1 in. from the bottom and centered on the nut guide. A ¾-in. hole, ⅝ in. deep, receives the end of the screw. Make a ¼-in. square key hole ½ in. from the end and ¼ in. from the screw center. The nut is slipped into the slot in the base and the screw turned into the nut until the ¾-in. nose on its end is fully seated in the corresponding hole in the bottom of the slot. Then a ¼-in. key is inserted in the key hole above referred to, and driven in until it passes across the ¼-in. groove in the screw, locking the latter in place, and enabling the nut to be traversed back and forth by turning the screw. The spindle base fits on the taper portion of the nut, and the spindle crossarm on the upper part of the nut taper, above the spindle base. Next, the spindle supports are driven into the crossarm, and the spindle fitted into its leather bearings between them. Block the base in the vise at an angle of 3⅜ in. rise in 6 in., and, holding the bit vertical, bore the distaff-support hole, centering 1½ in. from the narrow end and 1 in. from the base center. This hole tapers from ¾ in. at the top to ⅝ in. at the bottom.

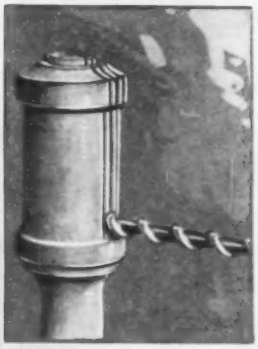
The ⅝-in. hole in the bottom for the long leg is 3 in. from the narrow end and 1¾ in. from the center, leaning toward the wide end 1¾ in. in 10 in., and toward the center 1 in. in 20 in. The angles of the front legs can be accurately bored by the use of a guide, as indicated in the photo showing this operation. They incline outward from the center 4½ in. in 12 in., and, parallel to the base center, 4¼ in. in 4½ in.

Assemble the legs with the base, stand on a floor, and scribe the leg ends ¼ in. up for cutting.

Dress the wheel to thickness. Scratch the bead V's with a nail point in a pivoted stick. Clamp the axle in a vise, push the wheel against the bench end, and, holding a ¼-in. chisel against the bench top with the right hand, turn the bead by rotating the wheel with the left hand, pressing the rim against a stop on the bench end to secure a uniform cut. Sand the wheel, assemble the spindles and put the wheel on its axle. Aline the grooves with the spindle and bobbin pulleys so as to mark the axle. Drill a ⅛-in. hole through hub and axle to receive a piece of nail as a key.

Forming the Nut in Mold by the Use of Plastic Wood

Assembly of Flier, Pulley and Spindle Eye



Slotting Upper Ends of Wheel Supports

Scribing the Rim of Wheel Preparatory to Sawing

Locating Center of Wheel on Temporary Spokes

Sawing Out Inside of Rim with Keyhole Saw

The pivoted member of the treadle (Fig. 13) is 1 in. square, with the ends turned to a taper. Use pieces of spikes as pivot pins, and hang 2 in. above the floor. The pitman, Fig. 10, has a ¼-in. slot at its

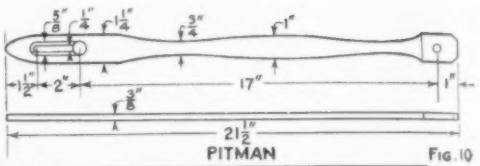


Fig. 10

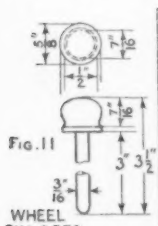


Fig. 11

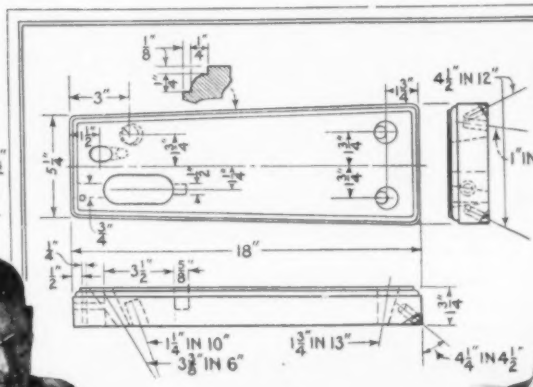
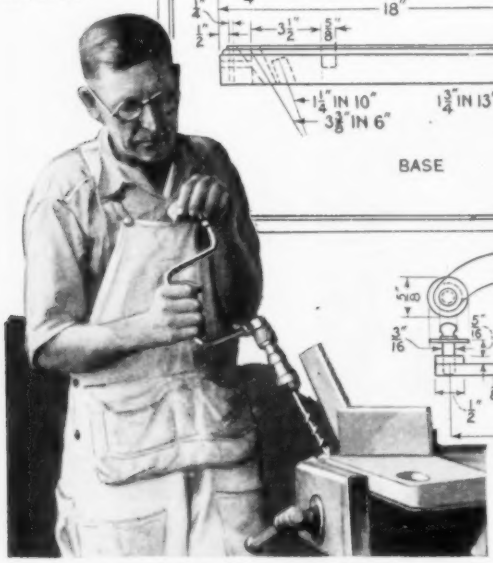
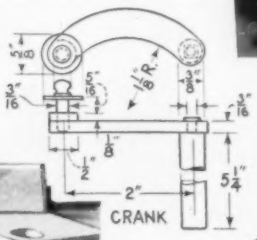


Fig. 12





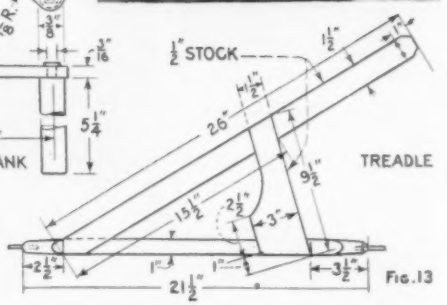


Fig. 13

Upper Right, Cutting Beads in Wheel Rim; Lower Left, Boring Holes for Legs

upper end to accommodate the crank-pin body. In order that the head of the crank pin, and its washer, may be passed through the slot, the latter terminates, at its lower end, in a ⅝-in. hole. Centering 2 in. from this, at the other end of the slot, is another ⅝-in. hole; this is drilled only ¼ in. deep. From this hole to the first, another slot is cut, ⅝ in. wide and ¼ in. deep, as indicated by the double lines in Fig. 10. This makes a shouldered slot, ¼ in. wide, on one side of the pitman and ⅝ in. wide on the other. The head of the crank pin with its washer rides on the shoulder. Attach the pitman end to the treadle with a leather thong tied underneath.

Give the wheel a coat of oil, and when dry and sanded off, give a second coat. Splice a single-string belt around the wheel and both pulleys.

Paper Used as Tire Flap

The tough paper tape used on new casings will protect the inner tube from rust on a clincher rim. The tape is wound around the rim, making several turns, and the tire applied as usual. The loose end of the tape should be held by patching cement so that the wrapping will lie flat while the tire is being applied. Such a tire flap will not stand water as well as one with rubber in it, but costs nothing and is easily obtained when needed.

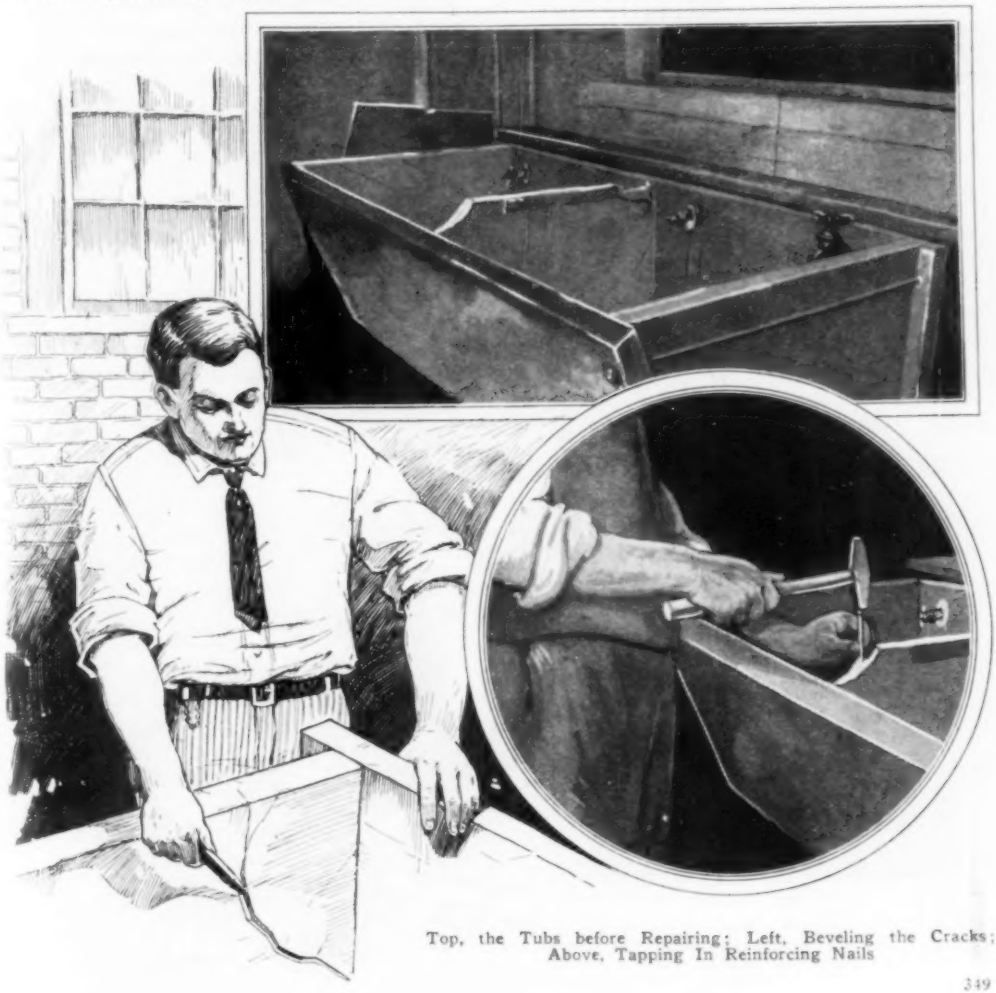
Repairing Broken Laundry Tubs

By R. H. KASPER

WHEN the household laundry tubs, which are usually made of an imitation stone, begin to leak, the housewife may tolerate the inconvenience for some time, but eventually the tubs have to be discarded. The following method was successful in repairing a set of tubs which leaked in practically every joint; in addition to this, many pieces were broken out and some of the panels were cracked. The condition of the tubs may be seen from the first illustration.

One point which it is necessary to observe is that the repair must be made from the inside; for any repair made from the outside will allow the water to seep through the cracks and, in a short time, leakage will again take place. The tubs should first be carefully examined for cracks. These may be very fine lines, scarcely discernible, but nevertheless they let water through, especially if it is hot. As the cracks are found they should be marked with chalk or crayon, as it is otherwise easy to lose track of them.

After the cracks have been found and marked, the first thing to do is to bevel them; that is, to cut a V-groove along the cracks. The "V" may be cut with a cold chisel, or may be scraped with the



Top, the Tubs before Repairing; Left, Beveling the Cracks; Above, Tapping In Reinforcing Nails

corner of an old file. As the material of the tubs is quite hard, the file edges will be rapidly dulled; a new sharp surface may be secured by breaking a piece off the end of the file. Laundry tubs are usually made with the end panels fitting into grooves in the front and back panels. This is a common point of leakage, as the original cement deteriorates and breaks out. These corners should be scraped thoroughly, so as to remove as much of the old, loose cement as possible.

If any of the panels are broken, which they usually are if a wringer or other appliance has been attached to them, the broken sections must be built up with cement. Some method of reinforcing these parts is necessary. With a regular machine drill, make a number of small holes, about 1 in. apart and 1 in. deep, into the broken sections. The drill must be sharpened frequently, to keep it cutting clean. A wire nail is then driven into each hole so that the head will come slightly below the finished surface. Care must be used in selecting the drill size, as the nail should be a light tapping fit in the hole; if driven too tightly, it may crack the composition.

After the nails have been placed, a mold is built around the broken sections. This is done by clamping a piece of wood on each side of the panel, fitting it well into the corners and flush with the finished surfaces. A mortar is then prepared by mixing two parts of fine white sand with one part of Portland cement, adding enough water to make a paste which pours easily. After wetting the broken surfaces with water, pour the mortar into the mold, working it well down into the cor-

Lower Left, Mold in Place; Right, Drilling Holes for Reinforcing Nails; Above, Finishing Repaired Sections

ners with a thin stick. Any excess is scraped off flush with the top of the mold. For filling the beveled cracks, the mortar should be of a heavier consistency, and should be worked in very carefully and smoothed with a trowel

Twenty-four hours later, the mold may be removed and any irregularities filled in or smoothed off. The cement is then permitted to set until it becomes hard to the touch. Finally, a wash is made with Portland cement and water, the mixture being about like heavy cream. This is applied to the repaired parts and to the corners with a varnish brush. Drying will take place rapidly, usually within an hour, after which a second and third coat should be applied, also with a brush.

After the repaired parts have become stone-hard, scrub the inside of the tubs with a stiff bristle brush and clear, cold water. A soap mixture is then made, cutting a cake of yellow laundry soap into small pieces and dissolving it in ½ gal. of water; warm water will dissolve the soap more rapidly, but the mixture must be applied cold. A varnish brush is used, and the solution rubbed in well so as to fill all the pores. After drying overnight, a mixture of alum, 1 lb., and water, ½ gal., is applied with a brush. It must be brushed in well, as the soapy surface repels the alum water in much the same manner as an oily surface repels water. After drying, the tubs should be filled with clear, cold water and permitted to stand for a few days to thoroughly harden the cement, after which the tubs will be ready for use.

A set of laundry tubs repaired by this method held water for two weeks without any noticeable drop in the level, whereas, before the repair, they would leak empty in a few hours.

An ever-ready auto creeper can be made by putting casters on one of the car's floorboards.

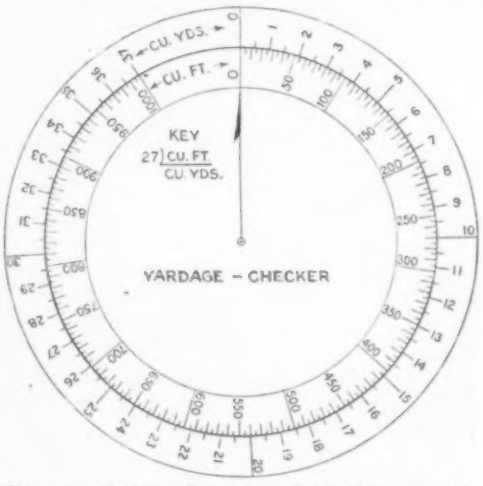


Chart for Quickly Converting Cubic Feet to Cubic Yards and Vice Versa

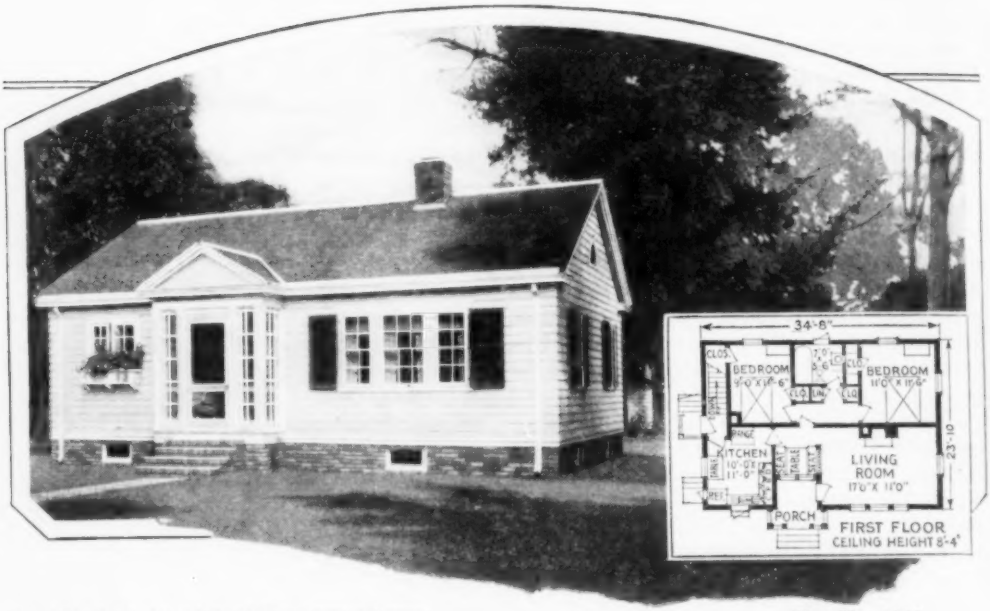
When the Grease-Cup Cap Is Lost

Small grease-cup caps disappear and become lost with an aggravating frequency. You can still keep the cup lubricating very satisfactorily, however, if a light grease is used at the time. Take an old tire-cement tube or similar collapsible tube, and cut it in two. One of the halves is cleaned out, filled with grease and tied securely to the post portion of the cup. Squeezing the tube from time to time forces plenty of the light grease down into the bearing.—Frank W. Bentley, Jr., Missouri Va[illegible]va.

Simple Yardage Checker Aids Engineers

A yardage checker of the kind shown in the drawing should be of interest and value to engineers and contractors for making preliminary estimates, and for a close check on final estimates. Its use is simple, reasonably accurate and avoids the possibility of error in division. The number of cubic feet is read on the inner circle and cubic yards directly opposite on the outer circle. For quantities from 1,000 to 10,000 cu. ft. the decimal point of both cubic feet and cubic yards is moved one place to the right; from 10,000 to 100,000 cu. ft., two places to the right, and so on. For example, 200 cu. ft. equals 7.4 cu. yd., 2,000 cu. ft. equals 74.0 cu. yd., 20,000 cu. ft., 740 cu. yd., and so on, for larger quantities.

Is This Your Home?



Plan No. 4A10

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and endorsed by the United States department of commerce. Please inclose 10c in stamps or coin. Blueprints, specification forms, and material lists for the house shown here may be obtained from The Architects' Small House Service Bureau for a small fee. If further information is desired, literature describing the plan service and publications of The Architects' Small House Service Bureau will be sent upon request. A booklet entitled "50 Ways to Lower Home Building Costs," illustrated by ten Bureau homes actually lived in and showing how as much as $1,000 can be saved on a home, may be obtained for 20c.

THIS delightful colonial bungalow is fully worth the appreciation critical home builders will feel for it. It is as convenient and economical a plan as you can find anywhere. Every comfort-giving feature is provided. Inside and out, the design has been kept simple and inexpensive, without missing any of the essentials of a modern home or sacrificing exterior charm. It is built entirely of frame with wide bevel siding on the exterior; shingle roof; brick base course and brick chimney. While the plan calls for a full basement, this can be omitted if desired. This house can be accommodated on a forty-five-foot lot. The plan is based on a rectangle; the roof is simple; there are no expensive extras—so this should be a home reasonable to build.

Its features in the way of conveniences are many. In this plan, for instance, the living quarters have been designed to occupy one side of the house and the sleeping quarters the other. Entrance to the bedroom section leads off a private hall.

The latticed entrance porch is a little to one side and opens directly into the living room. The porch is so well protected that a vestibule is unnecessary. The living room is beautifully proportioned. The brick fireplace with its handsome wood trim is in the center of the long inside wall.

In reality, this is a five-room house, because the dining alcove, equipped with the popular built-in side seats and table, has all the advantages of a dining room, yet it does not consume the valuable floor space that a dining room would take up in a house of this size. The beautiful, open grill which separates living room and dining alcove is really a decorative feature that adds distinction to both rooms.